Audit and Review Report for Plant Aging Management Reviews and Programs

Point Beach Nuclear Plant Units 1 and 2

Docket No. 50-266 and Docket No. 50-301

April 11, 2005

Revision 1

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License Renewal and Environmental Impacts Program
Washington, D.C. 20555-0001

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Point Beach Nuclear Plant, Units 1 and 2

1. Introduction

By letter (ADAMS Accession Number ML040580023) dated February 25, 2004, Nuclear Management Company (NMC, the applicant) submitted to the U.S. Nuclear Regulatory Commission (NRC) its application for renewal of Operating Licenses DPR-24 and DPR-27 for Point Beach Nuclear Plant, Units 1 and 2, respectively. The applicant requested renewal of the operating license for an additional 20 years, in accordance with the criteria of 10 CFR Part 54.

In support of the staff's safety review of the license renewal application (LRA) for Point Beach Nuclear Plant (PBNP), Units 1 and 2, the License Renewal and Environmental Impacts Program, Section B (RLEP-B), led a project team between April and July 2004 that audited and reviewed selected aging management reviews (AMRs) and associated aging management programs (AMPs) developed by the applicant to support the LRA for PBNP Units 1 and 2. The project team included both NRC staff and contractor engineers provided by Pacific Northwest National Laboratory, the RLEB-B technical assistance contractor.

The project team performed its work in accordance with the requirements of Title 10 of the Code of Federal Regulations (CFR), Part 54 (10 CFR Part 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 - Point Beach Nuclear Plant Units 1 and 2," Docket No. 50-266 and Docket No. 50-301 (ML041550860).

Overall, for its assigned scope of work, the project team comfirmed 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 current licensing basis (CLB) for Point Beach Units 1 and 2 for the period of extended operation.

2. Background

This audit and review report documents the results of the project team's audit and review work. The team performed its work at NRC Headquarters, Rockville, Maryland; at Pacific Northwest National Laboratory offices in Richland, Washington; and at the applicant's offices at the Point Beach plant site in Two Rivers, Wisconsin. The project team conducted site visits during the weeks of April 26, 2004, and June 7, 2004. The team conducted a public exit meeting at the applicant's offices in Twin Creek, Wisconsin, offices on July 15, 2004.

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 NRC regulations for fire protection, environmental qualification, 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 have 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 NRC-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 review of the substance of the matters described in the GALL Report. Rather, the staff confirms that the applicant established 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 addresses all the program elements of the referenced GALL program. These elements are described in the 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 those verifications are documented and retained by the applicant in an auditable form.

3. Summary of Information

in the Point Beach Units 1 and 2 License Renewal Application

The PBNP LRA closely follows the standard LRA format presented in Nuclear Energy Institute (NEI) guidance, NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR Part 54 -- The License Renewal Rule*, Revision 4, April 2001. Section 3 of the PBNP LRA provides the results of the AMPs for SCs that the applicant identified as subject to an AMR.

3.1 Point Beach Units 1 and 2 License Renewal Application Tables

PBNP LRA Tables 3.1.1, 3.2.1, 3.3.1, 3.4.1, and 3.5.1 provide descriptions of material, operational environment, and component types for the mechanical, structural, and electrical service SCs 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 coolant system subsection, this is Table 3.1.1, and in the engineered safety features subsection, this is Table 3.2.1.

X	Definition
1	Reactor Coolant System
2	Engineered Safety Features Systems
3	Auxiliary Systems
4	Steam and Power Conversion Systems
5	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 PBNP 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 coolant system subsection, the AMR results for the reactor vessel and control element drive mechanism pressure boundary are presented in Table 3.1.2 1, and the results for the reactor vessel internals are in Table 3.1.2 2. In the engineered safety features subsection, the emergency core cooling system results are presented in Table 3.2.2-1, and the containment spray system results are in Table 3.2.2-2.

The applicant compared the Point Beach 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 License Renewal Application Table 1 – Summary of Aging Management Evaluation in Chapter IV of the GALL Report

The PBNP LRA Table 1 provides a summary comparison of how the Point Beach AMR results align with the corresponding table of Volume 1 of the GALL Report. The LRA 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 the PBNP LRA Table 1 the corresponding component type in the PBNP LRA Table 1. The "Discussion" column includes further information. The following are examples of information that might be contained within the "Discussion" column:

- information on further evaluation required or reference to the location of that information
- the name of a plant-specific program being used
- exceptions to the GALL Report assumptions
- a discussion of how the line item is consistent with the corresponding line item in the GALL Report, when it may not be obvious
- 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 PBNP evaluations and programs align with Volume 1 of the GALL Report.

3.1.2 License Renewal Application Table 2 – Summary of Aging Management Evaluation Line Items

The PBNP 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 engineered safety features system group contains tables specific to emergency core cooling, containment spray, containment cooling, containment penetrations, and hydrogen control. Table 2 consists of the following nine columns:

- *Component Type*. Column 1 identifies the component types that are subject to an AMR. The component types are listed in alphabetical order. In the structural tables, component types are sub-grouped by material.
- *Intended Function*. Column 2 identifies the license renewal intended functions for the listed component types. Definitions and abbreviations of intended functions are listed in Table 2.0-1 in Section 2 of the PBNP LRA.
- *Material*. Column 3 lists the particular materials of construction for the component type being evaluated.
- *Environment*. Column 4 lists the environment to which the component types are exposed. Internal and external service environments are indicated. A description of these environments is provided in Table 3.0-1, Table 3.0-2, and Table 3.0-3 for mechanical, structural, and electrical components, respectively.
- *Aging Effect Requiring Management*. Column 5 lists the aging effects identified as requiring management for the material and environment combinations of each component

type.

- *Aging Management Programs*. Column 6 lists the programs used to manage the aging effects requiring management.

- *GALL Report Volume 2 Item*. Column 7 documents identified consistencies of factors listed in Table 2 of the PBNP LRA with the GALL Report by noting the appropriate GALL Report item number. Each combination of the following factors listed in Table 2 is compared to the GALL Report to identify those consistencies: component type, material, environment, aging effect requiring management, and AMP. If there is no corresponding item number in the GALL Report for a particular combination of factors, Column 7 is left blank.

- *Table 1 Item*. Column 8 is a cross reference line items from Table 2 to Table 1. Each combination of the following that has an identified GALL Report item number also has a Table 1 line item reference number: component type, material, environment, aging effect requiring management, and AMP. Column 8 lists the corresponding line item from Table 1. If there is no corresponding item in the GALL Report Volume 1, Column 8 is left blank.

- *Notes*. Column 9 contains notes that are used to describe the degree of consistency with the line items in the GALL Report. 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 format of 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 PBNP. The letter notes are described in detail in Section 7.2 of this report.

Correlations between the combination in the PBNP LRA Table 2 and a combination for a line item in Volume 2 of the GALL Report are identified by the GALL Report item number in Column 7. If Column 7 is blank, the applicant did not identify a corresponding combination in the GALL Report. If the applicant identified a GALL Report line item, the next column provides a reference to a Table 1 row number. This reference corresponds to the GALL Report Volume 2 "roll-up" to the GALL Report Volume 1 tables. Many of the GALL Report evaluations refer to plant-specific programs. In these cases, the applicant considers the PBNP evaluation to be consistent with the GALL Report if the other elements are consistent. Any AMP suitable for management of a particular aging effect is considered to be consistent with the GALL program for line items referring to a plant-specific or alternative program if it has been reviewed and determined to be consistent with the seven program elements (attributes) used to review the plant-specific program.

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 - Point Beach Nuclear Plant Units 1 and 2" (ML041550860). The project team examined 20 of the PBNP LRA AMPs and associated AMRs. 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 and AMRs as identified in the audit and review plan.

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, contain some deviations from the

GALL Report. These deviations are of two types:

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

During the audit and review process, the project team determined that the applicant used the word "enhancement" to describe two types of revisions to plant procedures or program activities. The applicant used "enhancement" to describe one type of programmatic revision to achieve consistency with the GALL Report. The project team reviewed these programmatic enhancements per the process described in the audit and review plan.

The applicant also used the word "enhancement" to describe revisions that were required only by the applicant's internal administrative implementing documents. These administrative enhancements are not necessary to demonstrate consistency with GALL criteria and are not within the scope of the audit and review process described in the audit and review plan. Therefore, the project team did not review these types of administrative enhancements and explicitly stated which enhancements were not reviewed in each AMP write-up.

The project team reviewed all of the AMRs in the tables in Chapter 3 of the PBNP LRA except those assigned to the Office of Nuclear Reactor Regulation (NRR), Division of Engineering (DE) staff. They were either consistent with the GALL Report, as identified by Notes A through E in the PBNP LRA Table 3.X.2-Y (from Column 9 of the Table 2s discussed in Section 3 of this report), or reviewed and accepted by the project team on the basis of an NRC-approved precedent (see Section 5.3 below).

5. Audit and Review Process

The project team followed the process detailed in the Point Beach Units 1 and 2 audit and review plan (ML041550860). This process is summarized in this section.

5.1 Point Beach Units 1 and 2 LRA AMPs Consistent with the GALL Report

For the PBNP 1 & 2 LRA AMPs for which the applicant claimed consistency with the AMPs in the GALL Report, the project team comfirmed consistency. The team reviewed the AMP descriptions and compared 7 of the 10 program elements for those AMPs (as defined in Branch Technical Position RLSB 1 of the SRP-LR, Appendix A.1) to the corresponding program elements for the GALL AMPs (Attachment 3 shows the 10 program elements from the SRP-LR). As discussed in the PBNP 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 NRR Division of Inspection Program Management (DIPM) and the results documented in Section 3 of the PBNP Safety Evaluation Report (SER) related to the PBNP LRA.

For PBNP LRA AMPs that have one or more exceptions or enhancements, the project team reviewed each exception or enhancement to determine whether it is 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 the PBNP LRA AMPs. In these

cases, the team reviewed the difference to determine whether or not it is acceptable and whether or not the AMP, as modified by the difference, would adequately manage the aging effects.

For those PBNP LRA AMPs that are not included in the GALL Report—i.e., those based on an NRC-approved precedent—the project team reviewed the AMP against the seven program elements within its review scope. On the basis of its audit and reviews, the project team determined whether the AMPs would manage the aging effects for which they are credited (see Section 5.3 below).

5.2 Point Beach Units 1 and 2 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.

The project team comfirmed that the AMRs reported by the applicant to be consistent with the GALL Report are consistent with the GALL Report and comfirmed that the plant-specific AMRs reported to be justified on the basis of an NRC-approved precedent are technically acceptable and applicable. For AMRs 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 recommended further evaluation.

5.3 NRC-Approved Precedents

To help facilitate the staff review of its PBNP LRA, an applicant may reference NRC-approved precedents to demonstrate that its non-GALL programs correspond to reviews that the staff had approved for other plants during its review of previous applications for license renewal. When an applicant elects to provide precedent information, the project team determines whether the material presented in the precedent is applicable to the applicant's facility, determines whether the plant program is bounded by the conditions for which the precedent was evaluated and approved, and verifies that the plant program contains the program elements of the referenced precedent. In general, if the project team determines that these conditions are satisfied, it will use the information in the precedent to frame and focus its review of the applicant's program.

It is important to note that precedent information is not a part of the PBNP LRA; it is supplementary information voluntarily provided by the applicant as a reviewer's aid. The existence of a precedent, in and of itself, is not a sufficient basis to accept the applicant's program. Rather, the precedent facilitates the review of the substance of the matters described in the applicant's program. As such, in its documentation of its reviews of programs that are based on precedents, the precedent information is typically implicit in the evaluation rather than explicit. If the project team determines that a precedent identified by the applicant is not applicable to the particular plant program for which it is credited, it may refer the program to the NRR DE for review in the traditional manner, i.e., as described in the SRP-LR, without consideration of the precedent information. As noted in Section 4 of this audit and review report, the applicant chose to provide precedent information to support its selection of certain PBNP programs. Therefore, some of the project team reviews documented in this audit and review report considered precedent information in the manner described above.

5.4 Updated Final Safety Analysis Review Supplement

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

5.5 Documentation and Documents Reviewed

In performing its work, the project team relied heavily on the PBNP LRA, the SRP-LR, and the GALL Report. The project team also examined the applicant's precedent review documents and 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 confirm that the applicant's activities and programs will adequately manage the effects of aging on SCs.

Any discrepancies or issues discovered during the audit and review that required a formal response on the docket are documented in this audit and review report. The project team's questions all were resolved during the site visit interviews or in the letter dated July 12, 2004, from Dennis L. Koel (NMC) to Document Control Desk (NRC), "Clarifications to Point Beach Nuclear Plant License Renewal Application Information As a Result of Aging Management Program and Aging Management Review Audits of April and June 2004" (ML041960159). Therefore, no requests for additional information were issued.

Attachment 5 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 aging management.

6. Exit Meeting

The project team held a public exit meeting with the applicant on July 15, 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 audit and review report.

7. Audit and Review Results

The project team's audit and review activities for the PBNP LRA AMPs and AMRs, and conclusions, are documented in this section.

7.1 Aging Management Programs

The project team's audit and review activities for the PBNP LRA AMPs and its conclusions

regarding these programs are documented below. The audit and review was performed in accordance with the guidance contained in the PBNP audit and review plan as summarized in Section 5 of this report.

7.1.1 ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program (AMP B2.1.1)

In the PBNP LRA, Appendix B, Section B2.1.1, the applicant states that PBNP AMP B2.1.1, "ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program," is an existing program that is consistent with GALL Report Section XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and GALL Report Section XI.M3, "Reactor Head Closure Studs," with exceptions.

7.1.1.1 Program Description

The PBNP LRA states that inspections under the ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program are performed to identify and correct degradation in Class 1, 2, and 3 piping, components, and their integral attachments. The program includes periodic visual, surface, and/or volumetric examinations and leakage tests of all 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 in ASME Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," or commitments requiring augmented inservice inspections, and are within the scope of license renewal.

The Code of Federal Regulations, 10 CFR 50.55a, requires that inservice inspection of Class 1, 2, and 3 pressure-retaining components and their integral attachments be conducted in accordance with the latest edition of ASME Section XI approved by the NRC 12 months prior to the start of a 10-year interval. The ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program at PBNP is implemented by an inservice inspection (ISI) program. The ISI program for the fourth 10-year interval, which began on July 1, 2002, for both PBNP Units 1 and 2, will meet the 1998 edition through 2000 addenda (98A00) of ASME Section XI as modified by 10 CFR 50.55a and approved relief requests and code cases.

The applicant credits this program with managing the following aging effects:

- loss of material due to crevice corrosion, wear, general corrosion, and pitting corrosion
- loss of mechanical closure integrity due to stress relaxation
- cracking due to flaw growth, stress corrosion, and fatigue
- reduction in fracture toughness due to thermal embrittlement.

7.1.1.2 GALL Report Consistency

The PBNP LRA states that AMP B2.1.1, "ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program," is consistent with, but includes exceptions to, the GALL Report Sections XI.M1, "ASME Section XI Inservice Inspections Program, Subsections IWB, IWC, and IWD," and XI.M3, "Reactor Head Closure Studs."

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 5 of this report for LRA AMP B2.1.1, including "ASME Section XI, Subsection IWB, IWC, and IWD Inservice Inspection Program Basis Document for

License Renewal," LR-AMP-017-IWBCD, Revision 2, which provides an assessment of how the GALL Report AMP elements are addressed by PBNP LRA AMP B2.1.1.

The project team reviewed the seven program elements contained in the PBNP LRA AMP and associated basis document against the GALL Report Sections XI.S1, XI.S2, and XI.S4 for consistency.

7.1.1.3 Exceptions to the GALL Report

In Appendix B, Section B2.1.1 of the LRA, the applicant stated that its ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program is consistent with GALL AMP XI.M1, with exceptions.

The ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program takes exceptions to the "scope of program" program element for GALL AMP XI.M1. The applicant identified, in the LRA, exceptions to IWB-1220, IWC-1220, but not IWD-1220. Specifically, (1) use of ASME Code exemption criteria found in IWB-1220 of the 1989 edition of Section XI, as required by 10 CFR 50.55a, and (2) use of exemptions associated with IWC-1220 of Section XI for the auxiliary feedwater system piping, vessels, pumps, valves and their confections in piping between NPS 4 inch and NPS 1 ½ inch. The applicant also stated that these exceptions will result in fewer components being exempted from the ASME Code requirements.

For the first exception, 10 CFR 50.55a states that for Class 1 piping, applicants are not permitted to apply the criteria that permits exemption from inspection of the components listed in IWB-1220 of Section XI, 1989 Addenda through the latest edition. The regulation directs the applicant to perform inspections of the components listed in IWB-1220 of Section XI (1989 edition) of the ASME Code without the exceptions. This exception to the GALL Report is consistent with the criteria of 10 CFR 50.55a and was in the scope of the ASME Code evaluation documented in Chapter 1 of the GALL Report, Volume 2. On the basis of its review of the regulation and ASME Code evaluation performed as part of the GALL Report, the project team finds this exception acceptable.

For the second exception, the 1998 edition through 2000 (98A00) addenda of the ASME Code deleted the IWC-1220 exception which was permitted by the 1995 Edition through the 1996 Addenda (95A96) of the ASME Code. Section 50.55a of 10 CFR was amended in 2001 to adopt the 98A00 ASME Code. In the Federal Register statement of consideration (Vol 67 FR 60520) to this rulemaking, the staff documented its evaluation of 98A00 of the ASME Code to determine if the conclusions of the GALL Report are also applicable for AMPs that rely on the ASME Code which are incorporated into Section 50.55a by the final rule. The staff, for 98A00 ASME Code, found that the GALL Report remains valid and authorized use of the 98A00 as an alternative to the 95A96 without the need for the applicant to submit to the NRC its plant specific associated with license renewal. On the basis of its review of the Federal Register conclusion the project team finds this exception acceptable. Furthermore, the basis for this finding applies to all exception to PBNP AMP B2.1.1, which identify the exception of using the 98A00 verison of the ASME Code rather than the 95A96 version, as identified in the GALL Report.

The ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program takes exceptions to the "parameters monitored or inspected" and "detection of aging effects" program elements for GALL AMP XI.M1, such that the applicant will use the 1998 edition through 2000 addenda (98A00) of the ASME Section XI Code. Specifically, (1) PBNP ISI program is currently based on the 1998 edition through 2000 addenda of ASME Section XI, (2) will implement risk-informed ISI for examination categories B-F, B-J, C-F-1, and C-F-2, (3) will modify the sequence of examinations for welds, (4) examination of only one of the three vessels comprising the

regenerative heat exchanger for Category B-D, (5) use of technical specification surveillance testing as an alternative to the system leakage test of Class 3 pressure retaining components of the emergency diesel generator support systems for Category D-B, (6) alternative requirements of ASME Code Case –533-1, Code Case –566-1, and Code Case –616 will be applied, (7) only visual examination will be performed for Class 1 pump casing welds, as specified in 98A00 edition of the ASME Code.

The project team reviewed the information provide in the LRA. The project team finds that for most of these exceptions, the applicant has relied on ASME relief requests as its justification the exceptions. The project team finds that use of NRC approved relief request per 10 CFR 50.55a criteria is not an appropriate basis for justifying an exception to the GALL Report. As discussed in Chapter 1 to Volume 2 of the GALL Report, the staff evaluated the 95A96 verison of the Code per the 10 AMP program elements to assure that the aging effects will be adequately managed. The staff, when it approved a relief request per the requirements of 10 CFR 50.55a, did not evaluate the exception to assure that the aging effect will be adequately managed. Because PBNP AMP B2.1.1 relied on relief requests as part of the justification for these exceptions, the staff issued RAI B2.1 (Use of Relief Requests) to obtain clarification on the use of the relief request and to request the applicant to provide technical justification for these exceptions. Based on the applicant's RAI response <Unresolved Issue B2.1>

The ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program takes exception to the "parameters monitored or inspected" and "detection of aging effects" program elements for GALL AMP XI.M3, such that the applicant will use the 1998 edition through 2000 addenda (98A00) of the ASME Section XI Code.

GALL Report AMP XI.M3 identifies use of volumetric and surface examinations of reactor head closure studs. The 98A00 version of the ASME Code only requires surface or volumetric examination, but not both.

The applicant stated, in the LRA, that since the issuance of Regulatory Guide 1.65, the sensitivity of volumetric examinations for detection of shallow defects has greatly improved and hence surface examination of the studs adds little value. The staff agrees that use of the guidance included in Regulatory Guide 1.65 will improve the ability to detect shallow surface defects. On the basis that improved volumetric inspection capabilities and the staff's adoption of the 98A00 edition of the ASME Code in the Federal Register for use with the GALL Report, the project team finds this exception acceptable.

The ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program also takes two exceptions to the "monitoring and trending" program element for GALL AMP XI.M1. Specifically, (1) the applicant stated that IWB-2420(b) of the 98A00 edition of the code allows use of the acoustic emission to monitor growth of existing flaws in lieu of successive examinations during the next three inspection periods and (2) modify the sequence of the examination established in the previous inspection interval in a manner that reduces scaffolding, insulation and radiation inspection.

For the first exception, the applicant stated that IWB-2420(b) of the 98A00 edition of the code allows use of the acoustic emission to monitor growth of existing flaws in lieu of successive examinations during the next three inspection periods. The 95A96 edition of the code does not allow this option. On the basis of its review, as discussed previously, the staff's adaption of the 98A00 edition of the ASME Code in the Federal Register for use with the GALL Report. On this basis, the project team finds this exception acceptable.

For the second exception, the project team reviewed the information provided in the LRA and

held discussion with the applicant's technical staff associated with modifying the sequence of the examination established in the previous inspection interval in a manner that reduces scaffolding, insulation and radiation inspection. Because PBNP AMP B2.1.1 relied on relief requests as part of the justification for these exceptions, the project team issued RAI B2.1.1/B2.1.2/B2.1.3 - 1 (Use of Relief Requests) to obtain clarification on the use of the relief request and to request the applicant to provide technical justification for these exceptions.<Unresolved Issue B2.1>

7.1.1.4 Enhancements

The PBNP LRA states that enhancements to the ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program include revisions to existing activities credited for license renewal to ensure that inspections for the applicable aging effects are performed and any noted indications are appropriately evaluated. Additionally, applicable process control documents will be revised to ensure that new leak-before-break analyses are performed following use of the Section XI flaw evaluation option or repair/replacement of Class 1 welds and cast austenitic stainless steel (CASS) within the scope of the leak-before-break analysis.

The administrative enhancements as described in the PBNP AMP B2.1.1, "ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program," are not necessary to demonstrate consistency with GALL criterion. As described in Section 4, Audit and Review Scope, the project team did not review this administrative enhancement.

7.1.1.5 Operating Experience

The applicant's LRA provides the following discussion under AMP B2.1.1, Operating Experience:

> A review of industry operating experience related to the ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program revealed numerous instances of primary pressure boundary degradation. There have been numerous NRC communications including information notices, generic letters, and bulletins. Most of the instances of degradation fall into the following categories:
>
> - boric acid corrosion caused by leakage at mechanical connections
> - cracking caused by thermal fatigue
> - degradation of bolting caused by stress corrosion cracking (SCC) of high-strength bolts or boric acid corrosion
> - leaks or cracks caused by primary water stress corrosion cracking (PWSCC) of Alloy 600 components – Cracking caused by SCC of primary piping has been very rare in PWRs. NRC Information Notice 97-019, "Safety Injection System Weld Flaw at Sequoyah Nuclear Power Plant, Unit 2," April 18, 1997, informed PWR utilities of a large circumferential crack in

low-pressure safety injection system piping at Sequoyah-2 caused by SCC. The crack was discovered by a routine inservice ultrasonic examination. This is also one of relatively few large non-throughwall cracks discovered through routine ISI. Large non-throughwall cracks were discovered by routine ISI also in steam generator girth welds, as documented by NRC Information Notice 1985-065, "Crack Growth in Steam Generator Girth Welds" (ML031180225) and NRC Information Notice 1990-004, "Cracking of the Upper Shell-to-Transition Cone Girth Welds in Steam Generators" (ML031470418).

Most of the indications found by examinations required by the ISI programs at PBNP have been evidence of borated water leakage at mechanical joints such as flange connections and valve bonnets. These indications were found via the VT-2 visual examinations during the system leakage test. In some of these cases, evidence of boric acid corrosion of bolting was discovered. Most of the leaks were corrected by tightening the bolting and replacing corroded bolts, if required. A search of condition reports and maintenance work orders on reactor vessel head closure studs for both PBNP Units 1 and 2 revealed that no degradation of the studs or nuts has been detected. The examinations and inspections are conducted according to the requirements specified in Table IWB-2500-1.

The review of plant-specific operating experience revealed two instances where ISI examinations discovered flaws through means other than the system leakage test. Unacceptable flaw indications were discovered in each reactor vessel outlet nozzle-to-shell weld during the ultrasonic examination of reactor vessel welds at PBNP Unit 1 in 1984. A fracture mechanics evaluation was performed that demonstrated that the flaws posed no threat to continued safe operation of the reactor vessel. The flaws have since been resized using more accurate techniques and have been determined to be within code allowances.

An example of degradation discovered by an examination performed as a result of industry operating experience was a crack discovered via radiography performed on a Masoneilan containment isolation valve seat cavity. The radiographic examination was performed as a result of industry operating experience with cracking caused by thermal cycling in similar valves. PBNP determined the affected valve remained operable based on an analysis that predicted very slow growth for this flaw.

The ISI program at PBNP is updated frequently to account for industry operating experience. In addition, ASME Section XI is revised every 3 years and addenda issued in the interim, which allows the code to be updated to reflect operating experience. The requirement to update the ISI program to reference more recent editions of ASME Section XI at the end of each inspection

interval ensures that the ISI program reflects enhancements due to operating experience that have been incorporated into ASME Section XI.

NRC Inspection Report R-99-017, Dresden Units 2 and 3 (ML003710107), documented an inspection of the ISI program. Activities inspected relating to ISI included radiographic testing (RT) examinations, nondestructive examination (NDE) procedures and examination data, contractor and licensee personnel qualifications, and a review of the long-term plan. No violations were identified, and the implementation of the program was found to meet ASME code requirements.

A review of NRC inspection reports, QA audit/surveillance reports, and self-assessments since 1999 revealed no other issues or findings that could impact the effectiveness of the ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program. As additional operating experience is obtained, lessons learned may be used to adjust this program.

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above industry and plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B2.1.1 will adequately manage the aging effects that are identified in the applicant's LRA for which this AMP is credited.

7.1.1.6 UFSAR Supplement

The applicant provides its UFSAR for the Inservice Inspection Program for Class 1, 2, and 3 components in the LRA, Appendix A, Section 15.2.1, which states that ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection (ISI) Program inspections are performed to identify and correct degradation in Class 1, 2, and 3 piping, components, and their integral attachments. The program includes periodic visual, surface and/or volumetric examinations and leakage tests of all Class 1, 2, and 3 pressure-retaining components, and their integral attachments, including welds, pump casings, valve bodies, and pressure-retaining bolting. These commitments are included in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC, dated February 25, 2004 (ML040580023).

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, and concluded 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. In addition, on the basis of its review of the exceptions to 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 during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Based on 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 ASME Section XI, Subsections IWE and IWL Inservice Inspection Program (AMP B2.1.2)

In the PBNP LRA, Appendix B, Section B2.1.2, the applicant states that PBNP AMP B2.1.2, "ASME Section XI, Subsections IWE and IWL Inservice Inspection Program," is an existing program that is consistent with the GALL Report Section XI.S4, "10 CFR Part 50 Appendix J," and is consistent with, but includes exceptions to, Section XI.S1, "ASME Section XI, Subsection IWE," and Section XI.S2, "ASME Section XI, Subsection IWL."

7.1.2.1 Program Description

The PBNP LRA states that the ASME Section XI, Subsections IWE and IWL Inservice Inspection Program manages aging of (1) steel liners of concrete containments and their integral attachments; containment hatches and airlocks; seals, gaskets, and moisture barriers; and pressure-retaining bolting; and (2) reinforced concrete containments and unbonded post-tensioning systems. The primary inspection methods employed are visual examinations with limited supplemental volumetric and surface examinations, as necessary. Tendon anchorages and wires are examined visually. Tendon wires are tested to confirm that minimum mechanical property requirements are met. Tendon corrosion protection medium is analyzed for alkalinity, water content, and soluble ion concentrations. Pre-stressing forces are measured in sample tendons. Measured tendon lift-off forces are compared to predicted tendon forces calculated in accordance with NRC Regulatory Guide 1.35.1 (ML003740040). This program is in accordance with 10 CFR 50.55a and approved code cases and relief requests.

The applicant credits this program with managing aging effects for the following:

- carbon steel and miscellaneous polymeric materials and components that provide containment pressure boundary/leaktight barrier function and are tested/inspected in accordance with 10 CFR 50, Appendix J, and/or ASME Section XI, Subsection IWE
- containment tendons
- concrete, which is inspected in accordance with ASME Section XI, Subsection IWL.

This program is credited by the Bolting Integrity Program for the inspection of pressure-retaining bolting associated with the containment pressure boundary.

7.1.2.2 GALL Report Consistency

The applicant states that PBNP AMP B2.1.2 is an existing program that is consistent with GALL AMP XI.S4, "10 CFR Part 50 Appendix J," and is consistent with, but includes exceptions to, the GALL Report, Section XI.S1, "ASME Section XI, Subsection IWE," and Section XI.S2, "ASME Section XI, Subsection IWL."

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 5 of this audit and review report for LRA AMP B2.1.2, including "ASME Section XI, Subsection IWE and IWL Inservice Inspection Program Basis Document for License Renewal," LR-AMP-028-IWEL, Revision 2, which provides an assessment of how the GALL Report AMP elements are addressed by PBNP LRA AMP B2.1.2.

The project team reviewed the seven program elements contained in the PBNP LRA AMP and associated bases document against the GALL Report Sections XI.S1, XI.S2, and XI.S4 for consistency.

7.1.2.3 Exceptions to the GALL Report

The project team reviewed the exceptions and its justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

In Appendix B, Section B2.1.2 of the LRA, the applicant stated that its ASME Section XI, Subsections IWE & IWL inservice inspection program is consistent with GALL AMP XI.S4 and is consistent with GALL AMPs XI.S1 and XI.S2, with exceptions.

The applicant takes exception to the “parameters monitored or inspected” and “acceptance criteria” program elements in that the applicant’s program is based on different versions of the American Concrete Institute (ACI) Code for concrete degradation. Specifically, PBNP AMP B2.1.2 cites ACI 201.1R-68, "Guide for Making a Condition Survey of Concrete in Service," instead of ACI 201.1R-77 as a reference for concrete degradation. GALL AMP XI.S2 cites ACI 201.1R-77 as a source of information. The applicant also stated that the earlier version is consistent with the 1992 Addenda of IWL-2510 and Table IWA-1600-1.

The project team finds that earlier ACI version is identical to the later ACI version except for date of issue. Also the earlier version is part of the applicant’s current licensing basis. On the basis that the earlier ACI version is identical to the later ACI version except for date of issue, the project team finds this exception acceptable.

The applicant also takes exceptions to the “detection of aging effects” program elements for GALL AMPs XI.S1 and XI.S2 in that (1) qualification of NDE personnel to a written practice in accordance with SNT-TC1A is performed instead of CP-189 which is required by IWA-2300, and (2) relaxation of illumination and direct examination distance requirements of IWA-2210 and allowing general visual inspection of inaccessible concrete surfaces instead of the VT-3 examination required by IWL-2510(a), for GALL AMP XI.S2 only. The applicant, in the LRA, justified these exceptions based on the approval of an NRC approved relief request.

The project team reviewed the information provide in the LRA. The project team finds that the applicant has relied on ASME relief requests as its justification for the exceptions. The project team finds that use of NRC approved relief request per 10 CFR 50.55a criteria is not an appropriate basis for justifying an exception to the GALL Report. As discussed in Chapter 1 to Volume 2 of the GALL Report, the staff evaluated the 95A96 verison of the Code per the 10 AMP program elements to assure that the aging effects will be adequately managed. The staff, when it approved a relief request per the requirements of 10 CFR 50.55a, did not evaluate the exception to assure that the aging effect will be adequately managed. Because PBNP AMP B2.1.2 relied on relief request as part of the justification for the exceptions, the project team issued RAI B2.1 to obtain clarification on the use of the relief request and to request the applicant to provide technical justification for these exceptions. <Unresolved Issue B2.1>

The applicant also takes exceptions to the “monitoring and trending” program elements for GALL AMP XI.S1 in that successive examination repairs are not performed. The applicant’s justification for this exceptions is based on the approval of an NRC approved relief request. As stated above, use of relief request as a basis for an exception is not a sufficient basis and RAI RAI B2.1 was issued to obtain additional technical basis to accept this exception. <Unresolved Issue B2.1>

7.1.2.4 Enhancements

The PBNP LRA states that enhancements to the ASME Section XI, Subsections IWE and IWL Inservice Inspection Program include revisions to the containment airlock door seal inspection and replacement plant procedure to provide more detailed documentation, and a methodology for trending and comparison of inspection results to acceptance criteria. The PBNP "CLRT Program Basis Document" will be revised to clarify that test results are documented in accordance with 10 CFR Part 50, Appendix J. The PBNP "ISI IWL Program" document will be revised to clarify that yield strength will also be determined for tendon wire samples in accordance with IWL-2523.2.

The change to the containment airlock door seal inspection and replacement plant procedure and the change to the basis document are administrative enhancements as described in PBNP AMP B2.1.2, "ASME Section XI, Subsection IWE and IWL Inservice Inspection Program." Therefore, it is not necessary to demonstrate consistency with GALL criterion. As described in Section 4, Audit and Review Scope, the project team did not review this administrative enhancement.

The PBNP "ISI IWL Program" document was reviewed by the project team and was found to be consistent with the criteria defined in GALL AMP XI.S2. Therefore the project team finds this enhancement acceptable.

7.1.2.5 Operating Experience

The project team reviewed the operating experience for the PBNP AMP B2.1.2, "ASME Section XI, Subsections IWE and IWL Inservice Inspection Program." In the LRA, the applicant states

> Plant-specific operating experience has shown that degradation has occurred. For example: failed tendon wires, missing or broken components found in the tendon hardware, degraded concrete in containment structure, corroded containment liner, and corrosion of penetrations inside of containment. These occurrences of degradation have been evaluated and corrective action has been taken.

The project team reviewed documented industry experience, specifically, NRC Information Notice 97-10, "Liner Plate Corrosion in Concrete Containments" (ML031050365), and NRC Information Notice 99-10, "Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments" (ML031040458). The project team determined that the plant-specific operating experience described in the LRA is bounded by documented industry experience.

Furthermore, the applicant also states in the LRA that during preparations for the 28th-year tendon surveillance, it was discovered that the designated "common" or "control" tendons (i.e., those tendons in each group that are tested every surveillance in order to establish the trend of pre-stress force for that group) had been retensioned during each preceding surveillance. Periodic retensioning of these tendons did not allow an accurate determination of pre-stress force relaxation trends. New common tendons, which had not been previously retensioned, were selected for the 28th-year surveillance. These tendons will be tested in future surveillances to establish valid pre-stress force trends. The NRC was advised of this situation in a letter from Mark P. Findlay (NMC) to Document Control Desk (NRC), dated June 29, 1999, "Dockets 50-266 AND 50-301 Reselection of Control Tendons in the Point Beach Nuclear Plant,

Units 1 and 2."

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above industry and plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B2.1.2 will adequately manage the aging effects that are identified in the applicant's LRA for which this AMP is credited.

7.1.2.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the ASME Section XI, Subsections IWE and IWL Inservice Inspection Program in the LRA, Section 15.2.2. The LRA states

> The ASME Section XI, Subsections IWE and IWL Inservice Inspection Program manages aging of (a) steel liners of concrete containments and their integral attachments; containment hatches and airlocks; seals, gaskets and moisture barriers; and pressure retaining bolting, and (b) reinforced concrete containments and unbonded post-tensioning systems. The primary inspection methods employed are visual examinations with limited supplemental volumetric and surface examinations, as necessary. Tendon anchorages and wires are visually examined. Tendon wires are tested to verify that minimum mechanical property requirements are met. Tendon corrosion protection medium is analyzed for alkalinity, water content and soluble ion concentrations. Prestressing forces are measured in sample tendons. Measured tendon lift-off forces are compared to predicted tendon forces calculated in accordance with Regulatory Guide 1.35.1. This program is in accordance with 10 CFR 50.55a and approved code cases and relief requests.

This program manages aging effects for

- carbon steel and miscellaneous polymeric materials and components that provide containment pressure boundary/leak-tight barrier function and are tested/inspected in accordance with 10 CFR 50, Appendix J and/or ASME Section XI, Subsection IWE
- containment tendons
- concrete, which is inspected in accordance with ASME Section XI, Subsection IWL.

NMC committed to implement an enhanced ASME Section XI, Subsections IWE and IWL Inservice Inspection Program prior to the period of extended operation in Enclosure 1 to the letter dated February 25, 2004, from Gary Van Middlesworth to the NRC, "Application for Renewed Operating License" (ML040580023).

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, and concluded 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 exceptions to the applicant's AMP, the project team finds that the applicant's program provides for adequate management of the aging effects for which the program is credited 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). Based on 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 ASME Section XI, Subsection IWF Inservice Inspection Program (AMP B2.1.3)

In the PBNP LRA, Appendix B, Section B2.1.3, the applicant states that PBNP AMP B2.1.3, "ASME Section XI, Subsection IWF Inservice Inspection Program," is an existing program that is consistent with, but contains exceptions to, the GALL Report Section XI.S3, "ASME Section XI, Subsection IWF."

7.1.3.1 Program Description

In the PBNP LRA, the applicant states in Appendix B, Section B2.1.3, that AMP B2.1.3, "ASME Section XI, Subsection IWF Inservice Inspection Program," is credited for managing the aging effects for Class 1, 2, and 3 component supports. The primary inspection method employed is visual examination. Criteria for acceptance and corrective action are in accordance with ASME Section XI, Subsection IWF. Degradation that potentially compromises the function or load capacity of the supports, including bolting, is identified for evaluation. Supports requiring corrective action are re-examined during the next inspection period. This program is in accordance with 10 CFR 50.55a and NRC-approved code cases and relief requests.

7.1.3.2 GALL Report Consistency

In the PBNP LRA, the applicant states that AMP B2.1.3 is consistent with the GALL Report Section XI.S3, "ASME Section XI, Subsection IWF," with exceptions.

The project team interviewed the applicant's technical staff and reviewed, in total or in part, the documents listed in Attachment 5.

In accordance with the guidance contained in the audit and review plan for PBNP, the project team reviewed the seven program elements contained in the PBNP AMP B2.1.3 and associated bases documentation and evaluated them for consistency with the GALL Report AMP XI.S3.

7.1.3.3 Exceptions to the GALL Report

The project team reviewed the exceptions and its justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

In Appendix B, Section B2.1.3 of the LRA, the applicant stated that its ASME Section XI, Subsection IWF inservice inspection program is consistent with GALL AMP XI.S3, with exceptions.

The ASME Section XI, Subsection IWF inservice inspection program takes exception to the "scope of program" program element in that, (1) the program uses the 1998 edition through the 2000 addenda of ASME Section XI where as GALL AMP XI.S3 references the 1989 through

1995 editions of the ASME Code with addenda through 1996, and (2) MC supports are not addressed.

Section 50.55a of 10 CFR was amended in 2001 to adopt the 98A00 ASME Code. In the Federal Register statement of consideration (Vol 67 FR 60520) to this rulemaking, the staff documented its evaluation of 98A00 of the ASME Code to determine if the conclusions of the GALL Report are also applicable for AMPs that rely on the ASME Code which are incorporated into Section 50.55a by the final rule. The staff, for 98A00 ASME Code, found that the GALL Report remains valid and authorized use of the 98A00 as an alternative to the 95A96 without the need for the applicant to submit to the NRC its plant specific associated with license renewal. On the basis of its review of the Federal Register conclusion the project team finds this exception acceptable.

The applicant stated, in the LRA, that there are not any MC supports in the scope of license renewal; therefore, it is not necessary to list inspection criteria for MC support in this aging management program. The project team reviewed the information provided in the LRA and held discussion with the applicant's technical staff, the project team confirmed the absence of MC supports being in the scope of license renewal. On this basis, the project team finds this exception acceptable.

The ASME Section XI, Subsection IWF inservice inspection program also takes exception to the "scope of program" and "detection of aging effect" program elements in that the IWF-2420 successive inspection criteria has been modified to sequence the examinations established in the previous inspection interval to be changed in a manner that reduces scaffold, insulation and radiation exposure.

GALL AMP XI.S3 states that to the extent practical, the same supports selected for examination during the first inspection interval are examined during each successive inspection interval.

The project team reviewed the information provide in the LRA. Because PBNP AMP B2.1.3 relied on relief request as part of the justification for the exceptions, the project team issued RAI B2.1 to obtain clarification on the use of the relief request and to request the applicant to provide technical justification for these exceptions.<Unresolved Issue B2.1>

7.1.3.4 Enhancements

The PBNP LRA states that enhancements to the ASME Section XI, Subsection IWF Inservice Inspection Program include revising existing implementing documents to include cracks as recordable conditions for component supports.

The administrative enhancements described in PBNP AMP B2.1.3, "ASME Section XI, Subsection IWF Inservice Inspection Program," are not necessary to demonstrate consistency with GALL criterion. As described in Section 4, Audit and Review Scope, the project team did not review this administrative enhancement.

7.1.3.5 Operating Experience

The applicant's LRA provides the following discussion under AMP B2.1.3, Operating Experience:

A review of industry and plant-specific operating experience was

conducted. NRC Information Notice 80-36 notified utilities of the potential for stress corrosion cracking (SCC) of high-strength component support bolts. High-strength (>150 ksi yield) component support bolting at PBNP is used in pinned connections associated with the steam generator, reactor coolant pump, and reactor vessel supports and is loaded only in shear. SCC of these bolts is not a concern because the bolts have no preload stress and are not located in an aggressive environment.

The most common relevant condition discovered by the ASME Section XI, Subsection IWF Inservice Inspection Program at PBNP has been loose fasteners in supports. Loose fasteners are a maintenance issue rather than a sign of age-related degradation. To date, these examinations have been effective in managing aging effects for ASME Class 1, 2, and 3 component supports.

A 1999 NRC inspection report contained a finding related to inservice inspection of component supports. Two pipe supports in the auxiliary feedwater pump room were found with gaps between the baseplate and the concrete wall that exceeded the criteria specified in plant procedures. A condition report was issued, and an operability determination performed to evaluate the support's capability to adequately transfer the design loads to the building structure. The operability determination concluded the support was operable and that no further action was required; the condition report was closed.

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above industry and plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B2.1.3 will adequately manage the aging effects that are identified in the applicant's LRA for which this AMP is credited.

7.1.3.6 UFSAR Supplement

The applicant provided its UFSAR supplement for the ASME Section XI, Subsection IWF, Inservice Inspection Program, AMP B2.1.3, which states that the program manages aging effects for Class 1, 2, and 3 component supports. The primary inspection method employed is visual examination. Criteria for acceptance and corrective action are in accordance with ASME Section XI, Subsection IWF. Degradation that potentially compromises the function or load capacity of the support, including bolting, is identified for evaluation. Supports requiring corrective action are re-examined during the next inspection period. This program is in accordance with 10 CFR 50.55a and approved code cases and relief requests. These commitments are included in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the Nuclear Regulatory Commission, dated February 25, 2004 (ML040580023).

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, and concluded 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. In addition, on the basis of its review of the exceptions 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).

7.1.4 Boraflex Monitoring Program (AMP B2.1.5)

In the PBNP LRA, Appendix B, Section B2.1.5, the applicant states that PBNP AMP B2.1.5, "Boraflex Monitoring Program," is an existing program that is consistent with, but includes exceptions to, the GALL Report Section XI.M22, "Boraflex Monitoring."

7.1.4.1 Program Description

The PBNP LRA Section 4.6.1 states that the Boraflex Monitoring Program manages aging effects for the Boraflex material in the spent fuel racks. This program provides for blackness testing and areal density measurements of the Boraflex material in the spent fuel storage racks to confirm the in-service Boraflex performance. In addition, tracking of the spent fuel pool silica levels provides a qualitative indication of boron carbide loss. Neutron attenuation or blackness testing will be performed to determine gap formation, while areal density measurements will be used to ascertain the physical loss of boron carbide. Monitoring and analysis of criticality will also be performed to assure that the required 5% subcriticality margin is maintained. Based on the results of these inspections and analysis, appropriate measures will be taken to ensure the Boraflex will continue to perform its intended function. This program addresses the concerns described in NRC GL 96-04.

7.1.4.2 GALL Report Consistency

In Section B2.1.5 of the LRA, the applicant states that the Boraflex Monitoring Program is an existing program that is consistent with, but includes exceptions to, the GALL Report Section XI.M22, "Boraflex Monitoring."

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 5 of this report.

The project team reviewed the seven program elements (see Section 5.1 of this audit and review report) contained in the PBNP LRA AMP and associated bases documents against the GALL Report Section XI.M22 for consistency.

7.1.4.3 Exceptions to the GALL Report

The project team reviewed the exceptions and its justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

In Appendix B, Section B2.1.5 of the LRA, the applicant stated that its Boraflex monitoring program is consistent with GALL AMP XI.M22, with exceptions. The Boraflex monitoring program takes exception to the "detection of aging effect" program element such that for certain accelerated samples tests, the applicant performs these tests at a minium frequency of five years. GALL AMP XI.M22 recommends that, "certain accelerated samples are tested every two years."

The applicant stated, in the LRA, that tests samples are as follows. Two SFP storage locations had received freshly discharged spent fuel assemblies each refueling for approximately 9 years, which has caused accelerated cumulative exposure levels to the bordering Boraflex panels. Four of these panels are tested during each scheduled surveillance. The results of the Boraflex areal density testing and Boraflex panel blackness testing are evaluated as part of the Boraflex monitoring program to determine if a change in test frequency or methodology is warranted.

During the audit, the applicant clarified the lack of accelerated individual sample testing. The applicant stated that in April 1989, PBNP submitted a surveillance program to the NRC-which NRC approved in February 1990-establishing blackness testing on 10 fulllength Boraflex panels. Four of the panels included accelerated exposure, having received freshly discharged fuel assemblies during the previous 9 years, thereby receiving an accelerated gamma dose of 1.5E10 rads, which is equivalent to that received by the average panel in 30 years. Subsequent Boraflex panel blackness testing has been performed/completed in August 1991, September 1996, and August 2001.

PBNP's current licensing basis is such that the plant does perform testing of "accelerated samples;" however, as noted above, a number of full-length panels are subjected to accelerated exposure.

Based upon its review of the applicant's test process, the GALL Report statement ("Results based on test coupons have been found to be unreliable in determining the degree to which the actual Boraflex panels have been degraded") that indicates that the accelerated samples are of limited value to an aging management program, and the applicant's testing of intentionally high exposure full-length panels, the project team concludes that testing of "accelerated samples" is not required to provide a reasonable assurance that aging effects will be appropriately managed in light of the blackness testing of full-length high-flux Boraflex panels during the period of extended operation. The project team further concludes that using the above exceptions is acceptable and ensures that the effects of aging will be managed in such a way that the intended functions of the affected SCs will be maintained, consistent with the CLB for the period of extended operation.

7.1.4.4 Enhancements

In the PBNP LRA, the applicant states that enhancements to the Boraflex Monitoring Program include:

1. creation of a new procedure to perform and control Boraflex areal density and blackness testing
2. determination of panels with "accelerated" exposure during the period of extended operation
3. creation of a new procedure for trending and analysis of the results of the Spent Fuel Pool silica sampling by using the EPRI RACKLIFE predictive code or its equivalent

The project team reviewed these statements provided in the program elements in the LRA and concluded that enhancements 1 and 2 are administrative enhancements that are not necessary to demonstrate consistency with GALL criterion. As described in Section 4, Audit and Review Scope, the project team did not review these enhancements.

The project team's review of enhancement 3 follows. During the audit and review process, the project team noted that PBNP currently has no procedure for trending and analysis of the results of the spent fuel pool silica sampling by using the Electric Power Research Institute (EPRI) RACKLIFE predictive code or its equivalent. However, the commitment for PBNP to implement an enhanced Boraflex Monitoring Program, which includes developing a procedure for trending and analysis of the results of the spent fuel pool silica sampling by using the Electric Power Research Institute (EPRI) RACKLIFE predictive code or its equivalent, is found as Item 18 in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC (ML040580023), dated February 25, 2004.

Based upon its review of the criteria in the GALL Report, the project team concludes that this enhancement to the Boraflex Monitoring Program is necessary for the PBNP LRA to be consistent with the GALL Report and will provide a reasonable guarantee that the Boraflex aging effect will be appropriately managed during the period of extended operation.

7.1.4.5 Operating Experience

In the PBNP LRA, Appendix B, Section B2.1.5, the applicant states

> The experience with Boraflex panels indicates that coupon surveillance programs are not reliable. Therefore, Boraflex integrity is measured and correlated, through a predictive code, with the silica levels in the pool water during the period of extended operation. These actions provide reasonable assurance that degradation of Boraflex sheets is adequately monitored, so that appropriate actions can be taken in a timely manner if significant loss of neutron-absorbing capability is occurring.
>
> The latest inspection of the SFP Boraflex panels was conducted in August 2001. The results of the Blackness Test indicated that for the first time since the Boraflex panels have been inspected, gaps have been found in 27 panels ranging from 0.8 inches to 3.4 inches. The gaps appear to be randomly distributed along the vertical length of the Boraflex panels. A Condition Report was issued to monitor the condition of the Boraflex in the SFP.
>
> A review of NRC Inspection Reports, QA Audit/Surveillance Reports, and Self-Assessments since 1999 revealed no issues or findings other than those described above that could impact the effectiveness of the Cable Condition Monitoring Program.

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above industry and plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B2.1.5 will adequately manage the aging effects that have been observed at the applicant's plant.

7.1.4.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the Boraflex Monitoring Program in the PBNP LRA, Appendix A, Section 15.2.5. In the LRA, the applicant states

> The Boraflex Monitoring Program manages aging effects for the Boraflex material in the spent fuel racks. This program provides for blackness testing and areal density measurements of the Boraflex material in the spent fuel storage racks to confirm the in-service Boraflex performance. In addition, tracking of the spent fuel pool silica levels provides a qualitative indication of boron carbide loss. The results of silica sampling will be trended and analyzed using a predictive code. Neutron attenuation or blackness testing will be performed to determine gap formation, while areal density measurements will be used to ascertain the physical loss of boron carbide. Monitoring and analysis of criticality will also be performed to assure that the required 5% subcriticality margin is maintained. Based on the results of these inspections and analysis, appropriate measures will be taken to ensure the Boraflex will continue to perform its intended function. This program addresses the concerns described in NRC GL 96-04.

Commitments to implement the Boraflex Monitoring Program prior to the period of extended operation are found as Item 18 in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC (ML040580023), dated February 25, 2004.

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, and concluded 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. In addition, on the basis of its review of the exceptions and 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).

7.1.5 Buried Services Monitoring Program (AMP B2.1.7)

In the PBNP LRA, Appendix B, Section B2.1.7, the applicant states that PBNP AMP B2.1.7, "Buried Services Monitoring Program," is a new program that has been initiated for the purpose of license renewal. The applicant states that the this AMP will be consistent with the GALL Report Section XI.M34, "Buried Piping and Tank Inspection," with enhancements.

7.1.5.1 Program Description

The PBNP LRA states that the Buried Services Monitoring Program manages aging effects on

the external surfaces of carbon steel, low-alloy steel, and cast iron components (e.g., tanks, piping) that are buried in soil or sand. This program includes (a) preventive measures to mitigate degradation (e.g., external coatings and wrappings), and (b) visual inspections of external surfaces of buried components for evidence of coating damage and substrate degradation to manage the effects of aging. The periodicity of these inspections will be based on plant operating experience and opportunities for inspections such as scheduled maintenance work.

7.1.5.2 GALL Report Consistency

The applicant states that PBNP AMP B2.1.7 will be consistent with the GALL Report Section XI.M34, "Buried Piping and Tank Inspection," with enhancements.

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 5 of this audit and review report for LRA AMP B2.1.7, including "Buried Services Monitoring Program Basis Document for License Renewal," LR-AMP-018-BSMON, Revision 2, April 14, 2004.

The project team reviewed the seven program elements contained in the description of PBNP AMP B2.1.7 and associated bases documentation against the GALL Report Section XI.M34 for consistency.

During the its review, the project team questioned in RAI B.2.1.7-1, how the applicant established that program components are all coated in light of the limited operating experience. In a letter dated March 15, 2005, the applicant provided its response. In its response, the applicant stated that its buried services monitoring program includes visual inspections of the external surfaces of buried carbon steel, cast iron, and low alloy steel components that are within the scope of license renewal in the PBNP service water, fuel oil, and fire protection systems.

The applicant also stated in its RAI response that inspections of the PBNP service water, fuel oil, and fire protection systems will be performed based on plant operating experience and opportunities for inspection. In addition, a susceptible location in the fire protection system (i.e., uncoated unwrapped piping) will be scheduled to be inspected once prior to the period of extended operation and at least every 10 years during the period of extended operation. The intent of these scheduled inspections is to ensure that buried components within the fire protection system are periodically inspected. Therefore, if an opportunity for inspection occurs prior to the scheduled inspection, the inspection of opportunity can be credited for satisfying the scheduled inspection. The fire protection system is considered a leading indicator for all buried components within the scope of the buried services monitoring program, since not all of the buried components in the fire protection system have been installed with a protective coating system (i.e., coatings and wrappings). If any loss of material is observed during these inspections, the results of the inspection will be evaluated and additional locations inspected, as required. These additional locations could include uncoated and/or coated buried piping in the fire protection system, service water system and fuel oil system. Evidence of coating/wrapping or component degradation will be documented and evaluated under the PBNP corrective action program.

The project team reviewed the information provided in the LRA and in the March 15, 2005 letter. On the basis of its review, the project team finds that the bounding nature of the inspection and that inspections will be scheduled once prior to the period of extended operation and at least every 10 years during the period of extended operation such that the effects of aging will be identified prior to loss of intended function. On this basis, the project team finds this item

acceptable.

7.1.5.3 Exceptions to the GALL Report

None.

7.1.5.4 Enhancements

The PBNP LRA, Appendix B, Section B2.1.7, states that the Buried Services Monitoring Program is a new program at PBNP. Enhancements to the program include the creation of those documents needed to implement the requirements of the program to manage the aging effects of concern for those systems and components within the scope of license renewal that credit the program. These enhancements are required to satisfy the NUREG-1801 aging management program requirements.

The LRA further states that "Enhancements are scheduled for completion prior to the period of extended operation."

The administrative enhancements as described in PBNP AMP B2.1.7, "Buried Services Monitoring Program," are not necessary to demonstrate consistency with GALL criterion. As described in Section 4, Audit and Review Scope, the project team did not review these enhancements.

7.1.5.5 Operating Experience

The PBNP LRA states that "Industry operating experience has shown that carbon steel, low alloy steel, or cast iron buried components have experienced corrosion or selective leaching degradation. The critical areas appear to be at the interface where the component transitions from above ground to below ground. This is the area where coatings and wrappings will most likely be missing or damaged."

The applicant provided clarification to the project team during the audit. The applicant, via letter dated July 12, 2004 (ML041960159), committed to provide the following additional information in the 2005 LRA annual update: "If there are any indications of selective leaching or if the condition is indeterminate, then a hardness test will be performed." The project team agrees that this clarification provides the appropriate guidance for the detection of selective leaching effects.

The LRA states also that "plant-specific operating experience with buried components inspected during periods of opportunity such as scheduled maintenance indicates that in all instances no signs of corrosion were found and that the protective coatings and relatively non-aggressive soil conditions serve to lessen the probability of component degradation due to corrosion."

The project team reviewed the plant-specific operating experience contained in the LRA with the plant's technical personnel and concluded that as long as coatings and wrappings remain undisturbed, corrosion is expected to be negligible. As additional operating experience is obtained, lessons learned may be used to adjust this program. The plant will continue to use inspections of opportunity to confirm the condition of buried components.

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B2.1.7 will adequately manage the aging effects that have been identified in the applicant's LRA for which this AMP is credited.

7.1.5.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the Buried Services Monitoring Program in the PBNP LRA, Appendix A, Section 15.2.7. It states that "The Buried Services Monitoring Program manages aging effects on the external surfaces of carbon steel, low-alloy steel, and cast iron components (e.g., tanks, piping) that are buried in soil or sand. This program includes (a) preventive measures to mitigate degradation (e.g., external coatings and wrappings), and (b) visual inspections of external surfaces of buried components for evidence of coating damage and substrate degradation to manage the effects of aging. The periodicity of these inspections will be based on plant operating experience and opportunities for inspection such as scheduled maintenance work."

The applicant committed to developing and implementing the Buried Services Monitoring Program prior to the period of extended operation. This commitment is documented in a letter dated February 25, 2004, from Gary Van Middlesworth to the NRC, "Application for Renewed Operating License" (ML040580023).

The project team reviewed the UFSAR supplement , found that it was consistent with the GALL Report, and concluded 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. In addition, on the basis of its review of the applicant's AMP, the project team finds that the applicant's program provides for adequate management of the aging effects for which the program is credited 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 Cable Condition Monitoring Program (AMP B2.1.8)

In the PBNP LRA, Appendix B, Section B2.1.8, the applicant states that AMP B2.1.8, "Cable Condition Monitoring Program," is a new program that is consistent with the GALL Report Section XI.E1, "Electrical Cables And Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." The applicant further states that AMP B2.1.8 is consistent with, but includes exceptions to, GALL Report Section XI.E2, "Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits," and Section XI.E3, "Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

7.1.6.1 Program Description

In the PBNP LRA Section B2.1.8, the applicant states that the Cable Condition Monitoring Program manages aging of conductor insulation materials on cables and connectors, and other electrical insulation materials that are installed in adverse localized environments caused by

heat, radiation, or moisture. The scope of this program includes accessible non-EQ electrical cables and connections, including control and instrumentation circuit cables, non-EQ electrical cables used in nuclear instrumentation circuits, and inaccessible non-EQ medium-voltage cables within the scope of license renewal.

The LRA states that the Cable Condition Monitoring Program provides reasonable assurance that the intended functions of electrical cables and connections within the scope of license renewal that are not subject to the environmental qualification requirements of 10 CFR 50.49 and are exposed to adverse localized environments caused by heat, radiation, or moisture are maintained consistent with the current licensing basis through the period of extended operation. This program considers the technical information and guidance provided in NUREG/CR-5643, IEEE Standard P1205-2000, SAND-96-0344, and EPRI TR-109619.

This program addresses cables and connections whose configuration is such that most cables and connections installed in adverse localized environments are accessible. It is a sampling program where selected cables and connections from accessible areas are inspected and represent, with reasonable assurance, all cables and connections in adverse localized environments.

7.1.6.2 GALL Report Consistency

In the PBNP LRA, Appendix B, Section B2.1.8, the applicant states that AMP B2.1.8, "Cable Condition Monitoring Program," is a new program that is consistent with the GALL Report Section XI.E1, "Electrical Cables And Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." The applicant further states that AMP B2.1.8 is consistent with, but includes exceptions to, GALL Report Section XI.E2, "Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits," and Section XI.E3, "Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 5 of this audit and review report for AMP B2.1.8.

The project team reviewed the seven program elements (see Section 5.1 of this audit and review report) contained in AMP B2.1.8 and associated bases documents against the GALL Report Sections XI.E1, XI.E2, and XI.E3 for consistency.

7.1.6.3 Exceptions to the GALL Report

The project team reviewed the exceptions and its justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

In Appendix B, Section B2.1.8 of the LRA, the applicant stated that its cable condition monitoring program is consistent with GALL AMP XI.E1. The applicant further stated that its cable condition monitoring program is consistent with, exceptions to GALL AMP XI.E2 and GALL AMP XI.E3.

The cable condition monitoring program takes exception to the "scope of program" program element for GALL AMP XI.E2 such that only non-EQ electrical cables used in nuclear instrumentation (NI) circuits that are within the scope of license renewal and are installed in adverse localized environments will be tested. This means that not all non-EQ instrumentation cable is tested for reduced insulation resistance (IR) value. GALL AMP XI.E2 states that this program applies to electrical cables used in circuits with sensitive, low-level signal such as

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

The project team verified that all electrical cables associated with radiation monitoring and nuclear instrumentation within the scope of license renewal at PBNP are either environmentally qualified in accordance with 10 CFR 50.49 or not installed in adverse localized environments. In either circumstance, the deterioration of IR values are either maintained (by virtue of the EQ program) or do not exist (benign environment). On the basis of its review, the project team finds this exception to be acceptable.

The cable condition monitoring program also takes exception to the “parameters monitored or inspected”, “detection of aging effects”, and “acceptance criteria” program elements for GALL AMP XI.E2 such that the surveillance tests required by the PBNP technical specifications do not include the electrical cables for certain nuclear instrumentation circuits. Therefore, the applicant stated that its cable condition monitoring program periodically tests nuclear instrumentation circuits to provide an indication of the cable insulation condition.

For the “parameters monitored or inspected”, “detection of aging effects”, and “acceptance criteria” program elements associated with the exception taken by the applicant, the GALL AMP XI.E2 states (1) the parameters monitored are determined from the plant technical specifications and are specific to the instrumentation loop being calibrated, as documented in the surveillance test procedure; (2) calibration provides sufficient indication of the need for corrective actions by monitoring key parameters and providing trending data based on acceptance criteria related to instrumentation loop performance. The normal calibration frequency specified in the plant technical specifications provides reasonable assurance that severe aging degradation will be detected prior to loss of the cable intended function. The first tests for license renewal are to be completed before the period of extended operation; (3) calibration readings are to be within the loop-specific acceptance criteria, as set out in the plant technical specifications surveillance test procedures.

The project team reviewed the applicant’s cable condition monitoring program and verified that the plant program, as documented in the project team’s PBNP audit and review report, for the IR testing of nuclear instrumentation is comprehensive and conservative in that it tests all nuclear instrumentation circuits for insulation condition with the frequency required in the GALL Report. On the basis of its review, the project team finds this exception acceptable.

The cable condition monitoring program takes exception to the “scope of program” program element for GALL AMP XI.E3 such that the cable condition monitoring program is based on prolonged exposure to significant moisture, which is defined as exposures to significant moisture that last more than a few years.

GALL AMP XI.E.3 states that "significant moisture" is defined as "periodic exposures to moisture that last more than a few days (e.g., cable in standing water)." RAI B2.1.8-1 was issued to clarify the basis for this exception. By letter dated March 15, 2005, the applicant provided its response. In its response, the applicant deleted this exception and agreed to the perform the cable testing, as described in the GALL AMP XI.E.3. On the basis of its review, the project team finds this acceptable.

The cable condition monitoring program also takes exception to the “parameters monitored or inspected” and “detection of aging effects” program elements for GALL AMP XI.E3 such that cable condition monitoring program requires periodic testing of a representative sample of in-scope, inaccessible medium-voltage cables not designed for submergence subject to prolonged exposure to significant moisture and significant voltage. Specifically, the testing is performed on a representative sampling of cable rather than on all cables.

GALL AMP XI.E.3 states that in-scope, medium-voltage cables exposed to significant moisture and significant voltage are tested to provide an indication of the condition of the conductor insulation. RAI B2.1.8-1 was issued to obtain additional information not currently contained in the LRA. By letter dated March 15, 2005, the applicant provided its response.

In its response, the applicant agreed to consider for testing all inaccessible non-EQ medium-voltage cables within the scope of license renewal not designed for submergence that are subject to significant moisture and significant voltage are considered. A representative sample of in-scope, inaccessible non-EQ medium-voltage cables not designed for submergence subject to significant moisture and significant voltage will be tested prior to the end of the current license period and once every ten years during the period of the extended license. This sample will include those cables considered to be most susceptible and will represent all cable types and manufacturers. The basis for this representative sample will be documented. In addition, the applicant, in its RAI response, revised the definition of significant moisture to be consistent with that contained in the GALL AMP XI.E.3. The project team reviewed the applicant's March 15, 2005, letter. On the basis of its review, the project team finds the applicant response acceptable.

7.1.6.4 Enhancements

In Appendix B, Section B2.1.8 of the LRA, the applicant stated that its cable condition monitoring program is consistent with GALL AMPs XI.E1, XI.E2,and XI.E3 with enhancements. The applicant stated that, for the "scope of program" program element, enhancements to the cable condition monitoring program include establishing a new program that manages aging of conductor insulation materials on cables and connections, and other electrical insulation materials that are installed in adverse localized environments caused by heat, radiation, or moisture. The project team considered these types of enhancements as administrative enhancements which does not require project team review.

7.1.6.5 Operating Experience

The following description of operating experience is taken from the applicant's LRA:

> Industry operating experience has shown that adverse localized environments caused by heat or radiation for electrical cables and connections may exist next to or above (within three feet of) steam generators, pressurizers or hot process pipes, such as feedwater lines. These adverse localized environments have been found to cause degradation of the insulating materials on electrical cables and connections that is visually observable, such as color changes or surface cracking. These visual indications can be used as indicators of degradation. Industry operating experience has also shown that visual inspections of non-EQ instrumentation circuit cables within the scope of license renewal are adequate to identify aging degradation, as documented in SAND96-0344, "Aging Management Guideline for Commercial Nuclear Power Plants - Electrical Cable and Terminations." Exposure of electrical cables to adverse localized environments caused by heat or radiation can result in reduced insulation resistance. Reduced insulation resistance can cause an increase in leakage currents between conductors and from individual conductors to ground. A significant reduction of insulation resistance is a concern for circuits with sensitive, high voltage, low-level signals such as

radiation monitoring and nuclear instrumentation since it may contribute to inaccuracies in the instrument circuits.

Plant-specific operating experience has shown that adverse localized environments caused by heat and moisture exist at PBNP. For example, the 4K VAC feeds to the Steam Generator Feed Pumps and from X04 have been exposed to adverse localized environments caused by heat and moisture, respectively. Maintenance work orders were generated to test and/or replace cables and connections that showed signs of aging due to adverse localized environments, as required.

Electrical cables associated with radiation monitoring instrumentation within the scope of license renewal at PBNP are either environmentally qualified in accordance with 10 CFR 50.49 or not installed in adverse localized environments (e.g., radiation monitoring instrumentation associated with the Control Room). Non-EQ electrical cables used in nuclear instrumentation circuits within the scope of license renewal are included within the scope of the Cable Condition Monitoring Program. Operating experience has shown that anomalies found during cable testing can be caused by the degradation of the nuclear instrumentation circuit cable and are a possible indication of potential cable degradation.

Plant-specific operating experience has shown that changes to nuclear instrumentation (NI) cable are gradual and minimal over a long period of time. PBNP Unit 1 has operated for 33 years and Unit 2 has operated for 31 years without any direct failure in the NI cabling. Rather, particular cables have exhibited varying degrees of noise, decreased insulation resistance (IR), and, in one case, a conductor to shield short. These conditions have decreased the signal quality but not interrupted or impaired the accuracy of the indication. In some cases of noise and reduced IR, this condition has been tracked over several years and little additional degradation has been observed. In the case of the conductor to shield short, the cable was abandoned and a spare cable connected to re-establish the circuit.

An NRC Inspection Report identified a finding regarding inadequate and untimely corrective actions relating to flooding of manholes containing safety and non-safety related cables. The inspectors reviewed corrective actions associated with flooded manholes containing electrical cables. Since 1997, numerous corrective action program documents have been written relating to flooded manholes, submerged cables in manholes, ice formation due to flooded manholes, effects of water on cables, and spurious alarms relating to manholes. Based on the number of corrective action program documents and associated ineffective corrective actions, the inspectors concluded that the licensee had not implemented effective corrective actions to address the problem of cables flooded in manholes.

A condition evaluation was performed as a result of questions

raised during the inspection. In order to better understand the magnitude of the groundwater intrusion problem into the electrical manholes, a new call-up to inspect and pump the flooded manholes was initiated. The new call-up periodically inspects and pumps down the electrical manholes, as necessary. As part of the new call-up, the approximate water level in each manhole is recorded. The recording of the water level will provide the basis for any future changes in frequency to the call-up and any deletions of manhole inspections. Based on the corrective actions taken to evaluate pumping out the manholes throughout the year and to evaluate the need to inspect other manholes for similar conditions, the NRC finding was closed. A solution to prevent manhole and cable vault flooding is currently being pursued.

An NRC Inspection Report also identified an Unresolved Item concerning the effects of prolonged water submergence on 13.8K VAC, 4160 VAC, and 480 VAC electrical cables. The NRC determined that this issue did not represent an immediate safety concern. However, they were concerned that if the condition were left uncorrected it would become a more significant safety concern in subsequent years if cable degradation were to interrupt the continuity of offsite power to the safeguards electrical buses. In response to these concerns, a number of these cables, including all of the 13.8K VAC cables subject to submergence, were successfully tested in 2003 using the Energized Partial Discharge Testing Methodology. These cables will also be tested in the future in accordance with the test vendor's recommendations using a proven testing methodology. In addition, actions have been taken to prevent further cable submergence. Based upon these actions, the NRC closed this URI during the third quarter 2003.

The above statements from the LRA were reviewed by the project team during discussions with the plant staff regarding the vault flooding program. The project team reviewed the documentation for the Electrical Manhole Inspection Program ("PB Aging Management Review for Electric Commodities," dated February 25, 2004, and pages B-94 through B-97 in the PBNP LRA). Records from the Computerized History and Maintenance Planning System (CHAMPS) were reviewed, showing frequency of maintenance actions and conditions found in manholes. CHAMPS is a computer-based program in which records of work performed on SSCs are initiated and managed. For the data sets reviewed (previous 12 months), water level in the manholes did not reach the cable junctions. New manhole inspection and pumpdown procedures require that the as-found water level be recorded on the Work Request form. When entered into CHAMPS, these data will be trended and used to modify the inspection frequency as required to keep the water level below the cable connections.

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above industry and plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B2.1.8 will adequately manage the aging effects that are identified in the applicant's LRA for which this AMP is credited.

7.1.6.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the Cable Condition Monitoring Program in the LRA, Appendix A, Section 15.2.8. The applicant states in Appendix A that the Cable Condition Monitoring Program manages aging of conductor insulation materials on cables and connectors, and other electrical insulating materials that are installed in adverse localized environments caused by heat, radiation, or moisture. The scope of this program includes accessible non-EQ electrical cables and connections, including control and instrumentation circuit cables, non-EQ electrical cables used in nuclear instrumentation circuits, and inaccessible non-EQ medium-voltage cables within the scope of license renewal. The program requires (a) visual inspection of a representative sample of accessible electrical cables and connections in adverse localized environments once every 10 years for evidence of jacket surface degradation, (b) testing of nuclear instrumentation circuits once every 10 years to detect a significant reduction in cable insulation resistance, and (c) testing of a representative sample of in-scope, medium-voltage cables not designed for submergence subject to prolonged exposure to significant moisture and significant voltage once every 10 years to detect deterioration of insulation.

The applicant committed to developing and implementing the Cable Condition Monitoring Program prior to the period of extended operation. This commitment is documented in a letter dated February 25, 2004, from Gary Van Middlesworth to the NRC, "Application for Renewed Operating License" (ML040580023), and in a letter from Dennis L. Koehl (NMC) to the Document Control Desk (NRC), "License Renewal Application Clarifications (TAC Nos. MC2099 and MC2100)" dated July 12, 2004, (ML041960159).

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, and concluded 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. In addition, on the basis of its review of the exceptions 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).

7.1.7 Closed-Cycle Cooling Water System Surveillance Program (AMP B2.1.9)

In the PBNP LRA, Appendix B, Section B2.1.9, the applicant states that AMP B2.1.9, "Closed-Cycle Cooling Water System Surveillance Program," is an existing program that is consistent with the GALL Report Section XI.M21, "Closed-Cycle Cooling Water System," with exceptions.

7.1.7.1 Program Description

The applicant states that the Closed-Cycle Cooling Water System Surveillance Program manages aging effects in closed-cycle cooling water systems that are not subject to significant sources of contamination, in which water chemistry is controlled and heat is not directly rejected to the ultimate heat sink. The program includes (1) maintenance of system corrosion inhibitor

concentrations to minimize degradation and (2) periodic or one-time surveillance testing and inspections to evaluate system and component performance. Inspection methods may include visual testing (VT), ultrasonic testing (UT), and eddy current testing (ECT).

The Closed-Cycle Cooling Water System Surveillance Program consists of activities that manage the aging effects for components in the following systems:

- chemical and volume control
- essential ventilation
- Class 1 piping/components
- non-Class 1 reactor coolant system components
- component cooling water
- residual heat removal
- containment spray
- safety injection
- emergency power
- waste disposal.

AMP B2.1.9 states that for the component cooling water system, the program relies on mitigative measures to minimize corrosion and microbiological growth through the addition of chromates and maintenance of water chemistry within specified limits. The chemicals added are potassium dichromate as a corrosion inhibitor and potassium hydroxide to maintain pH. The program monitors the performance of selected heat exchangers by performing heat balance testing to confirm the thermal performance function; it credits the One-Time Inspection Program for the inspection of selected heat exchangers and a representative sample of stagnant portions of the system piping. The inspections will check for fouling and evidence of corrosion or cracking. Nondestructive examinations may be used to confirm pipe wall thickness at selected locations where loss of material has been experienced. The program requires system pressure tests to locate and identify leaks so that corrective actions can be taken. The program also directs monitoring of system and component flow to confirm that components are receiving the required flow of cooling water.

AMP B2.1.9 states that for the EDG coolant subsystems, the program relies on mitigative measures to minimize corrosion in the engine coolant subsystems through the use and maintenance of corrosion inhibitors. Engine performance is checked by periodic surveillance tests. This program credits the One-Time Inspection Program to perform an inspection and condition assessment of various components in the EDG coolant subsystems.

AMP B2.1.9 states that for the gas turbine generator (G05) and associated diesels, the program relies on mitigative measures to minimize corrosion in the engine coolant subsystems through the use and maintenance of corrosion inhibitors. Equipment performance is checked by periodic surveillance tests. This program credits the One-Time Inspection Program to perform an inspection and condition assessment of various components in the coolant subsystems.

AMP B2.1.9 states that for the ventilation chilled water subsystems, the program relies on mitigative measures to minimize corrosion in the chilled water subsystems through the use and maintenance of corrosion inhibitors. The chilled water subsystems are normally in continuous operation. Equipment performance is monitored periodically. This program credits the One-Time Inspection Program to perform an inspection and condition assessment of various components in the chilled water subsystems.

7.1.7.2 GALL Report Consistency

In the PBNP LRA, the applicant states that AMP B2.1.9 is an existing program that is consistent with the GALL Report Section XI.M21, "Closed-Cycle Cooling Water System," with exceptions.

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 5 of this audit and review report for AMP B2.1.9.

In accordance with the guidance contained in the project team's audit and review plan, the project team reviewed the seven program elements contained in the applicant's AMP and associated bases documentation against the GALL Report Section XI.M21 for consistency.

7.1.7.3 Exceptions to the GALL Report

The project team reviewed the exceptions and its justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

In Appendix B, Section B2.1.9 of the LRA, the applicant stated that its closed-cycle cooling water surveillance program is consistent with GALL AMP XI.M21, with exceptions. The closed-cycle cooling water surveillance program takes exception to the "preventive actions" and acceptance criteria" program element such that the EDG and gas turbine related cooling sub-systems, and the ventilation chilled water sub-systems corrosion inhibitor concentrations are maintained in accordance with the manufacturer's recommendation, not EPRI TR-107396, "Closed-Cooling Water Chemistry Guidelines."

GALL AMP XI.M21 states, for "preventive actions" and acceptance criteria" program elements, that the program should rely on the use of appropriate materials, lining, or coating to protect the underlying metal surfaces and maintenance of system corrosion inhibitor concentrations within specified limits of EPRI TR-107396 to minimize corrosion. The program includes monitoring and control of cooling water chemistry to minimize exposure to aggressive environments and application of corrosion inhibitor in the component cooling water system to mitigate general, crevice, and pitting corrosion.

The applicant stated, in the LRA, that the EDG and gas turbine related cooling sub-systems, and the ventilation chilled water sub-systems corrosion inhibitor concentrations are maintained in accordance with the manufacturer's recommendation, not EPRI TR 107396. The project team reviewed the EPRI guidance document and the PBNP operating experience. The project team observed that PBNP relies on the use of appropriate materials and a water treatment program to inhibit corrosion. In addition, potassium dichromate is used as the corrosion inhibitor in the component cooling (CC)system, and the chromate concentration limits fall within the typical control range provided in Table 4.2 of EPRI TR-107396. The program includes the monitoring and control of CC system chemistry in order to minimize exposure to aggressive environments and to mitigate corrosion. The EDG, gas turbine, gas turbine-associated diesels cooling subsystems, and ventilation chilled water sub-systems use commercial corrosion inhibitors. EPRI TR-107396 discusses these in general terms but does not provide specific concentration limits for the two products in use. The applicant maintains the corrosion inhibitor concentrations within the product manufacturer's recommended limits. The operating history indicates a lack of component degradation exposed to the CCCW system coolant.

On the basis of its review, the project team finds that the support of the manufactures recommendations for chemistry concentrations to maintain appropriate system operation and the service history of the subject systems. On this basis, the project team finds this exception acceptable.

The closed-cycle cooling water surveillance program also takes exception to the "parameters monitored or inspected" program element such that the (1) PBNP does not reference EPRI TR-107396 in any of the CC system, EDG, gas turbine, or chilled water sub-system procedures, and as such does not monitor the CC system for corrosion products, calcium and magnesium, or refrigerant chemicals, (2) the parameters stated in GALL AMP XI.M21 are not monitored for all heat exchangers, only on a selected few in the CC system, (3) not all of the EPRI chemistry parameters are monitored for the EDG, gas turbine, gas turbine associated diesels coolant sub-systems, and the ventilation chilled water sub-systems, and (4) pump suction or discharge pressure and coolant flows are not monitored for the EDG, gas turbine and ventilation related sub-systems.

GALL AMP XI.M21 states, for "parameters monitored or inspected" program element, that this program should monitor 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.

For the first exception, the applicant stated, in the LRA, that it did not reference EPRI TR-107396 in any of the CC system, EDG, gas turbine, or chilled water sub-system procedures. The EPRI document states that the system impurity that could be monitored are chlorides, fluorides, sulfates, corrosion products, calcium, and magnesium, refrigerant chemicals and radionucilides. The applicant stated, in the LRA, that the closed-cycle cooling water system surveillance program periodically monitors CC system chemistry to verify it is being maintained within specified limits (pH, chloride, fluoride, chromate and sulfate concentrations, conductivity, and radioactivity).

The project team reviewed the information provided in the LRA. The project team finds that it is not mandatory that the EPRI document be referenced, but that the important feature is what is monitored. With these monitored parameters and operability tests performed on various system components, the project team finds that the applicant has demonstrated satisfactory performance with the affected SCCs. On the basis that the consideration of the parameters monitored, the successful systems operating history and the operability tests performed, the project team finds the exception is acceptable.

For the second exception, the applicant stated that the parameters, as stated in GALL AMP XI.M21 are not monitored for all heat exchangers, only on a selected few in the CC system. The applicant stated that at PBNP the system flows are monitored, as are pump suction and discharge pressure. Selected heat exchangers are monitored for flow. Selected heat exchangers also are heat balance-tested. The smaller heat exchangers, such as the seal water heat exchangers on the containment spray pumps, residual heat removal pumps, and the safety injection pumps and the sample system heat exchangers, do not have the capability of performing a heat balance test. Flows through these heat exchangers are set within specified ranges so that they are capable of performing their intended function. Periodic performance of system pressure testing of the component cooling system verifies that the pressure boundary function of the components in the component cooling system is maintained. This test is used to identify leaks and correct them prior to a loss of system or component intended function.

The project team reviewed the information provided in the LRA. On the basis of its review, the project team finds exception acceptable.

For the third exception, the applicant stated that not all of the EPRI chemistry parameters are monitored for the coolant sub-systems in the EDG, gas turbine, gas turbine associated diesels,

and the ventilation chilled water. The applicant stated, in the LRA, that the EDG coolant subsystems are periodically sampled and analyzed to maintain the corrosion inhibitor concentration within the manufacturer's recommended range. The system performance is periodically monitored by checking system pressures and temperatures. The coolant in diesel generators G01 and G02 is also checked for pH, microbiological contamination, conductivity, total suspended solids, iron, copper, calcium, and magnesium. Engine coolant temperatures are recorded during the monthly surveillance tests.

The project team reviewed the information provided in the LRA. On the basis of its review, the project team finds that the sampling and surveillances of the coolant and controlled engine temperature provides a reasonable basis for concluding that successful operation of the subsystems. On this basis, the project team finds this exception acceptable.

For the fourth exception, the applicant stated that it does not monitor pump suction or discharge pressure and coolant flows for the EDG, gas turbine and ventilation related sub-systems. The applicant stated in the LRA that the flows are monitored on a system basis not on a subsystem basis. As stated above, the smaller containment spray pumps, residual heat removal pumps, and the safety injection pumps associated with the system heat exchangers have flows that are set within specified ranges so that they are capable of performing their intended function. Operating experience has confirmed acceptable performance of these pumps. The system flow assessments will continue to provide an indicator that the a subsystem may not have the desired pump suction or discharge pressure and result in appropriate corrective actions.

The project team reviewed the information provided in the LRA. On the basis of its review, the project team finds this exception acceptable based on the system limits, tests performed and the acceptable operating experienced observed.

The project team reviewed the applicant's closed-cycle cooling water surveillance program. The project team concludes that the applicant monitors the water chemistry and operating characteristics of the closed-cycle cooling water system in such a way that it enables the applicant to continue to confirm the effectiveness of the closed-cycle cooling water system. On the basis of its review, the project team finds this exception to be acceptable.

The closed-cycle cooling water surveillance program also takes exception to the "detection of aging effects" program element such that PBNP does not performed microbiological testing on the CC System, ventilation chilled water sub-systems, or the coolant sub-systems.

GALL AMP XI.M21 states that controlling water chemistry does not preclude corrosion at locations of stagnant flow conditions or crevices. Degradation of a component due to corrosion would result in degradation of system or component performance. The extent and schedule of inspections and testing in accordance with EPRI TR-107396 ensures detection of corrosion before the loss of intended function of the component. Performance and functional testing in accordance with EPRI TR-107396 ensures acceptable functioning of the CCCW system or components serviced by the CCCW 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. Components not in operation are periodically tested to ensure operability.

The applicant stated, in the LRA, that it monitors CC water flows only through critical heat exchangers and monitors the overall system performance. The EPRI TR-107396 also states that microbiological testing is performed on the bulk water in the CC system (planktonic organisms). The test can be performed to provide a good indication of trends in general microbiological control. Microbiological testing is performed on the nitrate based coolant used in

G01 and G02 because this type of coolant is susceptible to microbiological contamination. The applicant does not perform this type of test on the CC system, ventilation chilled water subsystems, or the coolant subsystems for G03 and G04. As previously stated, the chromates in the CC system are toxic to microbiological organisms, and plant experience has shown no problems with microbiological growth in the system. The glycol concentration in the ventilation chilled water subsystems—G03, G04, G05, G-500, and G-501—is maintained at a level where biological growth is inhibited. These preventive actions preclude the need to perform microbiological testing.

Furthermore, the applicant stated that its PBNP AMP B2.1.13, "One-Time Inspection Program" is credited with the detection of corrosion in areas of stagnant flow conditions in the CC system. Periodic heat transfer testing of the CC heat exchangers provides indication of fouling. Various CC system operating parameters such as pressure, flow, and surge tank volume are monitored and will provide indication of system degradation. The EDGs, gas turbine, and gas turbine-associated diesels are not normally in operation but are periodically tested to ensure operability. Internal inspections of portions of the engines coolant subsystem will be performed via the PBNP AMP B2.1.13. The ventilation chilled water subsystems are normally in operation, and system performance is periodically checked. Internal inspections of select components will be performed via the PBNP AMP B2.1.13.

The project team reviewed the information provided by the applicant and held technical discussions with the applicant. The project team concludes that the measures the applicant takes to monitor system chemistry and operating performance enable the applicant to continue to confirm the effectiveness of the closed-cycle cooling water system. The project team finds that the applicant's one-time inspection program supports the performance of its closed-cycle cooling water surveillance program, and will adequately sample those areas subject to low or stagnant flow as required by GALL AMP XI.M21. On this basis, the project team finds this exception acceptable.

The closed-cycle cooling water surveillance program also takes exception to the "monitoring and trending" program element such that (1) PBNP will perform tests as a result of CC System performance evaluations by the responsible engineer and (2) PBNP does not routinely perform heat removal capability tests on the EDG, gas turbine related coolant sub-systems, and the ventilation chilled water sub-systems.

GALL AMP XI.M21 states that the frequency of sampling water chemistry varies and can occur on a continuous, daily, weekly, or as-needed basis, as indicated by plant operating conditions. 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 testing intervals may be adjusted on the basis of the results of the reliability analysis, type of service, frequency of operation, or age of components and systems.

The applicant stated in the LRA that the CC system water chemistry is sampled on a periodic basis and as indicated by plant operating conditions. Functional performance of the CC system is monitored with the in-place instrumentation. System pressure tests are performed per plant procedures. Thermal balance testing of the component cooling and service water heat exchangers is performed on a frequency in accordance with plant procedures. Plant procedures are used to set flows to heat exchangers or a group of heat exchangers, except for pump seal coolers. The EDG and gas turbine-related coolant subsystems are sampled on a periodic basis. The project team considers the in-place monitoring equipment as an acceptable alternative for performing periodic functional tests. Based on review of the associated EPRI documents, plant chemistry sampling, monitoring, and surveillance procedures, system

performance tests, plant operating procedures, and plant operating history, and the applicant's response to questions, the project team finds the measures the applicant takes to monitor system chemistry and operating performance enable the applicant to continue to confirm the effectiveness of the closed-cycle cooling water system surveillance program. On this basis, the finds the exception acceptable.

The applicant does not routinely perform heat removal capability tests on the EDG and gas turbine-related coolant subsystems. However, operability testing is periodically conducted. In the LRA, the applicant stated that other heat exchanges are heat balanced-tested. These other tests combined with the operability test and system operability tests provide an indication of the heat flow performance of the EDG and gas turbine-related coolant subsystems. Based on the operability tests, tests on other heat exchanges in the system, and successful operation, the project team finds this exception acceptable.

The applicant also does not routinely perform heat removal capability tests on the ventilation chilled water subsystems. These systems are normally in continuous operation, and system operating parameters are periodically checked to assess system performance. The continuous operation along with the sampling of form other heat exchanges that are heat balanced-tested is an indication that the ventilation chilled water subsystems heat exchangers are performing appropriately. Based on the continuos operation, operability tests, tests on other heat exchanges in the system, and successful operation, the project team finds this exception acceptable.

7.1.7.4 Enhancements

The PBNP LRA states that enhancements to the Closed-Cycle Cooling Water System Surveillance Program include the revision of applicable procedures and/or call-ups to ensure consideration of the applicable aging effects and to establish sampling periodicity and criteria for the coolant associated with the gas turbine and related diesel engines, and applicable ventilation chilled water subsystems. The PBNP LRA also states that enhancements also include a review of the acceptable chloride and fluoride levels in the CC system, the creation of procedural requirements for operating the system within the established acceptance ranges for the applicable chemical parameters, and the completion of a strategy for a long-term condition assessment of the CC heat exchangers because of suspected galvanic corrosion of the tube support plates.

The administrative enhancements identified in PBNP AMP B2.1.9, "Closed-Cycle Cooling Water System Surveillance Program," are not necessary to demonstrate consistency with GALL criterion. As described in Section 4, Audit and Review Scope, the project team did not review these enhancements.

7.1.7.5 Operating Experience

The applicant states the following in LRA Appendix B, Section B2.1.9, "Closed-Cycle Cooling Water System Surveillance Program":

> Plant-specific operating experience indicates that CC system performance has been very good. The applicant has not experienced degradation of its CC system due to corrosion product build up or cracking. The chromate water treatment in the CC system has performed satisfactorily in mitigating loss of

material and loss of heat transfer. Routine checks performed on the CC system by operators, such as monitoring flows through heat exchangers, monitoring system pressures at various locations, monitoring pump suction and discharge pressure, and monitoring temperatures of both the CC system and the components that the CC water is cooling, ensure early detection of CC system problems that will lead to corrective actions. The performance of a system pressure test is used to detect and eliminate unacceptable leaks.

Tube vibration in the CC heat exchangers has been documented in the corrective action program. The vibration has been attributed to increased clearances in the tube-to-tube support plate interface. The CC heat exchangers were re-tubed with SeaCure tube material, which creates the potential for galvanic corrosion of the carbon steel tube support plates. Galvanic corrosion of the tube support plates is believed to be the reason for the increased clearances and subsequent tube vibration at high CC flows. A long-term condition assessment strategy for the CC heat exchangers is being developed regarding this issue. Trending of nitrite and microbiological levels in the engine coolant of G01 and G02 EDGs has revealed slight in-leakage of service water into the engine coolant. This resulted in the heat exchangers being inspected and repaired or replaced. Periodic nitrate depletion in G02 is an open issue that is being addressed via the corrective action process. There have been no significant degradation problems with the coolant subsystems of EDG G03 and G04, the gas turbine and associated equipment, and the ventilation chilled water subsystems. The Closed-Cycle Cooling Water System Surveillance Program provides reasonable assurance that these subsystems and components will continue to perform their intended functions.

A review of NRC Inspection Reports, QA Audit/Surveillance Reports, and Self-Assessments since 1999 revealed no issues or findings that could impact the effectiveness of the Closed-Cycle Cooling Water System Surveillance Program.

As additional operating experience is obtained, lessons learned may be used to adjust this program.

The project team reviewed LRPG 1-3, Operating Experience Data Collection, and its associated database. Per LRPG 1-3, plant staff collect the following information and control a database of LRA information cataloged in Plant-Specific Operating Experience Reported by Aging Management Program:

- plant-specific operating experience - Referencing NUTRK and/or t-track (a plant-specific database) plant staff track corrective actions, NRC notice violations, and License Event Reports (LERs). Also, EDMS tracks LERs, NRC Generic Letters, NRC Safety Evaluation Reports (SERs), Final Safety Analysis Reports (FSARs), Fire Protection Evaluation Reports, offsite dose calculation manual, action requests, incident investigations, nonconformance reports, quality assurance conditions reports, and root cause evaluations.

- industry operating experience - Referencing NUTRK and/or t-track and the Institute of Nuclear Power Operation (INPO) SEE-IN database, plant staff track SERs, significant event notifications, significant operating experience reports, operating and maintenance reminders. INPO EDMS tracks plant network operating experience, operating and maintenance reminders, plant status, significant event notifications, significant event reports, significant events by others, significant operating experience reports, vendor technical information programs, Westinghouse documents, nuclear safety advisory letters, technical bulletins, info grams, and Westinghouse technical reports (WCAPs)

- NRC generic communication - Referencing the EPRI NRC Generic Communications database, plant staff track generic letters, bulletins, information notices, circulars, administrative letters, regulatory issue summaries, and generic safety issues. NUTRK and/or t-track also track this information.

- the GALL Report.

The project team confirmed that the operating experience (OE) database is being developed and is being transferred to the license renewal database.

Based on the project team's review of the plant operating experience, the plant method for data collection, and discussions with the applicant's technical staff, the project team concludes that AMP B2.1.9 is capable of managing the aging effects that have been observed at the applicant's plant during the extended period of operation.

7.1.7.6 UFSAR Supplement

The applicant provided its UFSAR supplement for the Closed-Cycle Cooling Water System Surveillance Program in the applicant's LRA, Appendix A, Section A.15.2.9, which states that the Closed-Cycle Cooling Water System Surveillance Program manages aging effects in closed- cycle cooling water systems that are not subject to significant sources of contamination, in which water chemistry is controlled and heat is not directly rejected to the ultimate heat sink. The program includes

1. maintenance of system corrosion inhibitor concentrations to minimize degradation

2. periodic or one-time surveillance testing and inspections to evaluate system and component performance.

The UFSAR states that inspection methods may include visual, ultrasonic, and eddy current testing.

These commitments are included in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC, dated February 25, 2004 (ML040580023).

The project team reviewed the UFSAR supplement, found it to be consistent with the GALL Report, and concludes 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 exceptions 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 Fire Protection Program (AMP B2.1.10)

In the PBNP LRA, Appendix B, Section B2.1.10, the applicant states that PBNP AMP B2.1.10, "Fire Protection Program," an existing program, is consistent with GALL AMP XI.M26, "Fire Protection," and GALL AMP XI.M27, "Fire Water System," with exceptions.

7.1.8.1 Program Description

The PBNP LRA provides the following information on its fire protection program. The fire protection program consists of fire barrier inspections, electric and diesel-driven fire pump tests, halon fire suppression system inspections and tests, and water-based fire protection system inspections and tests. The fire barrier inspection requires periodic visual inspection of fire barrier penetration seals, fire dampers, fire barrier walls, ceilings and floors, and periodic visual inspections and functional tests of fire-rated doors to ensure that their functionality and operability is maintained. The electric and diesel-driven fire pumps is tested to ensure that an adequate flow of firewater is supplied and that there is no degradation of diesel fuel supply lines. The water-based fire protection systems are inspected and tested to provide reasonable assurance that fire water systems are capable of performing their intended function. Also, the applicant stated that its fire protection system credits the PBNP AMP B2.1.7, "Buried Services Monitoring Program " for the management of aging effects on the external surfaces of buried fire water system piping.

7.1.8.2 GALL Report Consistency

In the PBNP LRA, the applicant states that PBNP AMP B2.1.10 is consistent with GALL AMP XI.M26 and GALL AMP XI.M27, with exceptions.

The exceptions to consistency with the GALL Report identified by the applicant consist of the application of "Interim Staff Guidance (ISG) -04: Aging Management of Fire Protection Systems for License Renewal", dated December 3, 2003. ISG-04 is the culmination of several years' discussion with industry with the purpose of capturing lessons learned and of upgrading and improving those sections of the GALL Report that deal with fire protection. ISG-04 was approved by the staff on December 3, 2003 (ML023440137).

The GALL Report represents the staff position on acceptable aging management programs as of July 2001. ISG-04 modifies several statements of the GALL Report that address fire protection systems. Though ISG-04 remains to be incorporated into the GALL Report, the staff expectation is that the issues of the ISG will be addressed. The applicant has applied ISG-04 to the fire protection systems at PBNP.

The project team interviewed the applicant's technical staff and reviewed the documents listed in Attachment 5 of this report for AMP B2.1.10. The project team reviewed the seven program elements, as described in this audit and review report, contained in the PBNP AMP and associated bases documentation against GALL AMP XI.M26 and GALL AMP XI.M27 for consistency.

7.1.8.3 Exceptions to the GALL Report

The project team reviewed the exceptions and its justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

The fire protection program takes exception to the “preventive actions” program element for GALL AMP XI.M26 such that the fire protection evaluation report does not manage or prevent aging effects of components associated with fire prevention, fire detection, fire suppression, fire containment or alternative shutdown capability, so are not addressed in the PBNP fire protection aging management program. GALL AMP XI.M26, as modified by ISG-04, states that a fire hazard analysis is to assess the fire potential and fire hazard in all plant areas, and to specify measures for fire prevention, fire detection, fire suppression, and fire containment and alternative shutdown capability for each fire area containing systems, structures, and components important to safety.

The project team verified that the PBNP fire protection evaluation report did assess the fire potential and fire hazard in all plant areas, and did specify measures for fire prevention, fire detection, fire suppression, and fire containment and alternative shutdown capability for each fire area containing systems, structures, and components important to safety, as the fire hazard analysis, named in the GALL Report, specifies. Thus, the project team determined that the generic GALL Report term “fire hazard analysis” equates to the PBNP-specific term “fire protection evaluation report,” because each one performs the same actions and specifies the same measures. With regard to the exception, noted above, the project team did not expect to find requirements to manage or to prevent aging effects in the requirements in the PBNP fire protection evaluation program. The purpose of this fire protection evaluation report is not to manage or to prevent aging effects, but to demonstrate that the plant will maintain the ability to perform safe shutdown functions and to minimize radioactive material releases to the environment in the event of a fire. The project team did expect, and did find, requirements to manage and to prevent aging in this PBNP fire protection aging management program. It is this aging management program, with its specific program elements, e.g., preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria, and corrective actions, that actually does manage or prevent aging effects on the specified components associated with the above systems. The project team learned that the applicant had identified this as an exception on the basis that the program element contained requirements that did not manage or prevent aging effects. The applicant had complied with the GALL Report specification but wanted to call attention to the fact that the requirements did not actually manage or prevent aging effects. On the basis of its review, the project team finds this exception to be acceptable.

The fire protection program takes exception to the “parameters monitored and inspected,” the “detection of aging effects,” and the “monitoring and trending” program elements for GALL AMP XI.M26 such that the visual inspection of fire barrier penetration seals is performed on a 4.5-year inspection frequency, with approximately one-third of these seals being inspected every 18-months. The applicant stated that the inspection frequency of the visual inspections of the fire barrier penetration seals, during which approximately 33% of the total seal population are inspected, meets and exceeds that inspection frequency that is recommended by the GALL report, as modified by ISG-04. GALL AMP XI.M26, as modified by ISG-04, states that visual inspection of 10% of each type of penetration seal is to be performed at least once during every refueling outage.

The project team verified that the inspection frequency of the visual inspections of the fire barrier penetration seals, at approximately 33% versus 10%, meets and exceeds that inspection

frequency that is recommended by the GALL report, as modified by ISG-04. On the basis of its review, the project team finds this exception to be acceptable.

The fire protection program takes exception to the “detection of aging effects” program element for GALL AMP XI.M26 such that PBNP inspection personnel are not qualified to perform VT-1 or VT-3 visual inspections. GALL AMP XI.M26, as modified by ISG-04, states that VT-1 or equivalent and VT-3 or equivalent visual inspections are to be performed, and thus allows alternative inspections to be performed. This means that neither VT-1 nor VT-3 visual inspections are specifically recommended to be performed: alternative inspections are specifically allowed.

The project team reviewed the information provided by the applicant. The project team verified that, though the inspection personnel were qualified to perform these inspections in accordance with PBNP procedures, they were not qualified in accordance with VT-1 or VT-3. The project team determined that the applicable PBNP inspection procedures contained procedure requirements and acceptance criteria that were of sufficient detail and conservatism that they were the equivalent to those required for VT-1 and VT-3 visual inspection. The project team noted the practical matter that those personnel who had installed the fire barrier components, i.e., those who were the most familiar with them, were the principal inspectors who performed the required visual inspections. The project team further noted the further conservative measure that these inspectors reported any discrepancy discovered during the inspection to the fire protection system engineer or the fire protection engineer for his evaluation and disposition under the applicant’s corrective action program. Thus, the project team concluded that the detail and conservatism provided in the PBNP inspection procedures were sufficient to assure that an inspection equivalent to VT-1 or VT-3 will be performed. On the basis of its review, the project team finds this exception acceptable.

The fire protection program takes exception to the “detection of aging effects” program element for GALL AMP XI.M27 such that PBNP performs monthly yard fire hydrant inspections and annual yard fire hydrant flushing, though not in accordance with NFPA 25. The fire protection program also takes exception to the “detection of aging effects” program element for GALL AMP XI.M27 such that PBNP checks the flow capacity of the main fire loop annually, but does not measure individual fire hydrant flow. GALL AMP XI.M27, as modified by ISG-04, states that visual inspection of yard fire hydrants is to be performed annually, in accordance with NFPA 25, and that fire hydrant hose hydrostatic tests, gasket inspections, and fire hydrant flow tests are to be performed annually.

The project team noted that NFPA 25 recommends a fire hydrant visual inspection to be performed annually and after each operation, and determined that PBNP, in performing monthly fire hydrant visual inspections, meets and exceeds this NFPA 25 recommendation. The project team noted that PBNP treats fire hydrant hoses and gaskets as consumables, and that these components are thus not within scope of license renewal. The project team further noted that hoses and gaskets are visually inspected monthly and the hoses are hydrostatically tested on a frequency of 18 or 36 months, depending on the hose location. In the event that the hose or gasket does not pass the visual inspection, or the hose does not pass the hydrostatic test, it is replaced. This project team concluded that this practice precludes any aging concern of these components. The project team verified that main fire loop flow capacity test that PBNP performs annually has a flow capacity that meets and exceeds that of any single fire hydrant. On the basis of its review, the project team finds this exception to be acceptable.

The fire protection program takes exception to the “monitoring and trending” program element for GALL AMP XI.M27 such that inspection and testing is performed in accordance with the nuclear insurance carrier’s fire protection system testing requirements and generally follows the

guidance of the applicable NFPA codes and standards. GALL AMP XI.M27, as modified by ISG-04, states that system performance testing results are monitored and trended as specified by the NFPA codes and standards.

The project team reviewed the information provided by the applicant, as documented in its PBNP audit and review report. The project team finds that where significant deviations between PBNP fire protection system testing requirements and NFPA codes and standards testing requirements exist, an engineering analysis and justification is developed to demonstrate that, or the PBNP fire protection system testing requirements are changed such that, an equivalent level of protection is achieved by PBNP. The project team determined that the applicable NFPA standard in effect at PBNP is NFPA 13, "Standard for the Installation of Sprinkler Systems." The project team compared the monitoring and trending recommendations of NFPA 13 to those of the nuclear insurance carrier's fire protection system testing and determined that the PBNP monitoring and trending requirements met and exceeded those of NFPA 13. On the basis of its review, the project team finds this exception to be acceptable.

The fire protection program takes exception to the "acceptance criteria" program element for GALL AMP XI.M27 such that PBNP does not specifically inspect for biofouling in its sprinkler systems. GALL AMP XI.M27, as modified by ISG-04, states that no biofouling that could cause corrosion in the sprinkler systems is to exist.

The project team determined that the applicant takes actions to minimize biofouling in fire system components. These actions include flushing, performance testing, inspections, and chlorination when circulation water temperature exceeds 45F. The project team verified that PBNP plans to inspect or replace all sprinkler heads in accordance with NFPA 25. The inspection of some of the sprinkler heads will identify any corrosion, which will then be addressed in accordance with the PBNP corrective action program and thus accomplish the goal that no biofouling that could cause corrosion will exist. The remaining sprinkler heads will be replaced. Prior to replacement, the sprinkler lines will be flushed and drained, at which time, any loose corrosion products will be evident. The disposition of any corrosion products that are detected will be in accordance with the applicant's corrective action program. On the basis of its review, the project team finds this exception to be acceptable.

7.1.8.4 Enhancements

In Appendix B, Section B2.1.10 of the LRA, the applicant stated that its fire protection program is consistent with GALL AMP XI.M26 and GALL AMP XI.M27, with enhancements. The applicant stated that, for the "scope of program" and "detection of aging effects" program elements, enhancements include revisions to various existing implementing documents to add specific inspections, monitoring and trending requirements, and/or frequency adjustments based on operating experience. Additionally, new implementing documents will be created to cause inspections of selected components and portions of the fire suppression piping. In these documents the specific non-Appendix R/Safe Shutdown fire dampers to be inspected will be identified.

The administrative enhancements identified in PBNP AMP B2.1.10, "Fire Protection Program," are not necessary to demonstrate consistency with GALL criterion. As described in Section 4, Audit and Review Scope, the project team did not review these enhancements

7.1.8.5 Operating Experience

The project team reviewed the operating experience identified in the LRA for the fire protection

program. The application contained sufficient plant-specific operating experience, but did not specify any industry operating experience, e.g., those information notices (IN 88-56, IN 91-47, IN 94-28, and IN 97-70) and the generic letter (GL 92-08) identified in the GALL Report. When the project team questioned the applicant as to the extent of industry operating experience that had been used, the applicant stated that the applicable industry operating experience, i.e., those information notices and the generic letter identified in the GALL Report, had been reviewed and applied to the PBNP fire protection systems. The project team reviewed selected implementing procedures (RMP 9011, Rev 4, Safe Shutdown Fire Door Inspections, RMP 9011-2, Rev 2, Industrial Fire Door Inspections, RMP 9057, Rev 3, Fire Barrier Penetration Fire Seal Surveillance, RMP 58, Rev 6, Containment Fire Seal and Conduit Wrapping Inspection, Unit 1, and RMP 59, Rev 6, Containment Fire Seal and Conduit Wrapping Inspection, Unit 1) and located the application of industry operating experience in those procedures. Based on this sample review, the project team concluded that the applicant had applied adequate industry operating experience. The project team observed that the applicant has performed an extensive review and application of PBNP plant-specific operating experience to the fire protection systems. The project team observed that the applicant has identified condition reporting trending data that identified discrepancies in fire protection components, and has resolved deteriorating trends and specific conditions.

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 AMP B2.1.10 adequately applies plant-specific and industry operating experience to PBNP and that it adequately manages the aging effects that have been observed at PBNP.

7.1.8.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the fire protection program in the PBNP LRA, Appendix A, Section 15.2.10, Fire Protection Program, which states that the fire protection program includes fire barrier inspections, electric and diesel-driven fire pump testing, halon fire suppression system inspections and testing, and water-based fire protection systems inspections and testing. These commitments are included in the LRA submittal letter "Application for Renewed Operating License", from Gary D. Middlesworth to the Nuclear Regulatory Commission, dated February 25, 2004 (ML040580023). The project team noted that the fire barrier inspection requires periodic visual inspection of fire barrier penetration seals, fire dampers, fire barrier walls, ceilings and floors, and periodic visual inspections and functional tests of fire-rated doors to ensure that their functionality and operability is maintained; this is consistent with the GALL Report, as modified by ISG-04. The project team also noted that the electric and diesel-driven fire pumps are tested to ensure that an adequate flow of firewater is supplied and that there is no degradation of diesel fuel supply lines; this is consistent with the GALL Report, as modified by ISG-04. The project team also noted that the water-based fire protection systems are inspected and tested to provide reasonable assurance that fire water systems are capable of performing their intended function; this is consistent with the GALL Report, as modified by ISG-04.

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, as modified by ISG-04, and concluded 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 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 Report are consistent

with the GALL Report. In addition, on the basis of its review of the exceptions to 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 (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 Flow-Accelerated Corrosion Program (AMP B2.1.11)

In the PBNP LRA, Appendix B, Section B2.1.11, the applicant states that LRA AMP B.1.11, "Flow-Accelerated Corrosion Program," is an existing program that is consistent with the GALL Report Section XI.M17, "Flow-Accelerated Corrosion," with enhancements.

7.1.9.1 Program Description

The applicant states in the PBNP LRA, Appendix B, Section B2.1.11, that the Flow-Accelerated Corrosion Program manages aging effects due to flow-accelerated corrosion (FAC) on the internal surfaces of carbon or low alloy steel piping, elbows, reducers, expanders, and valve bodies which contain high energy fluids (both single-phase and two-phase). The applicant also states that the program implements the EPRI guidelines in NSAC-202L-R2 for an effective FAC program and includes (a) an analysis using a predictive code such as CHECWORKS to determine critical locations, (b) baseline inspections to determine the extent of thinning at these locations, (c) follow-up inspections to confirm the predictions, and (d) repairing or replacing components, as necessary.

7.1.9.2 GALL Report Consistency

In the PBNP LRA Appendix B, Section B2.1.11, the applicant states that the Flow-Accelerated Corrosion Program is an existing program that is consistent with the GALL Report Section XI.M17, "Flow-Accelerated Corrosion."

The project team interviewed the applicant's technical staff and reviewed, in total or part, the documents listed in Attachment 5 of this report for AMP B2.1.11, including the "PBNP Flow-Accelerated Corrosion Program Basis Document," LR-AMP-009-FAC, which provided an assessment of the aging management program element consistency with GALL Report Section X.M1.

In the PBNP LRA AMP B2.1.11 it states that if the minimum measured thickness is less than 70% of pipe nominal wall thickness, the sample size must be expanded. RAI B2.1.11-1 was issued to obtain additional information concerning the methodology of determining minimum all and how the applicant will be making its determination. The applicant clarified that it uses ASME guidance to determine minimum wall and how it determines when to expand its sample. The staff found this explanation satisfactory. <Confirmatory Item B2.1.11-1>

The project team reviewed the seven program elements (see Section 5.1 of this audit and review report) contained in the PBNP LRA Appendix B, AMP B2.1.11, and associated bases documentation against the GALL AMP X.M1 for consistency.

7.1.9.3 Exceptions to the GALL Report

None.

7.1.9.4 Enhancements

The LRA states that the scope of program element will be enhanced to add steam generator feedwater nozzles and attached reducers to the scope of the FAC program.

The GALL Report identifies the following criterion for the Scope of Program element associated with the enhancement:

> The FAC program, described by the EPRI guidelines in NSAC-202L-R2, includes procedures or administrative controls to assure that the structural integrity of all carbon steel lines containing high-energy fluids (two phase as well as single phase) is maintained.

The applicant's steam generator aging management review identified the need to include the steam generator feedwater nozzles and attached reducers to the FAC program. Based on technical discussions with Point Beach plant personnel and a review of the FAC program basis document LR-AMP-009-FAC and program document NP7.7.23, the project team concludes that this enhancement to the FAC program scope is acceptable and will ensure that wall thinning in Unit 1 and 2 steam generator feedwater nozzles will be managed according to the guidelines in NSAC-202L-R2 and that appropriate administrative controls will be in place to ensure that the structural integrity is maintained in carbon steel, high-energy locations.

The LRA states that the detection of aging effects and acceptance criteria program elements will include clarification of the implementing procedures for steam generator nozzles and reducers, more stringent controls placed on program basis documentation and software, and require a local thinning evaluation if the measured wall thickness is less than code design minimum wall thickness.

The administrative enhancements as described in PBNP AMP B2.1.11, "Flow-Accelerated Corrosion Program," are not necessary to demonstrate consistency with GALL criterion. As described in Section 4, Audit and Review Scope, the project team did not review these enhancements.

7.1.9.5 Operating Experience

The applicant performed a comprehensive review of industry issues and service and its relevance to PBNP, including wall-thinning problems in single-phase systems in feedwater and condensate systems (NRC IE Bulletin No. 87-01; NRC Information Notices [INs] 81-28, 92-35, and 95-11) and in two-phase piping in extraction steam lines (NRC INs 89-53, 97-84) and moisture separation reheater and feedwater heater drains (NRC INs 89-53, 91-18, 93-21, and 97-84).

The applicant's plant-specific operating experience review refers to a single event involving a feedwater heater steam leak at Point Beach Unit 1 in 1999 due to steam impingement and FAC. Subsequent to the failure, inspections were performed and repairs were made due to wall thinning. Unit 2 heater materials were FAC-resistant, and no wall thinning was noted. Based on the LRA discussion of this plant-specific event, it was not clear to the project team that the FAC program was effective in detecting wall thinning in the Unit 1 feedwater heater prior to failure. In addition, it appears that wall thinning in the other heaters was discovered and examined only after the first heater failed.

In technical discussions between the project team and PBNP staff, the applicant explained that the PBNP FAC program did not detect this condition, as feedwater heaters were not included within the scope of the program at the time. Immediately prior to this event, PBNP was evaluating industry operating experience (OE) on feedwater heater degradation. The timing of the industry OE did not allow for OE evaluation before the occurrence of the event. The FAC program was revised to include feedwater heaters within the scope of the program. The applicant stated that the FAC program has identified component thinning conditions that resulted in corrective actions being pursued prior to component failure. The applicant described two examples where thinning in the main feedwater pumps and heater drain tank pumps mini recirculation lines was discovered, the inspection scope was expanded, and sections of the lines were replaced with more corrosion-resistant materials. The applicant stated that the most common enhancements to the program are associated with scope additions and program process improvements resulting from FAC program findings, industry operating experience, and internal assessment recommendations.

Based on the project team's review of the above operating experience discussion and discussions with the applicants technical staff, the project team concludes that AMP B2.1.11 should be capable of managing aging effects that have been observed at the applicant's plant or at other nuclear power facilities during the extended period of operation.

7.1.9.6 UFSAR Supplement

The applicant provided its UFSAR supplement for the Fatigue Monitoring Program in the PBNP LRA, Appendix A, Section 15.2.11. The supplement states

> The Flow-Accelerated Corrosion Program manages aging effects due to flow-accelerated corrosion (FAC) on the internal surfaces of carbon or low alloy steel piping, elbows, reducers, expanders, and valve bodies which contain high energy fluids (both single phase and two phase). The program implements the EPRI guidelines in NSAC-202L-R2 for an effective FAC program and includes (a) an analysis using a predictive code such as CHECWORKS to determine critical locations, (b) baseline inspections to determine the extent of thinning at these locations, (c) follow-up inspections to confirm the predictions, and (d) repairing or replacing components, as necessary.

These commitments, including enhancements, are included in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC, dated February 25, 2004 (ML040580023).

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, and concluded 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).

7.1.9.7 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).

7.1.10 Fuel Oil Chemistry Control Program (AMP B2.1.12)

In the applicant's LRA, Appendix B, Section B2.1.12, the applicant states that AMP B2.1.12, "Fuel Oil Chemistry Control Program," is an existing program that is consistent with the GALL Report Section XI.M30, "Fuel Oil Chemistry Control Program," with exceptions.

7.1.10.1 Program Description

In the PBNP LRA, the applicant states that the Fuel Oil Chemistry Control Program consists of plant activities that manage the aging effects for components in the following systems and structures:

- emergency power
- fire protection.

AMP B2.2.12 states that the Fuel Oil Chemistry Control Program mitigates and manages aging effects on the internal surfaces of fuel oil storage tanks and associated components in systems that contain fuel oil. The AMP states that the program includes

- surveillance and monitoring procedures for maintaining fuel oil quality by controlling contaminants in accordance with applicable ASTM standards

- periodic draining of water from fuel oil tanks

- periodic or conditional visual inspection of internal surfaces or wall thickness measurements (e.g., by UT) from external surfaces of fuel oil tanks

- one-time inspections of a representative sample of components in systems that contain fuel oil.

AMP B2.2.12 states that the objective of the Fuel Oil Chemistry Control Program is to minimize the introduction and presence of contaminants in the plant's fuel oil system that could cause degradation of components in systems that contain fuel oil. This is accomplished by periodic sampling and chemical analysis of the fuel oil inventory at the plant and sampling, testing and analysis of new fuel oil as it is unloaded at the plant. Precautions are also taken during the unloading process to avoid introducing contaminants. Initial samples are visually inspected for entrained foreign material and water. If a sample appears to be unsatisfactory, offloading is discontinued or not allowed. All samples are taken in accordance with ASTM D4057 and are shipped to a laboratory approved in accordance with the PBNP QA program for analysis. There, the samples are processed by qualified technicians using approved test equipment, and reports are generated and sent back to the plant for review and retention. Technical Requirements Manual 4.12, Diesel Fuel Oil, Revision 2, requires the following ASTM standards:

- ASTM D4057 for sampling
- ASTM D2709 for water and sediment analysis
- ASTM D6217 for particulate analysis
- ASTM D2274 for stability analysis.

AMP B2.1.12 states that the accumulated water is removed from fuel oil tanks quarterly. The

above-ground storage tanks are periodically drained and inspected. Day tanks for the diesel-driven fire pump and emergency diesel generators are examined externally via UT wall thickness measurements and the results evaluated against the design thickness. Gas turbine starting and auxiliary diesel fuel tanks will be drained and inspected prior to the end of the current license. The initial inspection results will be used to determine the periodicity of future inspections. The EDG below-ground storage tanks and the underground emergency fuel tank are drained and inspected if deemed necessary based on the trends indicated by the results of the fuel oil analysis or as recommended by the system engineer based on equipment operating experience. Internal tank inspections will identify loss of material due to various aging mechanisms, including general and pitting corrosion and microbiologically influenced corrosion (MIC), and may include UT thickness measurements of the tank bottom.

AMP B2.1.12 states that a representative sample of components in systems that contain fuel oil will be inspected for evidence of aging effects via the One-Time Inspection Program and the results documented. These inspections will occur prior to the beginning of the period of extended operation and do not necessarily have to be performed on components that are within the scope of license renewal as long as the environment and material composition of the components inspected are the same as the components within scope.

7.1.10.2 GALL Report Consistency

In the applicant's LRA, the applicant states that AMP B2.1.12 is an existing program that is consistent with the GALL Report Section XI.M30, "Fuel Oil Chemistry Control Program," with exceptions.

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 5 of this audit and review report for AMP B2.1.12.

In accordance with the guidance contained in the project team's audit and review plan, the project team reviewed the seven program elements contained in the applicant's AMP and associated bases documentation against the GALL Report Section XI.M30 for consistency.

7.1.10.3 Exceptions to the GALL Report

The project team reviewed the exceptions and its justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

In Appendix B, Section B2.1.12 of the LRA, the applicant stated that its fuel oil chemistry control program is consistent with GALL AMP XI.M30, with exceptions. The fuel oil chemistry control program takes exception to the "preventive actions" program element for GALL AMP XI.M30 such that PBNP does not routinely add corrosion inhibitors, stabilizers, or biocides to the fuel oil. However, fuel oil additives would be considered if sample results indicate the presence of these degradation mechanisms.

GALL AMP XI.M30 states that the quality of fuel oil is maintained by additions of biocides to minimize biological activity, stabilizers to prevent biological breakdown of the diesel fuel, and corrosion inhibitors to mitigate corrosion. Periodic cleaning of a tank allows removal of sediments, and periodic draining of water collected at the bottom of a tank minimizes the amount of water and the length of contact time. Accordingly, these measures are effective in mitigating corrosion inside diesel fuel oil tanks. Coatings, if used, prevent or mitigate corrosion by protecting the internal surfaces of the tank from contact with water and microbiological organisms.

The applicant stated, in the LRA, the its fuel oil chemistry control program is geared to the discovery and correction of conditions that could lead to degradation of fuel oil system components. Accumulated water is periodically removed from the tanks. Draining of accumulated water will also remove sediments from the tanks. The quality of new fuel oil is verified and the quality of stored fuel oil is periodically checked. These actions will mitigate loss of material in the fuel oil tanks and other components.

The applicant stated, during the audit, that if tank wall/bottom thickness are determined via UT measurements from outside the tank, hence, there is no need to remove the tank (and associated equipment) from service and drain, clean, and inspect the inside of the tank. Periodic removal of free water and sediment via tank drain valves or via use of a bottom sample thief will minimize conditions and environment conducive to tank corrosion.

In addition, the applicant stated, during the audit, that the EDG below-ground tanks and underground tank are drained and inspected only if deemed necessary based on the results of the fuel oil sample analysis or as recommended by the system engineer. This is deemed to be acceptable based on the inspection results of above-ground tanks, which are considered to be in a more severe environment and have shown no appreciable material loss in more than 30 years of service. Additionally, wall thickness measurements of the underground tank indicate that no appreciable material loss has occurred in more than 30 years of service. Significant degradation of the inside surfaces of the EDG below-ground tanks and underground tank, or conditions expected to cause such degradation, would be evidenced by the quarterly particulate and stability oil sample analysis results and/or identified by routine inspections or tests performed on supported equipment, which is monitored by the system engineer. There are no expected aging effects for the outside surface of the EDG below-ground tanks because they are encased in concrete.

In addition, during the audit, plant technical staff indicated that operating experience validates that there is no need for chemical addition to the fuel oil system; the applicant continues to monitor operations for indications of aging conditions to warrant chemical addition and will do so if deemed necessary. Therefore, the applicant believes that no chemical addition is the preferred method at this time.

The project team reviewed the information provided by the applicant, as documented in the PBNP audit and review report, and held discussions with the applicant's technical staff. On the basis of its review and on plant specific operating history, the test results and the contaminants monitoring which shows no indication of aging in the various tanks, the project team finds this exception acceptable.

The applicant's fuel oil chemistry control program also takes exception to the "parameters monitored or inspected" and "acceptance criteria" program elements for GALL AMP XI.M30 such that (1) PBNP uses only D 2709 to determine the amount of contamination due to water and sediment in diesel fuel, (2) PBNP uses D 6217 in lieu of D 2276 for particulate determination, (3) PBNP also uses a filter with a pore size no larger than 0.8 micron, and (4) PBNP uses ASTM D 2274 for stability analysis.

GALL AMP XI.M30 states that the AMP should monitor fuel oil quality and the levels of water and microbiological organisms in the fuel oil, which cause the loss of material of the tank internal surfaces and are the principal parameters relevant to maintaining tank structural integrity. ASTM Standard D4057 is used for guidance on oil sampling. ASTM Standards D1796 and D2709 are used for determination of water and sediment contamination in diesel fuel. For determination of particulates, modified ASTM Standard D2276, Method A, is used.

The project team reviewed and compared the referenced ASTM standards D1796, D2709, D6217, D2276, and D4057; and the information provided by the applicant, as documented in the PBNP audit and review report. On the basis of its review, the project team finds that ASTM D2709 is a test method that covers the determination of volume of free water and sediment in middle distillate fuels. This standard has been revised since the issuance of the GALL Report. It is no longer a "pass/fail" test but actually quantifies the amount of water and sediment measurable to 0.01 mL. The project team reviewed the results of the last quarterly inspection report and found that the test as run is sensitive enough to verify that the water/sediment content is less than the applicant's limit of 0.05%. D1796 provides another quantified method of analysis and is applicable to higher viscosities of oil. Interviews with plant staff indicate that corrective actions are taken if any water or particulate are found in the oil above the 0.05% limit. Because ASTM D2709 meets the inspection criteria, the project team finds this approach acceptable.

The applicant stated, in the LRA, that ASTM D2276 as recommended in GALL AMP XI.M30 is applicable to aviation fuel, where as ASTM D6217 is more applicable to middle distillate fuel used in diesel engines. Consequently, with regard to the use of ASTM D2276 versus D6217, the project team finds the applicant's approach and basis for using Standard D6217 to be acceptable.

The applicant stated, in the LRA, that it also uses a filter with a pore size no larger than 0.8 micron versus GALL AMP XI.M30 recommendation of 3.0 micron, thus PBNP is more conservative. On the basis that the applicant uses a more conservative filter, the project team finds this acceptable.

The applicant also stated that it uses ASTM D 2274 for stability analysis. The level of microbiological organisms in the fuel oil is not directly measured but can be inferred from the particulate and stability parameters. Since the applicant does not routinely add biocides, it perform stability analysis to assess if biocides should be added. The project team reviewed the use of the ASTM standard and concurs that applicant use's of ASTM standard for stability analysis. On this basis, the project team finds this exception acceptable.

The applicant's fuel oil chemistry control program also takes exception to the "detection of aging effects" program element for GALL AMP XI.M30 such that PBNP does not periodically perform an internal inspection of all of the fuel oil tanks.

GALL AMP XI.M30 states that degradation of the diesel fuel oil tank cannot occur without exposure of the tank internal surfaces to contaminants in the fuel oil, such as water and microbiological organisms. Compliance with diesel fuel oil standards in parameters monitored/inspected program element and periodic multilevel sampling provide assurance that fuel oil contaminants are below acceptable levels. Internal surfaces of tanks that are drained for cleaning are visually inspected to detect potential degradation. However, corrosion may occur at locations in which contaminants may accumulate, such as a tank bottom, and an ultrasonic thickness measurement of the tank bottom surface ensures that significant degradation is not occurring.

The applicant stated, in the LRA, that fuel tanks for the diesel driven fire pump and emergency diesel generators are examined externally via UT wall thickness measurements, which the GALL AMP XI.M30 program description describes as an acceptable verification program.

Furthermore, the applicant stated that the emergency diesel generator below-ground storage tanks and the underground emergency fuel tank are drained and inspected only if deemed necessary based on the trends indicated by the results of the fuel oil analysis, or as

recommended by the system engineer based on equipment operating experience. This is considered acceptable based on the inspection results of the underground emergency fuel tank and the above ground storage tanks, which were inspected in 2000 and showed no appreciable material loss in over thirty years of operation. The emergency diesel generator below-ground storage tanks are relatively new tanks, which were installed in the 1994 time frame and are in a less severe environment than the above ground storage tanks.

The project team reviewed the information provided by the applicant, as documented in the PBNP audit and report, and held technical discussion with the applicant's staff. On the basis of its review, the project team determined that the applicant's fuel oil chemistry control program does not require periodic visual examinations and UT of all tanks. The program requires different measures for different tanks, and no tanks require both periodic visual inspection and UT as recommended by the GALL AMP XI.M30. On this basis, the project team finds this exception acceptable.

7.1.10.4 Enhancements

The PBNP LRA states that enhancements to the Fuel Oil Chemistry Control Program include revision of existing implementing documents and/or creation of new implementing documents to periodically drain water from the gas turbine starting and auxiliary diesel fuel tanks, periodically drain and inspect the gas turbine starting and auxiliary diesel fuel tanks and the two above-ground storage tanks, and periodically take UT thickness measurements of the EDG and diesel-driven fire pump day tanks. These enhancements are required to satisfy the GALL Report aging management program requirements.

The administrative enhancements as stated in PBNP AMP B2.1.12, "Fuel Oil Chemistry Control Program," are not necessary to demonstrate consistency with GALL criterion. As described in Section 4, Audit and Review Scope, the project team did not review these enhancements.

7.1.10.5 Operating Experience

As stated in the PBNP LRA Appendix B, AMP B2.1.12, "Fuel Oil Chemistry Control Program,"

- The operating experience of some plants has included identification of water in the fuel, particulate contamination, and biological fouling.

- A search of plant-specific operating experience has revealed past problems with sampling methods, which were corrected with a revision to the sampling procedure.

- Problems were noted also with the particulate levels of delivered fuel oil and were attributed to the fuel oil cloud point and cold weather. QA audits of the laboratory that performs the analysis of the fuel oil samples indicate that the laboratory is performing satisfactorily.

- The internals of the above-ground fuel oil tanks and the underground emergency fuel tank were inspected in August 2000 and no significant rust deposits, corrosion, or other obvious defects were found.

- Thickness measurements of the underground emergency fuel tank and the bottom of the above-ground fuel oil tanks were performed and indicated no significant loss of material.

- There have been no identified instances of component failure due to loss of material resulting from fuel oil contamination. A review of NRC Inspection Reports, QA

Audit/Surveillance Reports, and Self-Assessments since 1999 revealed no issues or findings that could impact the effectiveness of the Fuel Oil Chemistry Control Program.

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above industry and plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B2.1.12 will adequately manage the aging effects that are identified in the applicant's LRA for which this AMP is credited.

7.1.10.6 UFSAR Supplement

The applicant provided its UFSAR supplement for the Fuel Oil Chemistry Control Program in the applicant's LRA, Appendix A, Section A.15.2.12, which states that the Fuel Oil Chemistry Control Program mitigates and manages aging effects on the internal surfaces of fuel oil storage tanks and associated components in systems that contain fuel oil. The USFAR supplement states that program includes

(a) surveillance and monitoring procedures for maintaining fuel oil quality by controlling contaminants in accordance with applicable ASTM standards

(b) periodic draining of water from fuel oil tanks

(c) periodic or conditional visual inspection of internal surfaces or wall thickness measurements (e.g., by UT) from external surfaces of fuel oil tanks

(d) one-time inspections of a representative sample of components in systems that contain fuel oil.

These commitments are included in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC, dated February 25, 2004 (ML040580023).

The project team reviewed the UFSAR supplement, found it to be consistent with the GALL Report, and concludes 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 exceptions 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 One-Time Inspection Program (AMP B2.1.13)

In the PBNP LRA, Appendix B, Section B2.1.13, the applicant states that AMP B2.1.13, "One-Time Inspection Program," is a new program that is consistent with, but includes exceptions to, GALL Report Section XI.M32, "One-Time Inspection Program," and Section XI.M33, "Selective Leaching of Materials."

7.1.11.1 Program Description

The One-Time Inspection Program addresses potentially long incubation periods for certain aging effects and provides a means of verifying that an aging effect is either not occurring or progressing so slowly as to have negligible effect on the intended function of the structure or component. Hence, the One-Time Inspection Program provides measures for verifying an aging management program is not needed, verifying the effectiveness of an existing program, or determining that degradation is occurring which will require evaluation and corrective action.

The program elements include (a) determination of appropriate inspection sample size, (b) identification of inspection locations, (c) selection of examination technique, with acceptance criteria, and (d) evaluation of results to determine the need for additional inspections or other corrective actions. The inspection sample includes locations where the most severe aging effect(s) would be expected to occur. Inspection methods may include visual (or remote visual), surface or volumetric examinations, or other established NDE techniques.

This program is used for the following:

- To verify the effectiveness of water chemistry control for managing the effects of aging in stagnant or low-flow portions of piping, or occluded areas of components, exposed to a treated water environment.
- To manage the aging effects of loss of material due to galvanic corrosion and selective leaching
- To manage aging effects in infrequently accessed areas, such as high radiation, high temperature, confined spaces, and submerged areas.
- To verify the effectiveness of fuel oil chemistry control for managing the effects of aging of various components in systems that contain fuel oil.
- To verify aging effects are not occurring in various components (e.g., reactor vessel internals hold-down spring, letdown orifices, steam traps, and miscellaneous heat exchangers).

To verify the effectiveness of water chemistry control, this program will perform a one-time inspection on selected components where the flow of water is low or stagnant conditions exist. To verify the effectiveness of fuel oil chemistry control, this program will inspect various components in systems that contain fuel oil. The components to be inspected shall be chosen from the various systems within the scope of the Water Chemistry Control Program, the Closed-Cycle Cooling Water System Surveillance Program, and the Fuel Oil Chemistry Control Program. For systems that contain fuel oil, these inspections do not necessarily have to be performed on components that are within the scope of license renewal as long as the environment and material composition of the components inspected are the same as the components within scope. From these lists of components, a sample of the population will be selected for inspection as part of the One-Time Inspection Program. The inspection population will be based on such aspects of the SSCs as similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects. The sample size will be based on such aspects of the SSCs as the specific aging effect, location, existing technical information, system and structure design, materials of construction, service environment, or previous failure history. The inspections will be scheduled as close to the end of the current operating license as practical with margin provided to ensure completion prior to commencing

the period of extended operation. The inspection requirements may be satisfied by a destructive examination of removed components or a review of repair records to confirm that the component has been inspected for aging degradation and no significant degradation has occurred.

This program will perform an inspection for evidence of stress relaxation in the reactor vessel hold-down spring by performing a measurement of the non-compressed spring height. The inspection will be performed prior to the beginning of extended operation and the results will be evaluated against design specifications to determine if any corrective actions need to be taken to ensure adequate spring force will be maintained through the period of extended operation.

This program also assesses the loss of material due to galvanic corrosion on the internal surfaces of susceptible components. This program will select the locations to be inspected, provide the inspection criteria, evaluate the results of the inspections and provide recommendations for additional inspections, as necessary. The susceptibility and aggressiveness of galvanic corrosion is determined by the material position on the galvanic series, the conductivity of the surrounding environment and the ratio of the cathode to anode areas. Thus an inspection of selected locations of dissimilar metal connections in the systems for PBNP will determine whether loss of material due to galvanic corrosion will be an aging effect of concern for the period of extended operation. The results of these inspections will be indicative of material couples such as carbon steel-stainless steel, carbon steel-copper alloy, and copper alloy-stainless steel connections, or others used throughout the systems at PBNP, and they will also determine the need for additional inspections to manage this aging effect. Visual or volumetric examinations will be used to verify whether galvanic corrosion is a concern at PBNP. Any corrective actions will be implemented through the corrective action program.

The inspections will be scheduled as close to the end of the current operating license as practical with margin provided to ensure completion prior to commencing the period of extended operation. The inspection requirements may be satisfied by a review of repair or other inspection records to confirm that the component has been inspected for aging degradation and no significant degradation has occurred.

Selective leaching is the removal of one element from a solid alloy by corrosion processes. The most common example is the selective removal of zinc in brass alloys (dezincification). Another metal that is susceptible to selective leaching is gray cast iron, which can display this type of aging mechanism even in relatively mild environments. Therefore, this program includes a one-time visual inspection of selected components that may be susceptible to selective leaching. The inspection may include hardness measurements. The one-time inspections will determine whether loss of material due to selective leaching is occurring, and whether the process will affect the ability of the components to perform their intended function(s) for the period of extended operation. A sample of the components (such as piping, valve bodies and bonnets, pump casings, and heat exchanger components), whose materials of construction may include cast iron, brass, bronze, or aluminum bronze, that are exposed to raw water, treated water, or ground water environment that may lead to selective leaching will be selected for inspection. The inspections will be scheduled as close to the end of the current operating license as practical with margin provided to ensure completion prior to commencing the period of extended operation. Any corrective actions will be implemented through the corrective action program.

7.1.11.2 GALL Report Consistency

In the PBNP LRA, the applicant states that AMP B2.1.13 is a new program that will be consistent with the GALL Report Section XI.M32, “One-Time Inspection” and XI.M33, ‘Selective Leaching of Materials,” with exceptions.

The project team interviewed the applicant’s technical staff and reviewed, in whole or in part, the documents listed in Attachment 5 of this audit and review report for AMP B2.1.9.

The applicant states in AMP B2.1.13 that the One-Time Inspection Program uses the following methods to monitor or inspect degradation of components:

> For verification of the effectiveness of the Water Chemistry Control Program and the Closed-Cycle Cooling Water System Surveillance Program for stagnant or low flow areas and for verification of the effectiveness of the Fuel Oil Chemistry Control Program, a visual examination or other appropriate NDE methodology will be used to verify that degradation due to the applicable aging effects is not occurring.

The project team finds that the applicant does not describe parameters directly related to the degradation of a component as required by the GALL Report. The GALL Report clearly states that a link should be established between the degradation of the particular structure or component intended function(s) and the parameter(s) being monitored. An example of linking the degradation of a passive component intended function with the parameter being monitored is linking the aging effect loss of material in stainless steel valve bodies responsible for a pressure boundary function with an ultrasonic inspection method capable of measuring wall thickness.

The project team requested that the applicant provide a description that clearly identifies the link(s) between the parameters monitored or inspected and the aging effect for the particular structure or component. The inspection method selected for the parameter to be monitored shall be capable of measuring the parameter. The method is to be able to provide data that is adequate to conclude the aging effect is managed consistent with the CLB.

In response to the project team’s requests, the applicant provided Table 7.1.11-1 (see letter dated July 12, 2004, from Dennis L. Koel (NMC) to Document Control Desk (NRC), “Clarifications to Point Beach Nuclear Plant License Renewal Application Information As a Result of Aging Management Program and Aging Management Review Audits of April and June 2004" (ML041960159), which will be added to AMP B2.1.13, which links the aging effects/ mechanisms managed by the One-Time Inspection Program with the parameters monitored/ inspected and the measurement methodology. The inspection method identified is capable of measuring the parameter monitored and providing data that is adequate to conclude the aging effect is managed consistent with the current licensing basis. If an inspection method different from that listed in the table below is used, the basis for the revised inspection method will be documented. The One-Time Inspection Program manages these aging effects/mechanisms on the internal surfaces of components. Visual inspections are performed only when the components are drained/opened and the component surface of interest is accessible. If degradation is identified through a visual inspection, additional NDE may be performed to characterize the degradation and determine the extent of the condition.

Table 7.1.11-1. Relationship of Parameters Monitored or Inspected and Aging Effect for Specific Structure or Component.

Aging Effect	Aging Mechanism	Parameter Monitored	Measurement Method
Loss of Material	Crevice Corrosion	Wall Thickness	Visual (VT-1) and/or Volumetric (RT or UT)
Loss of Material	Galvanic Corrosion	Wall Thickness	Visual (VT-3) and/or Volumetric (RT or UT)
Loss of Material	General Corrosion	Wall Thickness	Visual (VT-3) and/or Volumetric (RT or UT)
Loss of Material	MIC	Wall Thickness	Visual (VT-3) and/or Volumetric (RT or UT)
Loss of Material	Pitting Corrosion	Wall Thickness	Visual (VT-1) and/or Volumetric (RT or UT)
Loss of Material	Selective Leaching	Wall Thickness	Hardness test (per applicant response to RAI B.2.1.13-1)
Loss of Material	Erosion	Wall Thickness	Visual (VT-3) and/or Volumetric (RT or UT)
Loss of Heat Transfer	Fouling	Tube Fouling	General or Remote Visual
Cracking	SCC	Cracks	Volumetric (RT or UT)
Loss of Preload	Stress Relaxation	Dimension Changes	Visual (VT-3)

In addition, the project team, based upon a review of the Parameters Monitored element for AMP B2.1.13, “One-Time Inspection Program,” could not find a statement that indicated that the NDE inspections performed as part of this AMP would be conducted in accordance with the requirements of the ASME Code and 10 CFR 50, Appendix B. The project team requested that the applicant provide verification that the NDE inspections performed as part of AMP B2.1.13 will be conducted in accordance with the requirements of the ASME Code and 10 CFR 50, Appendix B, or state that Point Beach is taking an exception to the GALL Report and provide a technical justification for the exception.

In response to the project team’s request, the applicant states that the NDE exams performed as a part of the One-Time Inspection Program will be conducted in accordance with the requirements of ASME Section XI and 10 CFR 50, Appendix B, except for the general or remote visual examinations. The general or remote visual examinations for loss of heat transfer due to fouling will be performed in accordance with the requirements of ASME Section V and 10 CFR 50, Appendix B.

The project team finds that, based upon the preceding discussion, an acceptable resolution to RAI B.2.1.13-1 and the PBNP commitment (letter dated July 12, 2004, from Dennis L. Koel [NMC] to Document Control Desk [NRC], “Clarifications to Point Beach Nuclear Plant License Renewal Application Information As a Result of Aging Management Program and Aging Management Review Audits of April and July 2004" [ML041960159]) to provide a table that links the aging effects/mechanisms managed by the One-Time Inspection Program with the parameters monitored/inspected and the measurement methodology, the One-Time Inspection Program is acceptable.

In accordance with the guidance contained in the project team’s audit and review plan, the project team reviewed the seven program elements contained in the applicant’s AMP and associated bases documentation against the GALL Report AMPs XI.M32 and AMP XI.M33 for consistency.

7.1.11.3 Exceptions to the GALL Report

The project team reviewed the exceptions and its justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

In Appendix B, Section B2.1.13 of the LRA, the applicant stated that its one-time inspection program is consistent with GALL AMP XI.M32, with exceptions. The one-time inspection

program takes exception to the “scope of program” and “detection of aging effects” program elements for GALL AMP XI.M32 such that Examination of nonexempt small-bore ASME Class 1 and 2 piping will be addressed within the applicant’s PBNP AMP B2.1.1, “ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program, “which includes volumetric examinations performed in accordance with risk-informed inservice inspection (RI-ISI) requirements.

GALL AMP XI.M32 states the program includes measures to verify that unacceptable degradation is not occurring, thereby validating the effectiveness of existing AMPs or confirming that there is no need to manage aging-related degradation for the period of extended operation. The structures and components for which one-time inspection is to verify the effectiveness of the AMPs (e.g., water chemistry control, etc.) have been identified in the GALL Report. Examples include small bore piping in the reactor coolant system or the feedwater system components in boiling water reactors (BWRs) and pressurized water reactors (PWRs). The GALL Report includes piping V4 inches in diameter as small bore piping.

The project team reviewed the NRC staff Safety Evaluation Report documented in a Letter from NRC to PBNP, July 2, 2003 "Point Beach Nuclear Power Plant, Units 1 &2 - Evaluation of Risk Informed Inservice Inspection Program (TAC Nos. MB5553 and MB5554) (ML030210167). The project team determined the following: The plant’s augmented programs for flow-accelerated corrosion (FAC) and high-energy break exclusion piping are not subsumed into the RI-ISI program and remain unaffected. The degradation mechanisms identified in the RI-ISI submittal included thermal fatigue, thermal transients, IGSCC, PWSCC, and FAC. These aging effects were compared with the aging effects identified in one of the RI-ISI program (EPRI TR-106706). All aging effects addressed by the one-time inspection program were found to be included in the scope of aging effects managed by the RI-ISI program. The applicant also clarified that although the RI-ISI program addresses Class 1, 2, and 3, only the Class 1 and Class 2 portions of the risk informed program are included in the LRA.

In Appendix B, Section B2.1.13 of the LRA, the applicant stated that its one-time inspection program is consistent with GALL AMP XI.M33, with exceptions. The one-time inspection program takes exception to the “scope of program,” “parameters monitored or inspected,” and “detection of aging effects“ program element such that hardness measurements may be performed in accessible locations to confirm the absence of selective leaching and determine material properties, which can be used in component functionality assessments. The internal surfaces of susceptible components may not be accessible for hardness measurements due to the size of the component. Therefore, only visual inspections are required by the program.

GALL AMP XI.M33 states, for the “scope of program” program element, this AMP determines the acceptability of the components that may be susceptible to selective leaching and assess their ability to perform the intended function during the period of extended operation. The GALL Report includes a one-time hardness measurement of a selected set of components to determine whether loss of material due to selective leaching is not occurring for the period of extended operation. GALL AMP XI.M33 states, for the “parameters monitored or inspected” and “parameters monitored or inspected” that the one-time visual inspection and hardness measurement includes close examination of a select set of components to determine whether selective leaching has occurred and whether the resulting loss of strength and/or material will affect the intended functions of these components during the period of extended operation. Selective leaching generally does not cause changes in dimensions and is difficult to detect. However, in certain brasses it causes plug-type dezincification, which can be detected by visual inspection. One acceptable procedure is to visually inspect the susceptible components closely and conduct Brinell hardness testing on the inside surfaces of the selected set of components to determine if selective leaching has occurred. If it is occurring, an engineering evaluation is

initiated to determine acceptability of the affected components for further service.

During the audit, the project team conducted discussions concerning this exception with PBNP technical staff. The project team has further evaluated this exception and is unable to reconcile how leaching of the subject components would be effectively managed using only visual inspection; that is without performance of hardness testing on the inside surfaces of the selected set of components. The inability to reconcile this exception is predicated on GALL AMP XI.M33, which indicates that visual inspections are generally unable to detect leaching. However, the project team acknowledges that components with limited accessibility may be one factor in choosing the "selected set of components" upon which the hardness tests are to be performed. The PBNP exception indicates that "hardness measurements may be performed," which therefore makes hardness testing optional. The project team issued RAI B.2.1.13-1, which requested the applicant to provide additional information that demonstrates that visual inspection alone will guarantee detection of leaching in cast iron and brass materials. Otherwise, the applicant is request to indicate whether or not it will perform a one-time visual inspection and hardness measurement on select set of components, of each material type, to determine whether selective leaching has occurred and whether the resulting loss of strength and/or material will affect the intended functions of these components during the period of extended operation.

By letter dated October 15, 2004, the applicant provided its response. In its response, the applicant stated that a one-time visual inspection and hardness measurement will be performed on accessible locations of a select set of components of each material type (i.e., cast iron and brass) to determine whether selective leaching has occurred and whether the resulting loss of strength and/or material will affect the intended functions of these components during the period of extended operation. The internal surfaces of susceptible components may not be accessible for hardness measurements due to the size of the component. Therefore, one of the factors used in choosing the selected set of components to be inspected for selective leaching will be the accessibility of the internal surface of the component for hardness testing. Hardness measurements will be performed in accessible locations to confirm the absence of selective leaching and determine material properties which can be used in component functionality assessments.

Furthermore, the applicant stated that during the aging management review process it was not always possible to determine whether the cast iron components in question were constructed of gray or ductile cast iron. In many cases the material specification only stated cast iron. In these cases, PBNP conservatively assumed that the material was gray cast iron and susceptible to selective leaching. Should further material evaluation determine that the material is ductile cast iron and therefore not susceptible to selective leaching, these components would be removed from the selected set of components to be inspected for selective leaching.

The project team reviewed the information provided by the applicant, as documented in the PBNP audit and review report, together with the applicant's October 15, 2004 letter. On the basis of its review, the project team finds this exception acceptable.

7.1.11.4 Enhancements

In Appendix B, Section B2.1.13 of the LRA, the applicant stated that its one-time inspection program is consistent with GALL AMP XI.M32 and GALL AMP XI.M33, with enhancements. The applicant stated that, for the "scope of program" program element, enhancements include the creation of new implementing documents required to provide those inspections necessary to manage aging of components within the scope of license renewal. The project team considered these types of enhancements as administrative enhancements which does not require project team review.

7.1.11.5 Operating Experience

As stated in the PBNP LRA Appendix B for AMP B2.1.13, "One-Time Inspection Program,"

> …the One-Time Inspection Program is a new program to be implemented before the current operating license expires. The NDE inspection methods that will be used, such as visual (or remote visual), surface or volumetric, or other established techniques, are consistent with industry practice.

The project team reviewed LRPG 1-3, Operating Experience Data Collection and its associated database. Per LRPG 1-3, plant staff collect the following information and controls a database of LRA information cataloged in Plant-Specific Operating Experience Reported by Aging Management Program:

- plant-specific operating experience - Referencing NUTRK and/or t-track plant (a plant-specific database) staff track corrective action, NRC notice violations, License Event Reports. Also, EDMS tracks License Event Reports, NRC Generic Letters, NRC Safety Evaluation Reports (SERs), Final Safety Analysis Reports, Fire Protection Evaluation Reports, Offsite dose calculation manual, action requests, incident investigations, non-conformance reports, quality assurance conditions reports, and root cause evaluations.

- industry operating experience - Referencing NUTRK and/or t-track and INPO SEE-IN database, plant staff track SERs, significant event notifications, significant operating experience reports, operating and maintenance reminders. INPO EDMS tracks plant network operating experience, operating and maintenance reminders, plant status, significant event notifications, significant event reports, significant events by others, significant operating experience reports, vendor technical information programs, Westinghouse documents, nuclear safety advisory letters, technical bulletins, info grams, and Westinghouse Technical Reports (WCAPs).

- NRC generic communication - Referencing the EPRI NRC Generic Communications database, plant staff track generic letters, bulletins, information notices, circulars, administrative letters, regulatory issue summaries, and generic safety issues. NUTRK and/or t-track also track this information.

- the GALL Report.

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above industry and plant-specific operating experience and

discussions with the applicant's technical staff, the project team concludes that AMP B2.1.12 will adequately manage the aging effects that are identified in the applicant's LRA for which this AMP is credited.

7.1.11.6 UFSAR Supplement

The applicant provided its UFSAR supplement for the One-Time Inspection Program in the applicant's LRA, Appendix A, Section A.2.1.6, which states that the One-Time Inspection Program addresses potentially long incubation periods for certain aging effects and provides a means of confirming that an aging effect is either not occurring or progressing so slowly as to have negligible effect on the intended function of the structure or component. Hence, the One-Time Inspection Program provides measures for confirming an aging management program is not needed, confirming the effectiveness of an existing program, or determining that degradation is occurring, which will require evaluation and corrective action.

The program addresses the following issues:

(a) determination of appropriate inspection sample size
(b) identification of inspection locations
(c) selection of examination technique, with acceptance criteria
(d) evaluation of results to determine the need for additional inspections or other corrective actions.

The inspection sample includes locations where the most severe aging effect(s) would be expected to occur. Inspection methods may include visual (or remote visual), surface or volumetric examinations, or other established NDE techniques.

This program is used to

- Verify the effectiveness of water chemistry control for managing the effects of aging in stagnant or low-flow portions of piping, or occluded areas of components, exposed to a treated water environment.

- Manage the aging effects of loss of material due to galvanic corrosion and selective leaching.

- Manage aging effects in infrequently accessed areas, such as high radiation, high temperature, confined spaces, and submerged areas.

- Verify the effectiveness of fuel oil chemistry control for managing the effects of aging of various components in systems that contain fuel oil.

- Verify aging effects are not occurring in various components (e.g., reactor vessel internals hold-down spring, letdown orifices, steam traps, and miscellaneous heat exchangers).

These commitments are included in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC, dated February 25, 2004 (ML040580023) and the letter dated July 12, 2004, from Dennis L. Koel (NMC) to Document Control Desk (NRC), "Clarifications to Point Beach Nuclear Plant License Renewal Application Information As a Result of Aging Management Program and Aging Management Review Audits of April and June 2004" (ML041960159).

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL

Report, and concluded that is 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 exceptions to the GALL program and the applicant's RAI response, 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 Open-Cycle Cooling (Service) Water System Surveillance Program (AMP B2.1.14)

In the PBNP LRA, Appendix B, Section B2.1.14, the applicant states that the Open-Cycle Cooling (Service) Water System Surveillance Program is an existing program that is consistent with the GALL Report Section XI.M20, "Open-Cycle Cooling Water System," with exceptions and enhancements.

7.1.12.1 Program Description

In the PBNP LRA, Appendix B, Section B2.1.14, the applicant states that the Open-Cycle Cooling (Service) Water System Surveillance Program relies on implementation of the recommendations of NRC GL 89-13 to ensure that the aging effects such as loss of material due to general, pitting, and crevice corrosion, MIC, and loss of heat transfer due to biological/corrosion product fouling (e.g., sedimentation, silting) caused by exposure of internal surfaces of metallic components in cooling water systems (e.g., piping, valves, heat exchangers) to raw, untreated (e.g., service) water will be managed for the period of extended operation. The aging effects are managed through (a) surveillance and control of biofouling, (b) verification of heat transfer by testing, and (c) routine inspection and maintenance program activities to ensure that aging effects do not impair component intended function. The applicant states that this program complies with PBNP responses to NRC GL 89-13

7.1.12.2 GALL Report Consistency

In the PBNP LRA, Appendix B, Section B2.1.14, the applicant states that the Open-Cycle Cooling (Service) Water System Surveillance Program is an existing program that is consistent with, but includes exceptions to, the GALL Report, Section XI.M20, "Open-Cycle Cooling Water System."

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 5 of this audit and review report for AMP B2.1.14, including the "Point Beach Nuclear Plant Open-Cycle Cooling (Service) Water System Surveillance Program Basis Document for License Renewal," LR-AMP-021-OCCW and NRC GL 89-13. In addition, the project team reviewed the Point Beach Nuclear Plant Generic Letter 89-13 Program Document, Revision 3, January 29, 2004, which provides additional supporting details about how the GALL program elements are addressed by the LRA Open-Cycle Cooling (Service) Water System Surveillance Program.

The project team reviewed the seven program elements (see Section 5.1 of this audit and review report) contained in the PBNP AMP B2.1.14 and associated bases documentation against the GALL Report AMP XI.M20 for consistency.

7.1.12.3 Exceptions to the GALL Report

The project team reviewed the exceptions and its justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

In Appendix B, Section B2.1.14 of the LRA, the applicant stated that its open-cycle cooling (service) water surveillance program is consistent with GALL AMP XI.M20, with exceptions. The open-cycle cooling (service) water surveillance program takes exception to the “scope of program” program element for GALL AMP XI.M20 such that not all of the safety-related heat exchangers are tested to verify heat transfer capability by performing a heat balance test.

GALL AMP XI.M20 states that consistent with the guidelines of NRC GL 89-13, the open-cycle cooling water system program implements a periodic testing program for degraded heat exchanger performance in order to verify heat transfer capabilities for heat exchangers relied on to transfer heat from safety-related systems, structures, and components to the ultimate heat sink.

The applicant, in the LRA, identified the following as in-scope components that will not receive routine heat transfer capability testing: primary auxiliary building battery room vent coolers, turbine driven auxiliary feed water pump turbine oil coolers, containment fan motor coolers, and emergency diesel generators G01/G02 coolant heat exchangers. The applicant stated that, as an alternative, these small heat exchangers are periodically inspected and cleaned as part of regular maintenance.

The project team reviewed the regular maintenance activities that were proposed as an alternative to periodic heat transfer verification testing for each of the heat exchangers identified in the exception, as documented in the PBNP audit and review report. The applicant stated that the primary auxiliary building battery room vent coolers and emergency diesel generators G01/G02 coolant heat exchangers are inspected and, if necessary, cleaned annually, and that the turbine driven auxiliary feed water pump turbine oil coolers and containment fan motor coolers are inspected and if necessary cleaned every refueling outage. In addition, selected parameters are monitored during periodic performance testing of the turbine-driven auxiliary feed water pumps and emergency diesel generators. The turbine driven auxiliary feed water pumps bearing oil temperatures are recorded and compared against acceptance criteria and the emergency diesel generators service water outlet temperature, coolant/service water differential pressure, lube oil temperature, and coolant temperature are recorded and trended. Inspection and cleaning frequencies are adjusted if coolant temperatures trend upward.

On the basis of its review, the project team concludes that these alternatives are consistent with PBNP’s responses to GL 89-13 and the applicant’s proposed periodic maintenance, monitoring, and trending is an acceptable alternative to periodic testing for degraded heat exchanger performance. In addition, the project team determined that the proposed periodic inspection and cleaning/flushing activities, and component functional testing (where applicable) will effectively manage fouling and scaling aging effects and ensure that heat transfer capabilities are maintained. On this basis, the project team finds the exception acceptable.

7.1.12.4 Enhancements

The PBNP LRA states that enhancements to the Open-Cycle Cooling (Service) Water System Surveillance Program include verification that the implementing documents for activities credited by the PBNP GL 89-13 Program Document contain a reference or other link back to the GL 89-13 Program Document, clarification of GL 89-13 commitments regarding the emergency diesel generator G01/G02 coolant heat exchangers, revisions to existing call-ups to ensure evaluations take place for the management of aging effects credited by the activity for license renewal, and the creation of new activities to inspect individual components or representative samples of components not addressed by existing activities.

The administrative enhancements as described in PBNP AMP B2.1.14, Open Cycle Cooling (Service) Water System Surveillance Program, are not necessary to demonstrate consistency with GALL criterion. As described in Section 4, Audit and Review Scope, the project team did not review these enhancements.

7.1.12.5 Operating Experience

The applicant-identified plant-specific operating experience was reviewed and revealed that condition reports (action requests) and work orders were initiated to repair system leaks and/or to investigate component wall thinning due to corrosion. The following examples of the typical deficiencies found in service water system components and addressed via the PBNP corrective action program are included in the PBNP LRA:

- Both A and B component cooling water heat exchangers experienced corrosion in the wall and nozzle area of the outlet channel head.

- Localized pitting was found in the service water piping supply to the old spent fuel pool heat exchanger. UT examination revealed that 68% wall thinning had occurred, and silt was found in the pipe.

- Leakage was found in the component cooling water heat exchanger blowdown lines.

- Deep pitting due to MIC was found on the G01 diesel generator heat exchangers. The pitting occurred beneath deposits formed by iron oxidizing bacteria. G02 coolers were inspected and did not have a similar problem due to the protective epoxy coating.

- Radiography of the K-3A service water air compressor after-cooler heat exchanger showed significant wall thinning due to internal corrosion. The heat exchanger also exhibited blockage due to nodule buildup.

- The G01 diesel generator heat exchangers (HX-55A-2 and HX -55A-1) were found to have significant erosion/corrosion at the south end bells.

- Spent fuel pool heat exchanger HX-13A outlet valve body was found to be severely pitted and eroded.

The applicant stated that these examples show that the program in place at Point Beach Units 1 and 2 is discovering and correcting deficiencies before they impede the component's intended function. The guidance of GL 89-13 has been implemented for approximately 10 years and has been effective in managing and monitoring the aging effects due to biofouling, corrosion, erosion, degradation of protective coatings, and silting in components serviced by the service water system. A corrective action document was written requesting review of PBNP GL 89-13

commitments pertaining to the coolant heat exchangers for emergency diesel generators G01 and G02. This issue is being tracked under the corrective action program.

The applicant states that a review of NRC Inspection Reports, QA Audit/Surveillance Reports, and Self-Assessments since 1999 revealed no other issues or findings that could impact the effectiveness of the Open-Cycle Cooling (Service) Water System Surveillance Program. As additional operating experience is obtained, lessons learned may be used to adjust this program.

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above industry and plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B2.1.14 will adequately manage the aging effects that have been observed at the applicant's plant.

7.1.12.6 UFSAR Supplement

The applicant provided its UFSAR supplement for the Open-Cycle Cooling (Service) Water System Surveillance program in the PBNP LRA, Appendix A, Section 15.2.14, which states that the Open-Cycle Cooling (Service) Water System Surveillance Program manages aging effects caused by exposure of internal surfaces of metallic components in water systems (e.g., piping, valves, heat exchangers) to raw, untreated (e.g., service) water. The aging effects are managed through (a) surveillance and control of biofouling, (b) verification of heat transfer by testing, and (c) routine inspection and maintenance program activities to ensure that aging effects do not impair component intended function. Inspection methods include VT, UT, ECT, and tangential radiography. This program complies with the PBNP response to NRC GL 89-13.

These commitments are included in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC, dated February 25, 2004 (ML040580023).

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, and concluded 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).

7.1.12.7 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 exceptions 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).

7.1.13 Periodic Surveillance and Preventive Maintenance Program (AMP B2.1.15)

In the PBNP LRA, Appendix B, Section B2.1.15, the applicant provides a description of the AMP B2.1.15, "Periodic Surveillance and Preventive Maintenance," (PSPM) program, as follows:

The Periodic Surveillance and Preventive Maintenance Program is an existing plant-specific program that manages aging effects for certain SSCs within the scope of license renewal. The program provides for inspection, examination, or testing of selected structures and components, including fasteners, for evidence of age-related degradation on a specified frequency based on operating experience or other requirements (e.g., Technical Specification or code requirements). Additionally, the program provides for replacement of certain components on a specified frequency based on operating experience. The Periodic Surveillance and Preventive Maintenance Program is also used to verify the effectiveness of other aging management programs.

It should be noted that surveillance and preventive maintenance activities associated with another aging management program are evaluated and identified as an implementing document as part of that program. However, they are also subject to the applicable requirements and controls of the Periodic Surveillance and Preventive Maintenance Program, including the constraints placed on deferrals, cancellations, and frequency changes.

Various surveillance and preventive maintenance activities are relied on to replace or manage the age-related degradation of structures and components within the scope of license renewal. The frequency of these predefined/recurring surveillance and preventive maintenance activities are specified by call-ups maintained in the Computerized History and Maintenance Planning System (CHAMPS). CHAMPS is a computer based program in which records of work performed on plant SSCs are initiated and managed. (It should be noted that CHAMPS is scheduled for replacement with a similar maintenance management system called EMPAC.)

Individual surveillance and preventive maintenance Work Orders for call-ups performed at regular intervals are forecast in CHAMPS from the controlled master call-up files to support the long range scheduling of these requirements. Work Orders are records created in CHAMPS to assign, manage, track the status, and identify the scope of work. The work scope is identified directly by the call-up or through reference to applicable Work Plans, drawings and approved procedures. Work Plans provide a formatted description of the work scope to be performed in implementing an activity.

During interviews with the applicant, the project team obtained additional clarification concerning the function and structure of this AMP, which is documented in a letter dated July 12, 2004, from the applicant to the NRC (ML041960159). This AMP is used in the following three distinct ways:

- When no other AMPs are listed to manage the aging effects, this AMP identifies applicable work plans, drawings, and approved procedures, and defines the specific inspection/ surveillance activities though the applicant's Computerized History and Maintenance Planning System (CHAMPS) . If another AMP is listed in the component's AMR (PBNP

LRA Table 3.X.2.Y), that AMR provides the details on how to manage the aging effect.

- This AMP provides additional controls for this and 23 other AMPs defined in the above-mentioned July 9, 2004, letter. These controls address inspection/surveillance schedule deferrals.

- This AMP also implements controls to confirm that replacement decisions are not altered when replacement was credited as the basis for concluding that the component does not need an aging management review in accordance with 10 CFR 54.21(a)(1).

7.1.13.1 Review of the AMP Against the Program Elements

The project team reviewed PBNP AMP B2.1.15 against the seven AMP program elements within its scope of review, in accordance with the criteria defined in the PBNP audit and review plan (ML041550872) and SRP-LR, Appendix A, Section A.1.2.3 and Table A.1-1.

The applicant stated, during the project team's interview of Point Beach personnel, and in the above-mentioned letter, that, if one or more AMPs, other than that discussed in Section B.2.1.15, is listed in the LRA aging management review (Tables 3.X.1.Y), then the SRP-LR program elements relating to surveillance or inspections are addressed via these other AMPs and the PSPM AMP. For AMR line items where only the B.2.1.15 AMP is cited, the following program element reviews apply, relative to surveillance or inspections.

The two control functions listed in the last two bullets of the program description apply to all AMR line items crediting the AMP discussed in LRA Section B.2.1.15. With regard to these control functions, the following program element reviews apply to all applications of the AMP defined in LRA, Section B.2.1.15.

> (1) Scope of Program - Paragraph A.1.2.3.1, "Scope of Program," of Appendix A.1 of the SRP-LR specifies that the program scope include the specific structures and components of which the program manages the aging effects.
>
> In PBNP AMP B2.1.15, the applicant states that the Periodic Surveillance and Preventive Maintenance Program consists of PBNP activities that manage the aging effects for components in the following systems and structures:
>
> - auxiliary feedwater
> - circulating water
> - containment unit 1 & 2 building
> - containment ventilation
> - emergency power
> - essential ventilation
> - main and auxiliary steam
> - non-Class 1 RCS components
> - plant air
> - pressurizer
> - primary auxiliary building structure
> - residual heat removal
> - service water
> - steam generator
> - structure
> - waste disposal.

The Periodic Surveillance and Preventive Maintenance Program manages aging effects for certain SSCs within the scope of license renewal. The program provides for inspection, examination, or testing of selected structures and components, including fasteners, for evidence of age-related degradation on a specified frequency based on operating experience or other requirements (e.g., technical specification or code requirements).

Additionally, the program provides for replacement of certain components on a specified frequency based on operating experience. The Periodic Surveillance and Preventive Maintenance Program is also used to verify the effectiveness of other aging management programs.

The project team reviewed AMP B.2.1.15 and examined LR-AMP-004-PSPM, "Periodic Surveillance and Preventive Maintenance Program." These documents list the specific systems in the scope of the AMP.

Based on a comparison of the above listing of specific systems to the criterion defined in Appendix A.1 of the SRP-LR, the project team found the applicant's proposed Program Scope program element to be acceptable.

(2) Preventive Actions - Paragraph A.1.2.3.2.2, "Preventive Actions," of Appendix A.1 of the SRP-LR states "For condition or monitoring programs, they do not rely on preventive actions and thus, this information need not be provided."

In PBNP AMP B2.1.15, the applicant states

> There are no preventive measures associated with the aging effects of concern for license renewal. The inspection, examination, or testing of selected structures and components on a specified frequency is intended to identify the extent to which aging effects are occurring (i.e., condition). The replacement of certain components on a specified frequency also does not prevent aging effects from occurring. Aging effects are mitigated by periodically replacing components on a specified interval to prevent age-related degradation leading to a loss of intended function.

The project team reviewed the above LRA statement concerning preventive actions and concluded that AMP B2.1.15 is a condition program and, thus, that information on preventive action does not need to be provided.

Based on a comparison of the above LRA preventive action statement to the criteria stated in paragraph A.1.2.3.2.2 of the SRP-LR, the project team found the applicant's proposed preventive action program element to be acceptable.

(3) Parameters Monitored/Inspected - Paragraph A.1.2.3.3, "Parameters Monitored or Inspected," of the SRP-LR states:

- 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 parameters monitored should be the specific parameters being controlled to achieve prevention or mitigation of aging effects.

In PBNP AMP B2.1.15, the applicant states

> The condition of selected structures and components is monitored through inspection, examination, or testing for evidence of age-related degradation on a specified frequency based on operating experience or other requirements (e.g., Technical Specification or code requirements). Certain components are also replaced on a given frequency based on operating experience.

The project team reviewed this statement and the information in the above-mentioned July 12, 2004, letter, which identified the parameters that are monitored by the Periodic Surveillance and Preventive Maintenance Program and linked them with the associated aging effects, aging mechanisms, and examination methods. The project team comfirmed that the specified examination method is capable of identifying and characterizing the parameter monitored and providing data sufficient to conclude that the associated aging effect is managed consistent with the current licensing basis.

Based on a comparison of the results of the above review, pertaining to parameters monitored or inspected, to the criteria stated in paragraph A.1.2.3.3 of the SRP-LR, the project team found the applicant's proposed parameters monitored/inspected program element to be acceptable.

(4) Detection of Aging Effects - Paragraph A.1.2.3.4, "Detection of Aging Effects," of Appendix A.1 of the SRP-LR states

- Provide information that links the parameters to be monitored or inspected to the aging effects being managed.

- Describe when, where, and how program data are collected (i.e., all aspects of activities to collect data as part of the program).

- Link the method or technique and frequency, if applicable, to plant-specific or industry-wide operating experience.

- Provide the basis for the inspection population and sample size when sampling is used to inspect a group of SCs. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects.

In PBNP AMP B2.1.15, the applicant states

The aging effects of concern are detected by inspection, examination, or testing of selected structures and components. Certain components are also replaced on a given frequency based on operating experience.

The periodicity of most surveillance and preventive maintenance activities that are credited for license renewal is usually driven by considerations other than aging, since the effects of aging usually occur slowly over time. For example, a check valve internal inspection is more likely to be driven by seat/disc/hinge pin wear than by erosion or corrosion of the valve body and the periodicity of most surveillance activities is based on plant Technical Specification requirements.

Activities credited for license renewal are subject to the constraints described below regarding frequency changes, deferrals, and cancellations, and plant procedures will be revised accordingly to ensure that these requirements are met.
Surveillance and preventative maintenance activities credited for license renewal shall be completed within a grace period of 125% of their assigned interval, not to exceed 2 years. The frequency of surveillance and preventive maintenance activities that are credited for license renewal may be adjusted, or the activity deferred or canceled provided an evaluation is performed justifying the change from a license renewal perspective based on plant and industry operating experience. An Action Request will be initiated for any surveillance or preventive maintenance activity credited for license renewal that is not completed within its allowed grace period, unless the activity has been properly deferred or canceled.

Additional procedure changes shall be accomplished to include

- Surveillance and preventive maintenance activities credited for license renewal shall be performed on a specified frequency based on operating experience or other requirements (e.g., Technical Specification or code requirements).

- The results of surveillance and preventive maintenance activities credited for license renewal shall be documented, and subject to review and approval.

- Surveillance and preventive maintenance activities credited for license renewal shall be specified by callups maintained in the equipment database, flagged as license renewal

> commitments, and subject to additional requirements and controls, including the constraints placed on deferrals, cancellations and frequency changes for license renewal.

The project team reviewed this and the information in the above-mentioned July 12, 2004, letter. The project team comfirmed that, in all cases, the parameters that are monitored or inspected are linked to the aging effects that are to be managed. The project team determined that this AMP and the 23 others that credit the Periodic Surveillance and Preventive Maintenance Program adequately describe the data-collection activities that are required. The project team determined that the examination methods of this program are adequately linked to either industry or plant operating experience; normally, these examination methods are performed in accordance with ASME Boiler and Pressure Vessel Code, Section XI, but some examination methods are performed in accordance with ASME Boiler and Pressure Vessel Code, Section V. The project team comfirmed that, when sampling is used to inspect a group of SSCs, the basis and size of the sample inspection population is based on similarity of construction materials, fabrication and construction details, design, installation, operating environment, and aging effects. As the examination methodology is based primarily on ASME Boiler and Pressure Vessel Code, Section XI, so is the sampling methodology. Both ASME Boiler and Pressure Vessel Code, Section XI, and risk-informed inservice inspection, which has been implemented at PBNP, apply sampling considerations in accordance with those of the SRP-LR.

Based on a comparison of the results of the above review to the criteria stated in paragraph A.1.2.3.4 of the SRP-LR, the project team found the applicant's proposed detection of aging effects program element to be acceptable.

(5) Monitoring and Trending - Paragraph A.1.2.3.5, "Monitoring and Trending," of Appendix 1 of the SRP-LR states

> C 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.
>
> C 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.

In PBNP AMP B2.1.15, "Monitoring and Trending," the applicant states

> Inspection, examination, testing, and component replacement activities credited for license renewal are performed on a specified frequency based on operating experience or other requirements (e.g., Technical Specification or code requirements). The results of these surveillance and preventive maintenance activities are documented, and subject to review and approval.

Given the nature of this aging management program, which is connected with 23 other AMPs, the project team evaluated this element by considering the three functions of this

AMP, which are identified in the program description. The project team determined that, for those AMR line items that rely on one of the 23 other programs that credit the use of the Periodic Surveillance and Preventive Maintenance program to define the aging management program, reliance for monitoring and trending activities is placed on those individual AMP program reviews; thus, when the project team finds the other AMPs to be acceptable, then the associated monitoring and trending element of this program is also acceptable. The project team determined that, for the control function performed by this program, trending is unnecessary; if examination deferral or cancellation results in un-managed aging, this condition would be addressed and corrected by the PBNP corrective action program. The project team determined that, for AMR line items relying on this AMP and the CHAMPS program, monitoring and trending is accomplished by CHAMPS.

Through interviews with PBNP technical staff, the project team determined the following information regarding CHAMPS. Many surveillance and preventive maintenance activities are credited and relied on to manage the effects of aging of SSCs at PBNP. These activities are performed at specified frequencies based on operating experience and other requirements. The performance of these activities is controlled by CHAMPS, which is a computer-based system in which the records of work performed on SSCs are initiated and managed. The management of these activities includes the identification, frequency, assignment, performance, and evaluation of each activity. An important part of this system is the ability to monitor and trend the work that is performed that manages the effects of age-related degradation at PBNP. CHAMPS is used to determine the extent of age-related degradation, if any, that is revealed by any of the surveillance and other activities, and to direct the required actions to correct or to mitigate that degradation. These results are trended to provide a means to anticipate degradation of an SSC before there is a loss of intended function. Monitoring and trending results are provided to the corrective action program and to the commitment management program, to ensure that any required changes or modifications are properly implemented.

Based on a comparison of the results of the above review to the criteria stated in the paragraph A.1.2.3.5 of the SRP-LR, the project team found the applicant's proposed monitoring and trending program element to be acceptable.

(6) Acceptance Criteria - Paragraph A.1.2.3.6, "Acceptance Criteria," of Appendix A of the SRP-LR states

- 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.

In PBNP AMP B2.1.15, the applicant states

> Acceptance criteria for inspection, examination, or testing of selected structures and components for evidence of age-related degradation are provided in the surveillance and preventive maintenance activities credited for license renewal. The acceptance criteria are related to the aging effect(s) of concern and are tailored to each individual inspection, examination, or test considering the aging effect(s) being managed. An Action Request will be initiated whenever the acceptance criteria are not met. Certain components are also replaced on a given frequency based on operating experience. Plant procedures shall be revised to include the following:
>
> - Acceptance criteria shall be specified in the surveillance and preventive maintenance activities credited for license renewal aging management. The acceptance criteria shall be related to the aging effect(s) of concern and tailored to each individual inspection, examination, or test considering the aging effect(s) being managed.

Given the nature of the Periodic Surveillance and Preventive Maintenance Program, which is connected with 23 other AMPs, this element is evaluated by considering the three functions of this AMP, which are identified in the program description. The project team determined that, for those AMR line items that rely on one of the 23 other programs that credit the use of the Periodic Surveillance and Preventive Maintenance Program to define the aging management program, reliance for acceptance criteria activities is placed on those individual AMP program reviews; thus, when the project team finds the other AMPs to be acceptable, then the associated acceptance criteria element of this program is also acceptable. The project team determined that, for the control function performed by this program, management controls, e.g., the corrective action program and action requests, are in place in the event that acceptance criteria are not met. SSCs that are replaced on a given frequency, based on operating experience, are not in the scope of license renewal and thus do not require an AMR review to be performed. These SCCs are only identified in the PSPM AMP to assure that, if the applicant ceased to perform its periodic replacement, then that SCC would need to be included within the scope of license renewal and would require a program to manage its aging effects. For those SCCs that have inspections invoked by CHAMPS or other plant procedures, the applicable acceptance criteria are contained in the associated CHAMPS work instructions or plant procedures. The project team noted that any condition that did not meet the associated acceptance criteria would be addressed and corrected by the PBNP corrective action program.

Based on a comparison of the results of the above review to the criteria stated in the paragraph A.1.2.3.6 of the SRP-LR, the project team found the applicant's proposed acceptance criteria program element to be acceptable.

(7) Corrective Actions - The NRR DIPM staff reviewed this program element, which is addressed in Section 3 of the PBNP SER.

(8) Confirmation Process - The NRR DIPM staff reviewed this program element, which is addressed in Section 3 of the PBNP SER.

(9) Administrative Controls - The NRR DIPM staff reviewed this program element, which is addressed in Section 3 of the PBNP SER.

(10) Operating Experience - Paragraph A.1.2.3.10, “Operating Experience,” of Appendix A.1 of the SRP-LR states that this program elements should provide objective evidence to support the conclusions that the aging effects will be managed so that the system and component intended functions will be maintained during the period of extended operation.

In PBNP AMP B2.1.15, the applicant states

> The Periodic Surveillance and Preventive Maintenance Program has been effective in maintaining the intended functions of long-lived passive SSCs. Surveillance and preventive maintenance activities entered in CHAMPS are effectively managed, with an improving trend noted in internal and external assessments performed over the past several years. Numerous Condition Reports, Action Requests, and Work Orders have been generated and resolved through the implementation of this program, which demonstrates the effectiveness of this program to identify and correct age-related degradation prior to a loss of intended function.
>
> NRC Inspection Reports, QA Audit/Surveillance Reports, and Self-Assessments since 1999 were reviewed to determine the effectiveness of the Periodic Surveillance and Preventive Maintenance Program. A number of process and procedural weaknesses were identified and upgrade efforts were undertaken to improve the overall effectiveness of the Periodic Surveillance and Preventive Maintenance Program. The backlog of over due preventive maintenance activities was excessive at one time, but has since been significantly reduced. A QA Audit noted that the preventive maintenance activities presently in CHAMPS were found to be effectively implemented as scheduled. Additional program improvements have also been initiated.

Given the nature of the Periodic Surveillance and Maintenance Program, which is connected with 23 other AMPs, this element is evaluated by considering the three functions of this AMP, which are identified in the program description. The project team determined that, for those AMR line items that rely on one of the 23 other programs that credit the use of the Periodic Surveillance and Preventive Maintenance Program to define the aging management program, reliance for operating experience is placed on those individual AMP program reviews; thus, when the project team finds the other AMPs to be acceptable, then the associated operating experience element of this program is also acceptable. The project team determined that, for the control function performed by this program, operating experience is unnecessary; operating experience is immaterial to the replacement of an SSC, both to its selection, which is based on

considerations other than operating experience, and its subsequent operation. The project team determined that, for AMR line items relying on this AMP and the CHAMPS program, CHAMPS, the records of which extend back to plant start-up, adequately managed operating experience through its use of inspection, examination, and test results, and their subsequent evaluation such that the intended function of PBNP SSCs is maintained during the current period of operation.

Based on a comparison of the results of the above review to the criteria stated in the paragraph A.1.2.3.10 of the SRP-LR, the project team found the applicant's proposed acceptance criteria program element to be acceptable.

7.1.13.2 UFSAR Supplement

The applicant provided its UFSAR supplement for the Periodic Surveillance and Preventive Maintenance Program in the LRA Appendix A, Section 15.2.15, and stated

> The Periodic Surveillance and Preventive Maintenance Program manages aging effects for certain SSCs within the scope of license renewal. The program provides for inspection, examination, or testing of selected structures and components, including fasteners, for evidence of age-related degradation on a specified frequency based on operating experience or other requirements (e.g., Technical Specification or code requirements). Additionally, the program provides for replacement of certain components on a specified frequency based on operating experience. The Periodic Surveillance and Preventive Maintenance Program is also used to verify the effectiveness of other aging management programs.

Given the nature of the Periodic Surveillance and Preventive Maintenance Program, which is connected with 23 other AMPs, this element is evaluated by considering the three functions of this AMP, which are identified in the program description. The project team determined that, for those AMR line items that rely on one of the 23 other programs that credit the use of the Periodic Surveillance and Preventive Maintenance Program to define the aging management program, reliance for the UFSAR supplement is placed on those individual AMP program reviews; thus, when the project team finds the other AMPs to be acceptable and consistent with the SRP-LR, then the associated UFSAR supplement of this program is also acceptable. The project team determined that, for the control function performed by this program, and for the AMR line items relying on this AMP and the CHAMPS program, the UFSAR adequately described the replacement activities.

The project team reviewed the UFSAR supplement and confirmed that it provided 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).

7.1.13.3 Conclusion

On the basis of its audit and review of the PBNP program, the project team found that PBNP 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 found that it provided an adequate summary description of the

program, as required by 10 CFR 54.21(d).

7.1.14 Reactor Vessel Internals Program (AMP B2.1.17)

In the PBNP LRA, Appendix B, Section B2.1.17, the applicant states that the Reactor Vessel Internals (RVI) program is an existing program consistent with the GALL Report Sections XI.M16, "PWR Vessel Internals," and XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)," with exceptions and enhancements.

7.1.14.1 Program Description

In the LRA, the applicant states that AMP B2.1.17 manages the aging effects for both non-bolted and bolted reactor pressure vessel internal components. The program provides for (a) inservice inspection (ISI) in accordance with ASME Section XI requirements including supplemental examinations on the leading locations of non-CASS components with respect to irradiation-assisted stress corrosion cracking (IASCC) and irradiation embrittlement and the leading locations of CASS components with respect to fluence and thermal aging embrittlement screening criteria, (b) evaluations that will identify leading locations with respect to IASCC and irradiation embrittlement and thermal aging embrittlement, (c) the development and implementation of appropriate nondestructive examination techniques and examination schedule for these locations, (d) baffle-former and barrel-former bolt evaluations that will determine the acceptability of the current arrangement or if ultrasonic examination and/or replacement of these bolts is necessary, and (f) monitoring and control of reactor coolant water chemistry in accordance with the Water Chemistry Control Program to mitigate SCC or IASCC.

This program is credited by the PBNP Bolting Integrity Program AMP B2.1.4 for the inspection of bolting internal to the reactor vessel. In addition to the requirements of ASME Section XI, Subsection IWB, this program monitors for loss of preload caused by stress relaxation of bolted joints and specifically addresses cracking in baffle/barrel former bolts. The evaluation of AMP B2.1.4 is reviewed by the NRR DE staff. Therefore, the project team did not review this item.

This program also credits the PBNP One-Time Inspection Program, AMP B2.1.13, for the management of stress relaxation of the lower internals hold-down spring.

The applicant states that PBNP will actively participate in industry groups such as the EPRI MRP RI-ITG and Westinghouse Owners' Group, who are studying materials degradation issues for reactor vessel internals (RVI). PBNP also will implement NRC-approved industry activities resulting from the MRP, as appropriate, to manage any applicable aging effects identified through the EPRI MRP effort. The applicant will continue to monitor industry research on the significance of void swelling and augmented examinations for void swelling based on the results and recommendations of the industry research. In a letter dated July 12, 2004, from Dennis L. Koel (NMC) to Document Control Desk (NRC), "Clarifications to Point Beach Nuclear Plant License Renewal Application Information As a Result of Aging Management Program and Aging Management Review Audits of April and June 2004 (TAC Nos. MC2099 and MC2100)" (ML041960159), PBNP stated that as new information and technology become available, the plant-specific Reactor Vessel Internals Program will be modified to incorporate enhanced inspections of appropriate components as necessary and that the revised Reactor Vessel Internals Program will be submitted to the NRC for review and approval two years prior to entering into the period of extended operation.

7.1.14.2 GALL Report Consistency

In the LRA, the applicant states that the Reactor Vessel Internals Program is an existing program that is consistent with GALL Report Section XI.M16, “PWR Vessel Internals,” and Section XI.M13, “Thermal Aging Embrittlement and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS),” with exceptions.

The project team interviewed the applicant’s technical staff and reviewed, in whole or in part, the documents listed in Attachment 5 of this audit and review report for AMP B2.1.17, including the RVI program basis document for license renewal, LR-AMP-015-RVINT, which provides additional supporting details about how the GALL AMP XI.M13 and XI.M16 elements are addressed by the LRA RVI program.

The project team reviewed the seven program elements (see Section 5.1 of this audit and review report) contained in the LRA AMP and associated bases documentation against the GALL Report Sections XI.M13 and XI.M16 for consistency.

7.1.14.3 Exceptions to the GALL Report

The project team reviewed the exceptions and its justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

In Appendix B, Section B2.1.17 of the LRA, the applicant stated that its reactor vessel internals program is consistent with GALL AMP XI.M16 and GALL AMP XI.M13, with exceptions.

The reactor vessel internals program takes exception to the “scope of program” and “acceptance criteria” program elements for GALL AMP XI.M16 and GALL AMP XI.M13, such that the applicant currently use the 1998 edition through 2000 addenda (98A00) of the ASME Section XI Code.

GALL AMP XI.M16 and GALL AMP XI.M13 identifies the following criterion for the “scope of program” and “acceptance criteria” program elements associated with the exception taken: augmented inservice inspection (ISI) to monitor the effects of cracking in accordance with the ASME Code, Section XI, Subsection IWB, Table IWB 2500- 1 (1995 edition through the 1996 addenda). Any indication or relevant condition of degradation is evaluated in accordance with IWB-3100 by comparing ISI results with the acceptance standards of IWB-3400 and IWB-3500.

The project team confirmed that the later code edition/addenda encompass the requirements of the earlier code with respect to the examination requirements IWB-2500, Examination Category B-–3, evaluation requirements in IWB-3100, and acceptance criteria specified in IWB-3400 and IWB-3500. In addition, in the September 26, 2002, edition of the Federal Register (67 FR 60520), the staff documented its review of the acceptance of the 1998 edition through 2000 addenda (98A00) of the ASME Section XI Code for use with the GALL Report. In addition, the Federal Register statement of consideration (Vol 67 FR 60520) to this rulemaking, the staff documented its evaluation of 98A00 of the ASME Code to determine if the conclusions of the GALL Report are also applicable for AMPs that rely on the ASME Code which are incorporated into Section 50.55a by the final rule. The staff, for 98A00 ASME Code, found that the GALL Report remains valid and authorized use of the 98A00 as an alternative to the 95A96 without the need for the applicant to submit to the NRC its plant specific associated with license renewal. On the basis of its review and the Federal Register conclusion the project team finds this exception acceptable.

The reactor vessel internals program also takes exception to the “detection of aging effects” program element for GALL AMP XI.M16 and GALL AMP XI.M13, such that this program does not specify resolution requirements for enhanced VT-1 examination, but rather it requires

examination methods sufficient to detect a crack of such size that crack growth during the interval until the next examination, will not result in a crack of critical size or larger.

GALL AMP XI.M16 and XI.M13 identify the following criterion for the “detection of aging effects” program element associated with the exceptions taken: the extent and schedule of the inspection and test techniques prescribed by the aging management program are designed to maintain structural integrity and ensure that the effects of crack initiation and growth due to stress corrosion cracking (SCC) or irradiation assisted stress corrosion cracking (IASCC), and loss of fracture toughness due to neutron irradiation embrittlement and/or thermal aging or void swelling will be discovered and repaired before the loss of intended function. The GALL AMPs recommends, that existing ASME Section XI inservice inspection program requirements be augmented by ultrasonic methods of volumetric or enhanced visual (VT-1) examinations and that the inspection technique is capable of detecting the critical flaw size with adequate margin. The critical flaw size is determined based on the service loading condition and service degraded material properties. For non bolted components the GALL states that the augmented ISI program may include enhancement visual VT-1 examinations and the enhanced visual (VT-1) examination should include the ability to achieve a 0.0005-inch resolution, with the conditions (e.g., lighting and surface cleanliness) of the inservice examination bounded by those used to demonstrate the resolution of the inspection technique.

The applicant stated, in the LRA, that augmented examinations for cracking may consists of VT-1, enhanced VT-1, or a volumetric examination when warranted by the size and location of the crack that must be detected to preserve intended functions. The applicant’s program does not specify any resolution requirements for enhanced VT-1 examinations but rather stated that the examination methods be sufficient to detect a crack of such size that crack growth during the interval until the next examination will not result in a crack of critical size or larger.

The applicant stated, during the audit, that demonstration of the capabilities of the inspection technique will verify the capability for flaw detection. The applicant stated that minimum flaw size required to be detected will be defined by analysis, and that the minimum flaw size required to be detected will be bounded by the capability of the inspection technique. At this time, the applicant was not able to adequately describe the correlation between an alternative enhanced VT-1 examination resolution (i.e., surface crack opening) and the detection of a crack of such size (length, depth, aspect ratio and orientation) that crack growth between subsequent examinations will not result in a crack of critical size or larger. Also, the applicant could not describe how these correlations will be verified in order to ensure that the alternative enhanced VT-1 examinations are capable of identifying the presence of a critical flaw size with adequate margin.

Based on the applicants explanation, the project team has not accepted this exception. However, in a letter dated July 12, 2004, the applicant stated that as new information and technology become available, the plant-specific reactor vessel internals program will be modified to incorporate enhanced inspections of appropriate components as necessary and that the revised reactor vessel internals program will be submitted to the NRC for review and approval two years prior to entering into the period of extended operation.

In addition, the reactor vessel internals program also takes exception to the “monitoring and trending” program element for GALL AMP XI.M16 and GALL AMP XI.M13, such that for this program, some augmented examinations may be performed at a different frequency or only one-time based on the susceptibility evaluations and examination results.

GALL AMP XI.M16 and GALL AMP XI.M13 specify that the RVI supplemental inspection program be implemented according to the requirements in IWB-2400 and that the program monitor the effects of cracking on the intended function of the component by detection and

sizing of cracks by augmentation of current inservice inspections in accordance with the requirements of the ASME Code, Section XI Table IWB 2500 1. Accordingly, GALL AMPs require that those core support structure components susceptible to cracking or loss of fracture toughness aging effects be examined at least once every 10 years.

The applicant stated, in the LRA, that the 10-year inspection frequency applies to the VT-3 examination, and therefore some augmented examinations may be performed at a different frequency or only one time, based on the susceptibility evaluations and examination results. As an alternative, the applicant stated that the augmented examinations will be scheduled as either “one-time ”inspections or “periodic” inspections.

In technical discussions with the project team during the audit, the applicant stated that the criteria for determining if a one-time inspection is adequate for a RVI component will be when a one-time inspection of a RVI component can ensure that the component will acceptably perform its function over the term of the extended license. Furthermore, the applicant stated that the RVI periodic inspections will be performed at least as frequently as the ASME Section XI inspection frequency.

With respect to the GALL AMPs recommendations, the project team determines that the 10-year inspection frequency does not applies only to VT-3 examinations. The ASME Code, Section XI Table IWB 2500-1 10-year inspection frequency specified in the GALL AMPs XI.M16 and XI.M13 applies specifically to the supplemental inspections (enhanced VT- 1 or UT) used to augment the existing VT-3 inservice inspection examinations. The GALL AMPs conclude that the examination schedule and frequencies in IWB 2400, combined with an assessment of susceptible or limiting components or locations and reliable examination methods, will provide timely detection of cracks.

In this case, the GALL AMPs assume a default inspection frequency and specifies requirements for defining the extent of examination and NDE method effectiveness. In doing so, the GALL AMPs include the use of fracture mechanics methods to identify susceptible components or component locations, critical crack sizes, and minimum NDE crack detection capability (e.g., the largest crack size that can go undetected such that the component can reliably perform its safety function, with margin, between subsequent inspections). Because the GALL AMPs assume all supplemental inspections will be performed at a 10-year frequency, it does not specifically address application of flaw tolerance methods to define inspection frequencies.

During the audit, the project team informed the applicant that the acceptability of any alternative inspection frequency greater than the 10-year frequency specified in the GALL AMPs will depend on the details of the flaw tolerance procedure used. At this time, the applicant could not provide sufficient information regarding the methods, parameters considered, and criteria employed to justify not performing any inspections after the initial baseline exam at the start of the extended operating period. In addition, the GALL AMPs require that scope of examination expansion and re-inspection beyond the baseline inspections are required if flaws are detected. In the LRA, the applicant did not describe how the examination scope expansions and re-inspections will be performed in the event that a relevant indication (crack) is detected, nor did the applicant explain how inspection results will be used to adjust examination locations and frequencies previously determined.

Based on the applicants explanation, the project team has not accepted this exception. However, in a letter dated July 12, 2004, the applicant committed to submit a revised detailed reactor vessel internals program to the staff for review and approval two years prior to entering into the period of extended operation, the staff agreed to reevaluate this exception and the applicability of the aforementioned technical issues.

7.1.14.4 Enhancements

In a letter dated July 12, 2004, from Dennis L. Koel (NMC) to Document Control Desk (NRC), "Clarifications to Point Beach Nuclear Plant License Renewal Application Information As a Result of Aging Management Program and Aging Management Review Audits of April and June 2004" (ML041960159), PBNP committed to submit a revised detailed Reactor Vessel Internals Program to the NRC for review and approval two years prior to entering into the period of extended operation. Consequently, there were no enhancements for this AMP for project team review.

7.1.14.5 Operating Experience

The applicant reviewed industry operating experience during the development of the Reactor Vessel Internals Program. The review includes operating experience described in NRC Information Notice (IN) 98-11, "Cracking of Reactor Vessel Internal Baffle Former Bolts in Foreign Plants," and IN 84 18, "Stress Corrosion Cracking in PWR Systems." Most of the industry operating experience reviewed has involved cracking of austenitic stainless steel baffle-former bolts or SCC of high-strength internals bolting. SCC of guide tube split pins also has been reported.

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The project team review of the PBNP RVI operating experience revealed that PBNP has responded to industry operating experience regarding RVI degradation. Two examples that demonstrate the PBNP response to industry operating experience with RVI are augmented examination and replacement of guide tube split pins, and augmented examination and replacement of baffle-former bolts. Guide tube split pins were replaced at PBNP Units 1 and 2 in response to SCC failures of these pins in other Westinghouse RVI. A more SCC-resistant heat treatment was applied to the replacement pins. An augmented examination via UT was conducted on the baffle-former bolts in Unit 2. The UT examination identified a number of bolts with indications indicative of crack-like flaws. A number of bolts sufficient to guarantee the structural margins of the baffle-former joints were replaced, including all bolts with UT indications. The replacement bolts are fabricated from a more IASCC-resistant material. The applicant stated that PBNP will participate in the EPRI RI-ITG, which is engaged in ongoing research into aging effects of RVI and provides guidance to utilities on corrective actions for these aging effects. PBNP also participates in Westinghouse Owners' Group activities related to RVI.

On the basis of its review of the above industry and plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B2.1.17 will adequately manage the aging effects that are identified in the applicant's LRA for which this AMP is credited.

7.1.14.6 UFSAR Supplement

The applicant provided its UFSAR supplement for the Reactor Vessel Internals Program in PBNP LRA, Appendix A, Section 15.2.17. The applicant states

> The program provides for (a) Inservice Inspection (ISI) in accordance with ASME Section XI requirements, including examinations performed during the 10-year ISI examination; (b) An evaluation that will identify leading locations with respect to IASCC and irradiation embrittlement, appropriate non-destructive

examination techniques, and an examination schedule for these locations; (c) Baffle-former/barrel-former bolt evaluation that will determine the acceptability of the current arrangement or if ultrasonic examination and/or replacement of these bolts is necessary; (d) For cast austenitic stainless steel components subject to neutron fluence in excess of 10^{17} n/cm2 or determined to be susceptible to thermal embrittlement, an augmented inspection of components experiencing significant tensile stress (>5 ksi); (e) Evaluation of the significance of void swelling; (f) monitoring and control of reactor coolant water chemistry in accordance with the Water Chemistry Control Program to mitigate SCC or IASCC; (g) Participation in industry initiatives that will generate additional data on aging mechanisms relevant to RVI and develop appropriate inspection techniques to permit detection and characterization of features of interest; and (h) One-time inspection of the internals hold-down spring for evidence of stress relaxation.

These commitments are included in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC, dated February 25, 2004 (ML040580023) and the letter dated July 12, 2004, from Dennis L. Koel (NMC) to Document Control Desk (NRC), "Clarifications to Point Beach Nuclear Plant License Renewal Application Information As a Result of Aging Management Program and Aging Management Review Audits of April and June 2004" (ML041960159).

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, and concluded 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).

7.1.14.7 Conclusion

On the basis of the PBNP commitment to submit a revised detailed Reactor Vessel Internals Program to the NRC for review and approval two years prior to entering into the period of extended operation, the NRC agreed to reevaluate this AMP and exceptions with respect to the program ability to adequately manage 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). This commitment is included in the letter dated July 12, 2004, from Dennis L. Koel (NMC) to Document Control Desk (NRC), "Clarifications to Point Beach Nuclear Plant License Renewal Application Information As a Result of Aging Management Program and Aging Management Review Audits of April and June 2004" (ML041960159).

7.1.15 Structures Monitoring Program (AMP B2.1.20)

In the PBNP LRA, Appendix B, Section B2.1.20, the applicant states that PBNP AMP B2.1.20, "Structures Monitoring Program," is consistent with the GALL Report, Section XI.S5, "Masonry Wall Program," and Section XI.S6, "Structures Monitoring Program," and is consistent with, but includes exceptions to, GALL Report Section XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants," and Section XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems."

7.1.15.1 Program Description

The PBNP LRA states that the Structures Monitoring Program manages the aging effects associated with steel (including fasteners), concrete (including masonry block and grout),

earthen berms, and elastomers. The environments include below-grade and fluid-exposed material, outdoor weather, and indoor air. The program includes all safety-related buildings, structures within the containment, other buildings within the scope of license renewal, crane bridge and trolley structures, and component supports (including high-energy line break structures and panels) within the scope of license renewal. The program provides for periodic visual inspections and examination of accessible surfaces of the structures and components and identifies the aging effects that impact the materials of construction.

The LRA states that of the various mechanisms for concrete degradation, only cavitation and abrasion of concrete exposed to flowing water (i.e., water intake/discharge structures) are considered to be of sufficient significance to require aging management. However, this program also provides for comprehensive management of other various potential degradation mechanisms for the concrete structures within the scope of this program. The Bolting Integrity Program credits this program for the inspection of all structural and component support bolting within the scope of license renewal that is not within the scope of the ASME Section XI, Subsection IWF Inservice Inspection Program or the Systems Monitoring Program. Bolting associated with the supports for electrical cabinets, conduits, and cable trays also is included within the scope of this program. Visual inspections of bolting are performed concurrent with the structure inspection. The visual inspections check for corrosion, cracking, missing or loose fasteners, and coating degradation.

7.1.15.2 GALL Report Consistency

In the PBNP LRA, the applicant states that PBNP AMP B2.1.20 is an existing program that is consistent with GALL Report Sections XI.S5, "Masonry Wall Program," and XI.S6, "Structures Monitoring Program," and is consistent with, but includes exceptions to, Sections XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants," and XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems."

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 5 of this audit and review report for AMP B2.1.20, including "PBNP Structures Monitoring Program Basis Document for License Renewal," LR-AMP-022-STRMON, Revision 2.

The project team reviewed the seven program elements (see Section 5.1 of this audit and review report) contained in PBNP AMP B2.1.20 and associated bases documents against the GALL Report Sections XI.M23, XI.S5, XI.S6, and XI.S7 for consistency.

7.1.15.3 Exceptions to the GALL Report

The project team reviewed the exceptions and its justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

During the audit, the project team noted that, for the "scope of program" program element for PBNP AMP B2.1.20, the applicant incorrectly describe the overhead crane locations for cranes. By letter dated July 12, 2004, the applicant committed to revise, as part of its LRA annual update, the "scope of program" program element for PBNP AMP B2.1.20 to add more detail specifically describing overhead crane locations. On this basis, the project team finds that the scope of the applicant's program is consistent with the GALL AMP XI.M23.

The project team also noted that, for the "scope of program" program element for PBNP AMP B2.1.20, the applicant did not include steel edge supports and bracing for masonry walls, as required by GALL AMP XI.S5. The applicant was asked to provide clarification during the audit.

By letter dated July 12, 2004, the applicant committed to revise, as part of its LRA annual update, the "scope of program" program element for PBNP AMP B2.1.20 to add a description of the steel edge supports and bracing for masonry walls. On this basis, the project team finds that the scope of the applicant's program is consistent with the GALL AMP XI.S5.

In Appendix B, Section B2.1.20 of the LRA, the applicant stated that its structures monitoring program is consistent with GALL AMP XI.S7, with exceptions. The structures monitoring program takes exception to the "scope of program" program element for GALL AMP XI.S7 such that the applicant has not committed to RG 1.127, Revision 1 and does not include the intake crib, intake pipes, or discharge flume within the scope of license renewal.

GALL AMP XI.S7 states that RG 1.127 applies to water-control structures associated with emergency cooling water systems or flood protection of nuclear power plants. The water control structures included in the RG 1.127 program are concrete structures; embankment structures; spillway structures and outlet works; reservoirs; cooling water channels and canals, and intake and discharge structures; and safety and performance instrumentation.

During the audit, the applicant stated that its current licensing basis (CLB) takes an exception to RG 1.127 in that PBNP does not include inspection of the intake crib, intake pipes, or discharge flume as part of its CLB. This exception to the scope is addressed in Section 2.4 of this SER. The project team reviewed the inspection methods applied by the applicant and determined that the inspections performed on the circulating water pumphouse are in agreement with RG 1.127.

On the basis of its review of the inspection methods, as documented in PBNP audit and review report, and interviews with the applicant's technical staff, the project team concludes that the inspection methods used by the applicant are in agreement with RG 1.127 and therefore meet the inspection criteria of GALL AMP XI.S7. On this basis, the project team finds the exception acceptable.

The structures monitoring program also takes exception to the "parameters monitored or inspected" program element for GALL AMP XI.M23 such that the applicant does not keep records of the number and magnitude of crane lifts that have been made.

GALL AMP XI.M23 states that, for the "parameters monitored or inspected" program element, the program evaluates the effectiveness of the maintenance monitoring program and the effects of past and future usage on the structural reliability of cranes. The number and magnitude of lifts made by the crane are also reviewed.

The applicant stated, in the LRA, that although the records of the number and magnitude of lifts that have been made are not kept, the applicant uses the cranes for the functions they were designed to perform, and the cranes are inspected periodically. Crane usage is well within the design capacity and service duty of the cranes. Any lifts in excess of rated crane capacity would be evaluated and documented per ANSI B30.2.

During the audit, the applicant informed the project team that the crane's service duty would not be exceeded during the period of extended operation. The applicant directed the project team to Section 4.3.13 of the LRA, "Crane Load Cycle Limit." The project team reviewed this section, as it related to crane operation, and determine that the of expected number of lifts is significantly less than the design criteria. On this basis, the project team finds this exception acceptable.

7.1.15.4 Enhancements

The PBNP enhancement to the detection of aging effects program element consists of

- revising existing implementing documents to perform specific inspections related to aging effects on the parameters to be monitored

- providing acceptance criteria.

The GALL Report identifies the following criteria for the Detection of Aging Effects program element associated with the enhancements:

- Gall Report Section XI.S5 states that visual examination of the masonry walls by qualified inspection personnel is sufficient. The frequency of inspection is selected to ensure there is no loss of intended function between inspections. The inspection frequency may vary from wall to wall, depending on the significance of cracking in the evaluation basis. Unreinforced masonry walls that have not been contained by bracing warrant the most frequent inspection because the development of cracks may invalidate the existing evaluation basis.

- GALL Report Section XI.S6 states that for each structure/aging effect combination, the inspection methods, inspection schedule, and inspector qualifications are selected to ensure that aging degradation will be detected and quantified before there is loss of intended functions. Inspection methods, inspection schedule, and inspector qualifications are to be commensurate with industry codes, standards and guidelines, and are to also consider industry and plant-specific operating experience. Although not required, ACI 349.3R-96 and ANSI/ASCE 11-90 provide an acceptable basis for addressing detection of aging effects. The plant-specific structures monitoring program is to contain sufficient detail on detection to conclude that this program attribute is satisfied.

- GALL Report Section XI.S7 states that visual inspections are used primarily to detect degradation of water-control structures. In some cases, instruments have been installed to measure the behavior of water-control structures. RG 1.127 indicates that the available records and readings of installed instruments are to be reviewed to detect any unusual performance or distress that may be indicative of degradation. RG 1.127 describes periodic inspections, to be performed at least once every 5 years. Similar intervals of 5 years are specified in ACI 349.3R for inspection of structures continually exposed to fluids or retaining fluids. Such intervals have been shown to be adequate to detect degradation of water-control structures before they have a significant effect on plant safety. RG 1.127 also describes special inspections immediately following the occurrence of significant natural phenomena, such as large floods, earthquakes, hurricanes, tornadoes, and intense local rainfalls.

- GALL Report Section XI.M23 states that crane rails and structural components are visually inspected on a routine basis for degradation. Functional tests are also performed to assure their integrity.

The PBNP LRA states that new implementing procedures will be created and/or existing procedures revised to include those components not currently inspected. LRA Appendix B, Section B2.1.20, provides three examples of specific program enhancements; however, the complete list of enhancements to AMP B2.1.20 is contained in "Structures Monitoring Program Basis Document for License Renewal," LR-AMP-022-STRMON, Revision 2. These enhancements are required to satisfy the aging management program requirements documented in the GALL Report. The enhancements are scheduled for completion prior to the period of extended operation.

The project team concludes that the enhancements are acceptable and that the enhancements are necessary for the applicant to comply with the GALL criteria.

7.1.15.5 Operating Experience

The PBNP LRA states

> Masonry walls are inspected per plant procedures. Cracks in masonry walls have been found primarily at the mortar joints and these findings have been documented and resolved. Concrete structure inspections have been and continue to be a large part of the Structures Monitoring Program as described in plant procedures. Cracks, erosion, corrosion of embedded steel, and concrete spalling have been observed. These findings are evaluated and resolved by engineering. Periodic inspections of the circulating water pumphouse have been an ongoing program. Divers perform inspections during refueling outages. Minor degradation of these concrete structures has been found and recorded. Zebra mussels are periodically removed from the forebay areas. The structural members of the cranes that are in the scope of this program are inspected. There has been no corrosion related degradation found on these structural components.
>
> No signs of physical damage have been observed on the earthen berm around the above ground fuel oil storage tanks. Industry operating experience has shown that degradation occurs in structural steel and concrete components. The inspections performed at PBNP as part of the Structures Monitoring Program have revealed that degradation has occurred in both concrete and structural steel components. The inspection results are recorded in an annual report. Any degradation determined to be a potential cause of failure or indicative of changing conditions that may lead to an increased degradation rate are documented in the corrective action program. Evaluation of inspection results will place the structures in one of the following categories:
>
> - Acceptable: Acceptable structures are capable of performing their structural functions, including the protection and support of maintenance rule systems or components. Acceptable structures are free of deficiencies or degradation which could lead to possible failures. Acceptable structures shall be assigned Maintenance Rule (a)(2) status.
>
> - Acceptable with Deficiencies: Structures which are Acceptable with Deficiencies are those which are capable of performing their structural functions, including the protection or support of maintenance rule systems or components, but are degraded or have deficiencies which could deteriorate to an unacceptable condition, if not analyzed or corrected prior to the next scheduled examination. Structures that are Acceptable with Deficiencies should be considered for Maintenance Rule (a)(1) status. If the structure requires repair or more frequent inspections to provide assurance that it will remain functional, Maintenance Rule (a)(1) goal

setting should be considered.

- Unacceptable: Unacceptable structures are those which are damaged or degraded such that they are not capable of performing their structural functions. An unacceptable structure should be classified as a functional failure in accordance with the Maintenance Rule. Structures classified as Unacceptable shall be placed in Maintenance Rule (a)(1) status.

A review of NRC Inspection Reports, QA Audit/Surveillance Reports, and Self-Assessments since 1999 revealed no issues or findings that could impact the effectiveness of the Structures Monitoring Program. A Maintenance Rule assessment was performed by Nuclear Oversight in the first quarter of 2003, which reviewed the structural monitoring portion of the Maintenance Rule as a part of this assessment. The assessment concluded that the overall structural monitoring program was considered acceptable with program enhancements recommended. These enhancements were entered into the corresponding NUREG-1801 aging management program elements.

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above industry and plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B2.1.20 will adequately manage the aging effects that have been observed at the applicant's plant.

7.1.15.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the Structures Monitoring Program in the PBNP LRA, Appendix A, Section 15.2.20. It states that the Structures Monitoring Program manages the aging effects associated with steel (including fasteners), concrete (including masonry block and grout), earthen berms, and elastomers. The environments include below-grade and fluid-exposed material, outdoor weather, and indoor air. The program includes all safety-related buildings, structures within the containment, other buildings within the scope of license renewal, crane bridge and trolley structures, and component supports (including high-energy line break structures, panels) within the scope of license renewal. The program provides for periodic visual inspections and examination of accessible surfaces of the structures and components and identifies the aging effects that impact the materials of construction.

The NMC commitment to implement an enhanced structural monitoring program prior to the period of extended operation is included in Enclosure 1 to the letter dated February 25, 2004, from Gary Van Middlesworth (NMC) to Document Control Desk (NRC), "Application for Renewed Operating License" (ML040580023).

The project team confirmed that the UFSAR supplement 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).

7.1.15.7 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 exceptions and enhancements to the applicant's AMP, the project team finds that the applicant's program provides for adequate management of the aging effects for which the program is credited 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 Systems Monitoring Program (AMP B2.1.21)

The applicant's systems monitoring program is described in LRA Section B2.1.21, "Systems Monitoring Program." In the LRA, the applicant stated that this is an existing plant-specific program with portions of the program that are consistent, with exceptions and enhancements, with GALL AMP XI.M29, " Above Ground Carbon Steel Tanks."

7.1.16.1 Program Description

The applicant credited this program for managing the aging effects for certain SSCs within the scope of license renewal. The program manages aging effects for normally accessible external surfaces of piping, tanks, and other components and equipment with in the scope of license renewal.

The applicant stated that the scope of its systems monitoring program includes visual inspections of the external surfaces of components. The systems monitoring program is credited by PBNP AMP B2.1.6, "Boric Acid Corrosion Program," for the inspection of SSC that do not contain borated water, but may be subject to the degrading effects of borated water leakage. The applicant also stated that its systems monitoring program is also credited by PBNP AMP B2.1.1.4, "Bolting Integrity Program," for the inspection of bolting. The systems monitoring program credited PBNP AMP B2.1.22, "Tank Internal Inspection Program," for the inspection of inaccessible portions of the condensate storage tanks external surfaces (i.e., tank bottoms).

7.1.16.2 Review of AMP Against Program Elements

In accordance with 10 CFR 54.21(a)(3), the project team reviewed the information included in Appendix B, Section B2.1.21, of the LRA, regarding the applicant's demonstration of the system monitoring program to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended functions will be maintained consistent with the CLB throughout the period of extended operation. Also, during its audit and review, the project team confirmed the applicant's claim of consistency with the GALL Report. Furthermore, the project team reviewed the exceptions and its justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

In Section B2.0, "Aging Management Correlation," of the LRA, the applicant did not identify this aging management program as a plant-specific aging management program. However, in the discussion of PBNP AMP B2.1.21, "Systems Monitoring Program," the applicant stated that the system monitoring program is an existing plant-specific program. Further, the applicant stated that since this program includes visual inspection of the external surfaces of carbon steel tanks,

it is also and existing program that is consistent with, but includes exceptions to, GALL AMP XI.M29, “Above Ground Carbon Steel Tanks.”

The project team reviewed the systems monitoring program against the AMP elements found in the SRP-LR, Appendix A, Section A.1.2.3, and SRP-LR Table A.1-1 and focused on how the program manages aging effects through the effective incorporation of 10 elements (i.e., program scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria, corrective actions, confirmation process, administrative controls, and operating experience). The project team also reviewed the consistency of this aging management program with GALL AMP XI.M29, which is integrated into the plant-specific evaluations.

The applicant indicated that the corrective actions, confirmation process, and administrative controls are part of the site-controlled quality assurance program. The project team’s evaluation of the quality assurance program will be provided separately in Section 3.0.4 of the SER. The remaining seven elements are discussed below:

(1) Scope of Program - The applicant stated, in Appendix B, Section B2.1.21 of the LRA, that for this program element, the systems monitoring program consists of PBNP activities that manage the aging effects for components in the following systems and structures: auxiliary feedwater, chemical and volume control, circulating water, component cooling water, containment hydrogen detectors and recombiners, containment isolation components, containment spray, containment ventilation, emergency power, essential ventilation, feedwater and condensate, fire protection, heating steam, main and auxiliary steam, non-class 1 RCS components, plant air, residual heat removal, safety injection, service water, spent fuel cooling, treated water, and waste disposal.

The project team reviewed and confirmed that this program element satisfies the criterion defined in Appendix A.1.2.3.1 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.

The applicant also stated, in the LRA, that its systems monitoring program takes exceptions to the “scope of program” program element for GALL AMP XI.M29 such that it does not take credit for any coating or paint for mitigating corrosion even though the tanks may be painted or coated. GALL AMP XI.M29 recommends that, for above ground carbon steel tanks preventive measures to mitigate corrosion by protecting the external surfaces of carbon steel tanks protected with paint or coatings. The applicant stated that inspections of the coating or paint will provide an indication of the condition of the material underneath the coating or paint.

The project team reviewed the information, as documented in the PBNP audit and review report, and held discussion with the applicant’s technical staff. The project team finds that surface corrosion would not occur without effecting the coating or paint such surface degradation would be readily observed. On this basis, the project team finds this exception acceptable.

(2) Preventive Actions - The applicant stated, in Appendix B, Section B.2.1.21 of the LRA that there are no preventive measures associated with the aging effects of concern for license renewal.

The project team confirmed that the preventive actions program element satisfies the criterion defined in Appendix A.1.2.3.2 of the SRP-LR. The project team did not identify the need for preventive actions for this AMP because it is a condition monitoring program. Therefore, the project team finds this acceptable.

The applicant also stated, in the LRA, that its systems monitoring program takes exception to the "preventive actions" program element for GALL AMP XI.M29 such that (1) it does not take credit for any coating or paint for mitigating corrosion even though the tanks may be painted or coated and (2) sealant or caulking is not used at the interface edge between the tank and the concrete foundation for the condensate storage tanks and above ground fuel oil storage tanks.

GALL AMP XI.M29 recommends that sealant or caulking be used at the interface edge.

The applicant stated, in the LRA, that the internals of these tanks were inspected in 2000 and no significant rust deposits, corrosion, or other obvious defects were found. Thickness measurements of the bottom of the tanks were performed and indicated no significant loss of material. Subsequent to the inspection and thickness measurements, the tanks were upgraded. The upgrade installed a polyester resin coating on the inside of the tanks, covering the bottoms and extending approximately two feet up the tank walls. The applicant considered that future thickness measurements are not necessary or practical, because of potential thickness measurement complications due to the polyester resin coating, and the absence of any significant material loss due to corrosion in over 30 years of service.

The project team reviewed the information, as documented in the PBNP audit and review report, and held discussion with the applicant's technical staff. The project team finds that (1) surface corrosion would not occur without effecting the coating or paint such surface degradation would be readily observed and (2) that the applicant has added additional protection barriers to mitigate any future material loss. On this basis, the project team finds these exceptions acceptable.

(3) Parameters Monitored or Inspected - The applicant stated, in Appendix B, Section B2.1.21 of the LRA that the program utilizes periodic plant system walkdowns to monitor for leakage and evidence of material degradation. Above ground carbon steel tank external coatings or paint are inspected to provide an indication of the condition of the material underneath the coating or paint. Sealants or caulking at the tank/support structure interface, if used to prevent water intrusion, are also inspected for degradation.

The project team confirmed this program element satisfies the criteria defined in Appendix A.1.2.3.3 of the SRP-LR. The systems monitoring program is acceptable because the specified examination method is capable of identifying and characterizing the parameter monitored and providing data sufficient to conclude that the associated aging effect is adequately managed. On this basis, the project team finds that the parameters monitored or inspected program element is acceptable.

(4) Detection of Aging Effects - The applicant stated, in Appendix B, Section B2.1.21 of the LRA, that the external surfaces of various component types (e.g., pump casings, valve bodies, piping, expansion joints) are visually inspected for leakage

and evidence of material degradation, such as loss of material due to corrosion. The outer surfaces of above ground carbon steel tanks are visually inspected for signs of coating or paint degradation to provide an indication of the condition of the material underneath the coating or paint. The sealant or caulking at the tank/support structure interface, if used to prevent water intrusion, is also inspected for degradation. This program credits PBNP AMP B2.1.22, "Tank Internal Inspection Program for the inspection of inaccessible portions of the Condensate Storage Tanks," external surfaces (i.e., tank bottoms). Degradation of bolted connections is detected by visual inspections of the bolted components during system walkdowns. Bolted connections are inspected for missing fasteners and degradation such as damaged threads and evidence of corrosion.

The project team reviewed and confirmed that this program element satisfies the criterion defined in Appendix A.1.2.3.4 of the SRP-LR. The detection of aging effects, identifies the specific components for which the program manages aging. On this basis, the project team finds that the applicant's detection of aging effects program element is acceptable.

The applicant also stated, in the LRA, that its systems monitoring program takes exception the "detection of aging effect" program element for GALL AMP XI.M29 such that thickness measurements of the inaccessible external surfaces (i.e., tank bottoms) of the above ground fuel oil storage tanks are not performed. As discussed in the preventive actions element, this tank was inspected and upgraded in 2000. The inspection did not detect any significant material loss after 33 years of service and the new internal coating provides additional barrier protection.

The project team reviewed the information, as documented in the PBNP audit and review report, and held discussion with the applicant's technical staff. The project team finds that the applicant has added additional protection barriers to mitigate any future material loss. On this basis, the project team finds these exceptions acceptable.

In Appendix B, Section B2.1.21 of the LRA, the applicant stated that systems monitoring program is consistent with GALL AMP XI.M29, with enhancements. The applicant stated that, for the "detection of aging effects" program element, enhancements include revisions to existing implementing documents to strengthen the requirements for system walkdowns, documentation and records retention, and provide inspection guidance. Additionally, the aging effects and mechanisms to be managed will be incorporated into the existing implementing documents. The project team considered these types of enhancements as administrative enhancements which does not require project team review

(5) Monitoring and Trending - The applicant stated, in Appendix B, Section B2.1.21 of the LRA, that visual inspections are performed at least once per year for those systems and components that are accessible during normal plant operation. Systems and components that are only accessible during plant outages, are inspected at least once per refueling interval. The inspection frequency may be increased based on the safety significance, production significance, and operating experience of each system. These system walkdown inspections provide for timely detection of aging effects (i.e., prior to a loss of intended function). Walkdown results are also documented to provide a historical record of items monitored during the walkdowns. This program credits PBNP AMP B2.1.22, "Tank Internal Inspection Program," for the inspection of

inaccessible portions of carbon steel tank external surfaces, such as tank bottoms.

The project team confirmed that this program element satisfies the criteria defined in Appendix A.1.2.3.5 of the SRP-LR. Monitoring of inspection results will be performed and 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 applicant's monitoring and trending program element is acceptable.

The applicant also stated, in the LRA, that its systems monitoring program takes exception to the "monitoring and trending" program element for GALL AMP XI.M29 such that thickness measurements of the inaccessible external surfaces of the above ground fuel oil storage tanks are not performed. This exception is evaluated in the "detection of aging effects" program element, as discussed above. On this basis, the project team find this exception acceptable.

(6) Acceptance Criteria - The applicant stated, in Appendix B, Section B2.1.21 of the LRA, that an action request (which provides a means to document the finding and enter the concern into the plants corrective action program) will be initiated for any discrepancies found that may affect the components ability to perform its intended function (i.e., significant degradation). Other types of degradation are recorded for further evaluation. When bolted joints for pressure retaining components are observed to have significant degradation or be leaking, corrective actions are taken in accordance with the corrective action program. An action request is also initiated for significant degradation of tank coatings or paint, and sealants or caulking (if applicable). Significant degradation consists of cracking, flaking, or peeling of paint or coatings, and cracked sealant or caulking (if applicable). This program credits PBNP AMP B2.1.22, "Tank Internal Inspection Program" for thickness measurements of inaccessible portions of carbon steel tank external surfaces, such as tank bottoms. Thickness measurements will be evaluated against the design thickness.

The project team confirmed that this program element satisfies the criteria defined in Appendix A.1.2.3.6 of the SRP-LR. On this basis, the project team finds that the acceptance criteria program element is acceptable.

(7) Corrective Actions - The NRR DIPM staff reviewed this program element, which is addressed in Section 3 of the PBNP SER.

(8) Confirmation Process - The NRR DIPM staff reviewed this program element, which is addressed in Section 3 of the PBNP SER.

(9) Administrative Controls - The NRR DIPM staff reviewed this program element, which is addressed in Section 3 of the PBNP SER.

(10) Operating Experience - The applicant stated, in Appendix B, Section B2.1.21 of the LRA, that degradation of components that are within the scope of this program has been documented in accordance with plant procedures in the engineer's system handbooks. This includes inspections of bolting and the external surfaces of tanks. A review of documentation for seven systems within the scope of license renewal indicated that these walkdowns usually result in the initiation of corrective Work Orders for the repair of minor leaks from both flanged connections and valve stem packing, degraded grout under pumps, or pipe supports. Thickness measurements of the bottoms of the above ground fuel oil

storage tanks were performed in August of 2000, which indicated no significant loss of material due to corrosion in over 30 years of service. A review of NRC inspection reports, QA audit/surveillance reports, and self-assessments since 1999 revealed no issues or findings that could impact the effectiveness of the systems monitoring program.

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to verify that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. On the basis of its review of the above industry and plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that PBNP AMP B2.1.21 will adequately manage the aging effects that are identified in the applicant's LRA for which this AMP is credited.

7.1.16.3 Enhancements

The PBNP LRA states that enhancements to the Systems Monitoring Program include revisions to existing implementing documents to strengthen the requirements for system walkdowns, documentation and records retention, and provide inspection guidance. Additionally, the aging effects and mechanisms to be managed will be incorporated into the existing implementing documents.

These administrative enhancements as described in AMP B2.1.21 "PBNP Systems Monitoring Program", are not necessary to demonstrate consistency with GALL criterion. As described in Section 4, Audit and Review Scope, the project team did not review these enhancements.

7.1.16.4 UFSAR Supplement

The applicant provides its UFSAR supplement for the Systems Monitoring Program in the LRA, Appendix A, Section 15.2.21, and states that it will manage loss of material from components, as applicable, within the scope of license renewal.

These commitments are included in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC, dated February 25, 2004 (ML040580023).

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, and concluded 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).

7.1.16.5 Conclusion

On the basis of its review and audit of the applicant's program, the project team finds that those program elements for which the applicant claimed consistency with the GALL program are consistent with the GALL program. In addition, the project team has reviewed the exceptions and the associated justifications and determined that the AMP, with the exceptions is adequate to manage the aging effects for which it is credited. The 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). The project team also reviewed the FSAR supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

7.1.17 Water Chemistry Control Program (AMP B2.1.24)

In the PBNP LRA, Appendix B, Section B2.1.24, the applicant states that AMP B2.1.24, "Water Chemistry Control Program," is an existing program that is consistent with, but includes exceptions to, the GALL Report, Section XI.M2, "Water Chemistry."

7.1.17.1 Program Description

The applicant stated, in the LRA, that the objective of PBNP AMP B2.1.24,"Water Chemistry Control Program," is to protect the integrity, reliability, and availability of systems and components by managing the water chemistry in plant systems to ensure that water quality is compatible with the materials of construction and to minimize corrosion of internal surfaces exposed to corrosive environments. The program monitors and controls water chemistry based on the guidelines in EPRI TR-105714, "PWR Primary Water Chemistry Guidelines," for primary water chemistry and EPRI TR-102134, "PWR Secondary Water Chemistry Guidelines," for secondary water chemistry.

The applicant also stated, that PBNP AMP B2.1.13, "One-Time Inspection Program" verifies that the water chemistry control program is managing the effects of aging in low flow or stagnant areas.

7.1.17.2 GALL Report Consistency

In the PBNP LRA, the applicant states that AMP B2.1.24 is consistent with the GALL Report Section XI.M2, "Water Chemistry," with exceptions.

As described in the Point Beach Audit Plan, the project team reviewed seven program elements contained in AMP B2.1.24, "Water Chemistry Control Program," against the GALL Report Section XI.M2 for consistency.

As part of its review, the project team interviewed the applicant's technical staff and reviewed, in total or in part, the documents listed in Attachment 5 of this audit and review report for AMP B2.1.24.

7.1.17.3 Exceptions to the GALL Report

The project team reviewed the exceptions and its justification to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

In Appendix B, Section B2.1.24 of the LRA, the applicant stated that its water chemistry control program is consistent with GALL AMP XI.M2, with exceptions. The water chemistry control program takes exception to the "scope of program" program element for GALL AMP XI.M2 such that the applicant has adopted EPRI TR-105714 Revision 4 and EPRI TR-102134 Revision 5.

GALL AMP XI.M2 states that the water chemistry control should be conducted in accordance with EPRI TR-105714 Revision 3 for primary water chemistry and EPRI TR-102134 Revision 3 for secondary water chemistry.

The applicant stated, in the LRA, that the Revision 4 changes to EPRI TR-105714, issued in November 1996, consider the most recent operating experience and laboratory data, provide an increased depth of detail regarding the corrosion mechanisms affecting steam generators and the balance of plant, and also provide additional guidance on how to integrate these concerns

into the plant-specific optimization process. Revision 4 reflects increased emphasis on plant-specific optimization of primary water chemistry to address individual plant circumstances and the impact of the Nuclear Energy Institute (NEI) steam generator initiative, NEI 97-06, "Steam Generator Program Guidelines," which requires utilities to meet the intent of the EPRI guidelines. EPRI TR-105714 Revision 4 attempts to clearly distinguish between prescriptive requirements and non-prescriptive guidance.

EPRI TR-102134 Revision 5 provides additional details regarding plant-specific optimization and clarifies which portions of the EPRI guidelines are mandatory under NEI 97-06.

The applicant also stated, in the LRA, that a review of NRC inspection reports, QA audit/surveillance reports, and self-assessments since 1999 revealed no issues that could impact the effectiveness of the water chemistry control program. Additionally, industry experience indicates that using the EPRI guidelines for water chemistry has proven very effective in managing the degradation of primary and secondary SCCs. The EPRI water chemistry guidelines are revised periodically based upon industry experience.

The project team reviewed the information, as documented in the PBNP audit and review report, and held discussion with the applicant's technical staff. On the basis of its review, the project team determined that the use of EPRI guidelines, EPRI TR-105714 Revision 4 for primary water chemistry and EPRI TR-102134 Revision 5 for secondary water chemistry, is acceptable. On this basis, the project team this exception acceptable.

The water chemistry control program also takes exception to the "parameters monitored or inspected" program element for GALL AMP XI.M2 such that (1) EPRI TR-105714, Rev. 4 lists pH and conductivity as primary water diagnostic parameters to be monitored during power operation, but does not provide acceptance limits, (2) the applicant does not routinely monitor for lead, (3) PBNP also deviates slightly from EPRI TR-102134, Rev. 5 in the manner in which the hydrazine concentration is maintained, and (4) EPRI TR-102134, Rev. 5 lists pH and conductivity as secondary water diagnostic parameters to be monitored when the RCS temperature is greater than 200 degrees F, but does not provide acceptance criteria.

GALL AMP XI.M2 states that the water quality (pH and conductivity) is maintained in accordance with the EPRI guidelines. EPRI TR-105714 Revision 4 lists pH and conductivity as primary water diagnostic parameters to be monitored during power operation but does not provide acceptance limits.

As discussed in its evaluation for the "scope of program" program element, the project team determined that the use of EPRI guidelines, EPRI TR-105714 Revision 4 for primary water chemistry and EPRI TR-102134 Revision 5 for secondary water chemistry, is acceptable.

The applicant stated, in the LRA, that during startup conditions with the reactor coolant system at greater than 200 degrees Fahrenheit but at less than 5% reactor power, EPRI requires that hydrazine in the steam generator feedwater source be maintained at greater than 100 ppb (or greater than eight times the oxygen level, whichever is higher). The applicant does not have the capability for maintaining a continuous hydrazine feed at these conditions. Alternatively, the applicant makes batch additions of hydrazine to the steam generators through the auxiliary feedwater system to maintain detectable hydrazine levels in the steam generator blowdown.

The applicant also stated that making batch additions of hydrazine to the steam generators through the auxiliary feedwater system to maintain detectable hydrazine levels in the steam generator blowdown is adequate to ensure that there is little dissolved oxygen in the steam generator bulk water supply to contribute to corrosive conditions.

The project team review information provide by the applicant, as documented in the PBNP audit and review report and held discussions with the applicant's technical staff. On the basis of its review, project team determines that the proposed bulk addition of hydrazine and the use of EPRI guidelines (EPRI TR-105714 Revision 4 for primary water chemistry and EPRI TR-102134 Revision 5 for secondary water chemistry) are appropriate. On this basis, the project team finds this exception acceptable.

7.1.17.4 Enhancements

In Appendix B, Section B2.1.24 of the LRA, the applicant stated that its water chemistry control program is consistent with GALL AMP XI.M2, with enhancements. The applicant stated that, for the "detection of aging effects" and "monitoring and trending" program elements, enhancements include revisions to existing implementing procedures to include the applicable aging effects. Procedures will also be revised to require additional sampling after corrective actions have been taken, whenever a parameter is not within the specified value and continuous monitoring is not available. The project team considered these types of enhancements as administrative enhancements which does not require project team review.

7.1.17.5 Operating Experience

The applicant's LRA provides the following discussion under AMP B2.1.24, Operating Experience:

> The Water Chemistry Control Program has been in effect since initial plant operation and has been effective at maintaining the desired system water chemistry and detecting abnormal conditions, which have been corrected in an expedient manner. A review of condition reports/action requests supports the above statement as most are related to abnormal chemistry results during operational transients such as startups where the abnormal condition is expected, but the corrective action program is used for documentation. The EPRI guidelines for water chemistry are being used and the controlling procedures refer and adhere to the limits specified in them. Over time, this has proven to be an effective method of controlling concentrations of parameters such as sulfates, chlorides, fluorides, dissolved oxygen, lithium, sodium, iron, and copper that are detrimental to certain alloys in both the primary and secondary systems. Controlling these parameters mitigates aging effects in primary and secondary system components. Each unit had an Action Level (AL) 3 secondary chemistry excursion as a result of Low Pressure Turbine Modifications. The Unit 1 excursion occurred in April 1995. The AL3 limits for Organic Adjusted Cation Conductivity exceeded the AL3 limit of 7 : mhos/cm on April 17, 1995 (peak of 19.5 : mhos/cm). This was attributed to increased sulfates and chlorides. The plant remained in AL3 for approximately 14 hours, during which time power never exceeded 30%. Sulfates and chlorides peaked at 155 ppb and 120 ppb respectively during the startup. The Unit 2 excursion occurred in February/March 1999. The AL3 limits for Organic Adjusted Cation Conductivity exceeded the AL3 limit of 7 : mhos/cm on March 4, 1999 (peak of 9.35 : mhos/cm). This was also attributed to increased sulfates and chlorides. The plant remained in AL3 for approximately 12

hours, during which time power never exceeded 30%. Sulfates and chlorides peaked at 742 ppb and 156 ppb respectively during the startup. There is no recollection of any resin intrusion events into the primary system. A historical review of Reactor Coolant System data for sulfate as an indicator of a resin intrusion event did not reveal any evidence of such an event. An assessment performed by Nuclear Oversight in 2003 concluded that the chemistry program meets expectations. A self assessment conducted in mid-2003 concluded that the primary and secondary water chemistry programs meet station requirements, however some process weaknesses exist. These process weaknesses are being tracked via the corrective action process. A review of NRC Inspection Reports, QA Audit/Surveillance Reports, and Self-Assessments since 1999 revealed no other issues or findings that could impact the effectiveness of the Water Chemistry Control Program. Review of plant-specific operating experience also indicates that the chemistry program is performing its function of mitigating aging effects. No reports were found that attributed water chemistry as the cause of component deterioration, showing signs of aging effects, or failing to perform its function. Action Requests are initiated when water chemistry is found to be out of specification, and most of the instances occur during start-up when parameters are quickly changing and it is more difficult to control water chemistry. The time duration of out of specification water chemistry is minimal and there is no evidence of having caused detrimental effects on system components. As additional operating experience is obtained, lessons learned may be used to adjust this program.

The project team reviewed the applicant's discussion of plant operating history provided above and confirmed during interviews with applicant's technical staff that no failures have been traced to failures in the water chemistry monitoring program. The project team also confirmed that the applicant will verify the effectiveness of the water chemistry program using both inspections conducted under the current inservice inspection program and inspection conducted as part of the One-Time Inspection Program.

On the basis of its review of the above industry and plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B2.1.24 will adequately manage the aging effects that have been observed at the applicant's plant.

7.1.17.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the primary and secondary water chemistry control program in the PBNP LRA, Appendix A, Section 15.2.24, "Water Chemistry Control Program," which states that the water chemistry control program monitors and controls water quality based on EPRI guidelines for primary water chemistry and for secondary water chemistry. The applicant states that the program manages loss of material, cracking, and fouling, as applicable, by control of contaminants. The project team noted that for low-flow or a stagnant portion of a system, a one-time inspection of selected components at susceptible locations will provide verification of the effectiveness of the Water Chemistry Control Program.

These commitments are included in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC, dated February 25, 2004 (ML040580023).

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, and concluded 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 those portions of the program for which the applicant claims consistencies with the GALL program are consistent with the GALL program. On the basis of its review of the exceptions to 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 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).

7.1.18 Environmental Qualification Program (AMP B3.1)

In the PBNP LRA Section 4.8.1, the applicant states that the EQ Program is an existing program that is consistent with the GALL Report Section X.E1, "Environmental Qualification of Electric Components."

7.1.18.1 Program Description

In Section 15.3.2 and Appendix B3.1of the PBNP LRA, the applicant states that the Environmental Qualification (EQ) 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. In accordance with 10 CFR 54.21(c)(1)(iii), the EQ Program, which implements the requirements of 10 CFR 50.49, is viewed as an aging management program for license renewal. As required by 10 CFR 50.49, EQ components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. Aging evaluations for EQ components that specify a qualification of at least 40 years are considered time-limited aging analyses (TLAAs) for license renewal. The EQ Program ensures that these EQ components are maintained within the bounds of their qualification bases.

7.1.18.2 GALL Report Consistency

In the PBNP LRA, Appendix B, Section B3.1, the applicant states that the EQ Program is an existing program, as currently established to meet PBNP commitments for 10 CFR 50.49, and that it is consistent with NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," Section X.E1, "Environmental Qualification of Electric Components."

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 5 of this audit and review report for LRA AMP B3.1.

The project team audited the seven program elements (see Section 5.1 of this audit and review report) contained in the LRA AMP B3.1 and associated bases documents against the GALL AMP X.E1 for consistency.

7.1.18.3 Exceptions to the GALL Report

None.

7.1.18.4 Enhancements

In Appendix B, Section B3.1of the LRA, the applicant stated that its environmental qualification program is consistent with GALL AMP X.E1, with enhancements. The applicant stated enhancements to its EQ program include completing the EQ backlog elimination project to eliminate the backlog of outstanding EQ related tasks and addressing the recommendations from an independent assessment of the program, which include field verification of EQ components and the completion of EQ checklist reviews. These enhancements are intended to improve the overall health and effectiveness of the EQ program. The project team considered these types of enhancements as administrative enhancements which does not require project team review.

7.1.18.5 Operating Experience

From the applicant's LRA Section B3.1,

> Although some program execution issues have previously been experienced at Point Beach Nuclear Plant, a review of plant-specific and industry operating experience identified no premature failures due to aging effects that could affect the qualified life of an EQ component. NRC Inspection Reports, QA Audit/Surveillance Reports, and Self-Assessments since 1999 were reviewed to determine the effectiveness of the EQ Program as it currently exists. Numerous weaknesses were identified from a design and programmatic perspective. These weaknesses are indicative of issues related to executing existing PBNP commitments to 10 CFR 50.49 and do not indicate that changes are needed to the requirements (i.e., scope, qualification methods, acceptance criteria, etc.) established by these commitments. The EQ Program, as currently committed to 10 CFR 50.49, provides reasonable assurance that the intended functions of EQ components will be maintained through the period of extended operation.
> An EQ Program Backlog Elimination Project has been undertaken to eliminate the backlog of outstanding EQ related tasks, in order to improve the overall health and effectiveness of the EQ Program. Policies and procedures that govern the EQ Program have already been revised to strengthen the administrative controls associated with the program. Work is ongoing to eliminate the backlog of outstanding EQ related tasks.

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to verify that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above industry and plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B3.1 will adequately manage the aging effects that have been observed at the applicant's plant.

7.1.18.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the EQ of electrical components program in

the LRA, Sections 15.3.2 and 15.4.6. The Environmental Qualification (EQ) Program manages component thermal, radiation and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components not qualified for the current license term 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 time-limited aging analyses (TLAAs) for license renewal. The EQ Program ensures that these EQ components are maintained within the bounds of their qualification bases.

These commitments are included in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC, dated February 25, 2004 (ML040580023).

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, and concluded 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).

7.1.18.7 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 consistencies with the GALL program are consistent with the GALL program. Because 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).

7.1.19 Fatigue Monitoring Program (AMP B3.2)

The applicant's fatigue monitoring program is described in LRA Section B3.2, "Fatigue Monitoring Program." In the LRA, the applicant stated that this is an existing program. This program is consistent, with enhancements, with GALL AMP X.M1, "Metal Fatigue or Rector Coolant Pressure Boundary."

7.1.19.1 Program Description

The applicant states in the PBNP LRA, Appendix B, Section B3.2, that the PBNP Fatigue Monitoring Program is comparable to the program described in the GALL Report, Section X.M1. At PBNP, the fatigue monitoring program is a confirmatory program that monitors loading cycles due to thermal and pressure transients and cumulative fatigue usage for ASME Class 1 and selected Class 2 components analyzed to Class 1 rules (i.e., main feedwater nozzles) for which a cyclic or fatigue design basis exists. The program provides an analytical basis for confirming that the actual number of cycles does not exceed the number of cycles used in the design analysis, and the cumulative fatigue usage will be maintained below the allowable limit during the period of extended operation.

The impact of the effects of reactor coolant environment on component fatigue life, which is a time-limited aging analysis (TLAA), has been evaluated for a sample of critical components, including the seven component locations selected in NUREG/CR-6260. The results of these analyses are discussed in Section 4.3 of the LRA. This TLAA is reviewed by the NRR DE staff and addressed in Section 4 of the PBNP SER related to the LRA. The acceptability of these critical component locations, including the effects of reactor coolant environment, will continue to be confirmed by the Fatigue Monitoring Program.

7.1.19.2 GALL Report Consistency

In the PBNP LRA, Appendix B, Section B3.2, the applicant states that AMP B.3.2 is consistent with the GALL Report Section XI.M1.

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed in Attachment 5 of this audit and review report for PBNP AMP B3.2.

The project team reviewed the seven program elements (see Section 5.1 of this audit and review report) contained in the PBNP LRA AMP and associated bases documents against the GALL Report Section XI.M1 for consistency.

7.1.19.3 Exceptions to the GALL Report

None.

7.1.19.4 Enhancements

The PBNP LRA states that enhancements to the Fatigue Monitoring Program include modifying existing plant documents to monitor loading cycles and fatigue usage, including the effects of reactor water environment.

The administrative enhancements as described in PBNP AMP B3.2, "Fatigue Monitoring Program", are not necessary to demonstrate consistency with GALL criterion. As described in Section 4, Audit and Review Scope, the project team did not review these enhancements.

7.1.19.5 Operating Experience

The applicant documented a comprehensive review of industry issues and service-induced fatigue cracking since the late 1970s for Class 1 and 2 components and how the PBNP operating experience to date is addressed in the PBNP Fatigue Monitoring Program. The review included industry and plant-specific fatigue cracking operating experience associated with main feedwater piping and nozzle fatigue cracking resulting from thermal stratification cycling during low flow and hot standby conditions (NRC Bulletin 79-13), potential for fatigue cracking in normally stagnant piping systems attached to the reactor coolant system (NRC Bulletin 88-08), and thermal fatigue cracking of pressurizer surge piping (NRC Bulletin 88-11). The applicant's Fatigue Monitoring Program includes reviews of both industry and plant-specific operating experience regarding fatigue cracking for applicability to PBNP. These ongoing reviews are considered when selecting additional monitored components.

The project team reviewed the operating experience provided in the applicant's LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above industry and plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B3.2 will adequately manage the aging effects that have been observed at the applicant's plant.

7.1.19.6 UFSAR Supplement

The applicant provided its UFSAR supplement for the Fatigue Monitoring Program in the PBNP LRA, Appendix A, Section 15.3.3. The applicant stated that the Fatigue Monitoring Program is a confirmatory program that monitors loading cycles due to thermal and pressure transients and cumulative fatigue usage for selected reactor coolant system and other component locations. The program provides an analytical basis for confirming that the actual number of cycles does not exceed the number of cycles used in the design analysis and that the cumulative fatigue

usage will be maintained below the allowable limit during the period of extended operation.

The LRA Fatigue Monitoring Program UFSAR supplement also summarizes the time-limited aging analyses performed in the LRA Section 4.3. The applicant states that the impact of the effects of reactor coolant environment on component fatigue life has been evaluated for a sample of critical components, including the seven component locations selected in NUREG/CR-6260. The applicant states that appropriate environmental fatigue factors were calculated using the formulae from NUREG/CR-6583 for carbon and low-alloy steels and NUREG/CR-5704 for austenitic stainless steels. The applicant concludes that these critical component locations were determined to be acceptable for the period of extended operation, including the effects of reactor coolant environment, and that the acceptability of these critical component locations, including the effects of reactor coolant environment, will continue to be confirmed by the Fatigue Monitoring Program.

These commitments, including enhancements, are included in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC, dated February 25, 2004 (ML040580023).

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, and concluded 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).

7.1.19.7 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 consistencies 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).

7.1.20 Pre-Stressed Concrete Containment Tendon Surveillance Program (AMP B3.3)

In the PBNP LRA, Appendix B, Section B3.3, the applicant states that the PBNP AMP B3.3 is an existing program that is consistent with the GALL Report Section X.S1, "Concrete Containment Tendon Prestress."

7.1.20.1 Program Description

The PBNP LRA states that the Pre-Stressed Concrete Containment Tendon Surveillance Program is a confirmatory program that monitors the loss of containment prestressing forces in containment tendons throughout the life of the plant, including the period of extended operation. This program consists of an assessment of the results of the tendon prestressing force measurements performed in accordance with ASME Section XI, Subsection IWL. The assessment related to the adequacy of the prestressing forces will consist of the establishment of (1) acceptance criteria and (2) trend lines. The acceptance criteria will normally consist of a predicted lower limit (PLL) and the minimum required prestressing force or value (MRV).

7.1.20.2 GALL Report Consistency

The PBNP LRA states that AMP B3.3 is an existing program that is consistent with the GALL

Report Section X.S1.

The project team interviewed the applicant's technical staff and reviewed, in whole or in part, the documents listed for AMP B3.3 in Attachment 5 of this report, including "Pre-stressed Concrete Containment Tendon Surveillance Program Basis Document for License Renewal," LR-AMP-031-TENDON, Revision 2.

The project team reviewed the seven program elements contained in the PBNP LRA AMP and associated bases documentation against the GALL Report Section X.S1 for consistency.

7.1.20.3 Exceptions to the GALL Report

None.

7.1.20.4 Enhancements

In Appendix B, Section B3.3 of the LRA, the applicant stated that its pre-stressed concrete containment tendon surveillance program is consistent with GALL AMP X.S1, with enhancements. The applicant stated that, for the "detection of aging effects" program element, enhancements to the program include a more detailed requirements regarding the trending and evaluation of inspection results. Additionally, the IWL implementation schedule will be revised to include the period of extended operation.

GALL AMP X.S1 states that the loss of containment prestressing forces is detected by the program.

The applicant stated, in a letter from Mark P. Findlay (NMC) to the NRC, dated June 29, 1999, "Dockets 50-266 and 50-301, Reselection of Control Tendons in the Point Beach Nuclear Plant, Units 1 And 2," that the revised process for determining prestressing forces conforms with the intended requirements of Regulatory Guide 1.35, Revision 3, "Inservice Inspection of Ungrouted Tendons in Prestressed Concrete Containments," which is also consistent with Regulatory Guide 1.35.1,"Determining Prestressing Forces for Inspection of Prestressed Concrete Containments," referenced in the GALL Report. The enhancement pertaining to revising the IWL implementation schedule to include the period of extended operation will ensure that these actions are implemented prior to the period of extended operation.

The project team review information provide by the applicant, as documented in its PBNP audit and review report and held discussions with the applicant's technical staff. On the basis of its review, project team determines that the trending and evaluation of inspection results ensures that the AMP B3.3 is consistent with Regulatory Guide 1.35.1. On this basis, the project team finds this exception acceptable.

7.1.20.5 Operating Experience

The PBNP LRA states

> The calculated PLL and past inspection results indicate that the containment tendon wire prestress forces for PBNP Units 1 & 2 are expected to remain above the MRV for the period of extended operation.
>
> During the preparations for the 28th year tendon surveillance, it was discovered that the designated "common" or "control" tendons (i.e., those tendons in each group that are tested every

> surveillance in order to establish the trend of prestress force for that group) had been retensioned during each preceding surveillance as recommended by earlier versions of Reg. Guide 1.35. Periodic retensioning of these tendons did not allow an accurate determination of the prestress force relaxation trends. New common tendons which have not been previously retensioned were selected for the 28th year surveillance. These tendons will be tested in future surveillances in order to establish valid prestress force trends. The NRC was advised of this situation in a June, 1999 letter.
>
> A review of NRC Inspection Reports, QA Audit/Surveillance Reports, and Self-Assessments since 1999 revealed no issues or findings that could impact the effectiveness of the Pre-Stressed Concrete Containment Tendon Surveillance Program. As additional operating experience is obtained, lessons learned may be used to adjust this program.

The project team reviewed the letter from Mark P. Findlay (NMC) to Document Control Desk (NRC), dated June 29, 1999, "Dockets 50-266 and 50-301, Reselection of Control Tendons in the Point Beach Nuclear Plant, Units 1 And 2." This letter describes the designation of new control tendons that have not been retensioned in the past. This approach is consistent with the intended requirements of Regulatory Guide 1.35, Revision 3, and will ensure that during the remaining surveillances, the data obtained from the surveillances will allow for the development of a proper relaxation history and correlation of observed data with projected trends.

The project team also reviewed PPBNP Calculation 2000-0056, "Tendon Prestress Acceptance Limits," received December 5, 2000, which calculated containment PLL values for the period of extended operation. The calculation supported the applicant's conclusion that the containment tendon wire prestress forces are expected to remain above the MRV for the period of extended operation.

The project team reviewed the operating experience provided above and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above plant-specific operating experience and discussions with the applicant's technical staff, the project team concludes that AMP B3.3 will adequately manage the aging effects that are identified in the applicant's LRA for which this program is credited.

7.1.20.6 UFSAR Supplement

The applicant provides its UFSAR supplement for the Pre-Stressed Concrete Containment Tendon Surveillance Program in the PBNP LRA, Appendix A, Section 15.3.1. It states

> The Pre-Stressed Concrete Containment Tendon Surveillance Program is a confirmatory program that monitors the loss of containment prestressing forces in containment tendons throughout the life of the plant, including the period of extended operation. This program consists of an assessment of the results of the tendon prestressing force measurements performed in accordance with ASME Section XI, Subsection IWL. The assessment related to the adequacy of the prestressing forces will

consist of the establishment of (a) acceptance criteria, and (b) trend lines. The acceptance criteria will normally consist of a predicted lower limit (PLL) and the minimum required prestressing force or value (MRV). The trend line represents the trend of prestressing forces based on actual measured forces. Maintaining the prestressing force trend lines above the PLL ensures that the prestressing forces in the containment would not be below the MRVs prior to the end of the period of extended operation. In accordance with the requirements of 10 CFR 50.55a(b)(2)(viii)(B), an evaluation will be performed if the trend lines predict the prestressing forces in the containment to be below the MRV before the next scheduled inspection.

These commitments, including enhancements, are included in the LRA submittal letter, "Application for Renewed Operating License," from Gary D. Middlesworth to the NRC, dated February 25, 2004 (ML040580023).

The project team reviewed the UFSAR supplement, found that it was consistent with the GALL Report, and concluded 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).

7.1.20.7 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 applicant's AMP, the project team finds that the applicant's program provides for adequate management of the aging effects for which the program is credited 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). Based on 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 PBNP AMRs and its conclusions regarding these reviews are documented in this section.

The AMR reviews of PBNP LRA Sections 3.1 through 3.6 performed by the project team are provided in the following sections.

7.2.1 Aging Management of Reactor Coolant System

This section documents the project team's review of the applicant's aging management review (AMR) results for the reactor coolant system components and component groups associated with the following systems:

- class 1 piping/components system
- reactor vessel
- reactor vessel internals
- pressurizer
- steam generators
- non-class 1 RCS components system

7.2.1.1 Summary of Technical Information in the Application

In LRA Section 3.1, the applicant provided AMR results for the reactor coolant system components and component groups.

In Table 3.1.1, "Summary of Aging Management Evaluations in Chapter IV of NUREG-1801 for Reactor Coolant System," of the LRA, the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the reactor coolant system components and component groups that are relied on for license renewal. In Section 3.1.2.2 of the LRA, the applicant provided information concerning Table 3.1.1 components for which further evaluation is recommended by the GALL Report.

The applicant's AMRs incorporated applicable operating experience in the determination of aging effects requiring management (AERMs). These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

7.2.1.2 Project Team Evaluation

The project team reviewed LRA Section 3.1 to determine if the applicant provided sufficient information to demonstrate that the effects of aging for the reactor system components that are within the scope of license renewal and subject to an AMR will be adequately managed so that the intended functions will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Also, the project team performed an onsite audit of AMRs to confirm the applicant's claim that certain identified AMRs were consistent with the GALL Report. The project team did not repeat its review of the matters described in the GALL Report. However, the project team did verify that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL AMRs. The project team's evaluations of the AMPs are documented in Section 7.1 of this report. Detail of the project team's audit evaluation are documented in Section 7.2.1.2.1 of this report.

The project team also performed an onsite audit of those selected AMRs that were consistent with the GALL Report and for which further evaluation is recommended. The project team confirmed that the applicant's further evaluations were consistent with the acceptance criteria in Section 3.1.2.2 of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," dated July 2001. The project team's audit evaluation are documented in Section 7.2.1.2.2 of this report.

The project team performed an onsite audit and conducted a technical review of the remaining AMRs that were not consistent with or not address in the GALL Report. The audit and technical review included evaluating whether all plausible aging effects were identified and the aging effects listed were appropriate for the combination of materials and environments specified. The project team's audit evaluation is documented in Section 7.2.1.2.3 of this report.

Finally, the project team reviewed the AMP summary descriptions in the FSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the reactor coolant system components.

7.2.1.2.1 AMR Results That Are Consistent with the GALL Report, for Which Further

Evaluation is Not Recommended

Summary of Technical Information in the Application. In Section 3.1.2.1 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects related to class 1 piping/components system, reactor vessel, reactor vessel internals, pressurizer, steam generators, and non-class 1 RCS components system:

- ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program
- bolting integrity program
- boric acid corrosion program
- closed-cycle cooling water system surveillance program
- flow-accelerated corrosion program
- one-time inspection program
- periodic surveillance and preventive maintenance program
- reactor coolant system Alloy 600 inspection program
- reactor vessel surveillance program
- systems monitoring program
- steam generator integrity program
- water chemistry control program

Project Team Evaluation. In Tables 3.1.2-1 through 3.1.2-6 of the LRA, the applicant provided a summary of AMRs for class 1 piping/components system, reactor vessel, reactor vessel internals, pressurizer, steam generators, and non-class 1 RCS components system and identified which AMRs it considered to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report does not recommend further evaluation, the project team performed an audit and review to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant provided a note for each AMR line item. The notes described how the information in the tables aligns with the information in the GALL Report. The project team audited those AMRs with Notes A through E, which indicated the AMR was consistent with the GALL Report.

Note A indicated that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the AMP identified in the GALL Report. The project team audited these line items to verify consistency with the GALL Report and the validity of the AMR for the site-specific conditions.

Note B indicated 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 audited these line items to verify consistency with the GALL Report. The project team verified that the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The project team also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

Note C indicated 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 is consistent with the AMP identified by the GALL Report. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report. However, the applicant identified a different component in the GALL Report that had the same material, environment, aging effect,

and AMP as the component that was under review. The project team audited these line items to verify consistency with the GALL Report. The project team also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicated 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 audited these line items to verify consistency with the GALL Report. The project team verified whether the AMR line item of the different component was applicable to the component under review. The project team verified whether the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The project team also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

Note E indicated that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited. The project team audited these line items to verify consistency with the GALL Report. The project team also determined whether the identified AMP would manage the aging effect consistent with the AMP identified by the GALL Report and whether the AMR was valid for the site-specific conditions.

The project team conducted an audit and review of the information provided in the LRA. The project team did not repeat its review of the matters described in the GALL Report. However, the project team did verify that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL Report AMRs. The project team's evaluation is discussed below.

7.2.1.2.1.1 Loss of Fracture Toughness Due to Thermal Aging Embrittlement

In the discussion section of Table 3.1.1, Item 24 of the LRA, the applicant stated that it does not have cast austenitic stainless steel (CASS) RCS piping, but does have CASS primary loop elbows. The applicant stated that CASS thermal aging is addressed using a leak-before-break (LBB) evaluation method and that "significant margin exists between detectable flaw size and flaw instability." On that basis, the applicant concluded that an aging management program is not required to manage the aging effects of thermal embrittlement for CASS primary loop elbows.

The project team also noted that, in LRA Table 3.1.2-1, "Reactor Coolant System - Class 1 Piping/Components System - Summary of Aging Management Review," the primary loop elbows component type is listed, but did not list loss of fracture toughness due to thermal aging embrittlement as aging effect requiring management.

On the basis of its review, the project team determined that it does not agree with the applicant's conclusions because for CASS piping, loss of fracture toughness due to thermal aging embrittlement is an aging effect requiring management in accordance with the criteria contained in 10 CFR 54.21(a)(3). This is further supported by the GALL AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)," which identifies acceptable aging management options as "enhanced volumetric examination to detect and size cracks or plant of component-specific flaw tolerance evaluation." In addition, the project team finds, with regard to the applicant's use of LBB evaluation method, that LBB is not equivalent to a flaw tolerance methodology because it assumes through wall leakage and therefore does not assure the safety function of pressure boundary integrity.

The applicant was requested, in RAI Table 3.1.1-1, CASS Thermal Aging, to provide clarification of how it manages the aging effect of loss of fracture toughness due to thermal aging embrittlement for CASS primary loop elbows. The applicant has agreed to probe consistent with the GALL report and to perform a flaw tolerance evaluation < Confirmatory item Table 3.1.1-1>

The project team reviewed the 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 engineered safety features 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 LRA Table 3.1.1 (Table 1), the applicant's references to the GALL Report are acceptable and no further project team review is required.

Conclusion. The project team has evaluated the applicant's claim of consistency with the GALL Report. The project team also has reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the project team finds that the AMR results, except for CASS piping, which the applicant claimed to be consistent with the GALL Report, are consistent with the AMRs in the GALL Report. Therefore, the project team finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.1.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In Section 3.1.2.2 of the LRA, the applicant provided further evaluation of aging management as recommended by the GALL Report for reactor vessel, internals, reactor coolant system, and steam generator components. The applicant provided information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to pitting and crevice corrosion
- loss of fracture toughness due to neutron irradiation embrittlement
- crack initiation and growth due to thermal and mechanical loading or stress corrosion cracking
- crack growth due to cyclic loading
- changes in dimension due to void swelling
- crack initiation and growth due to stress corrosion cracking or primary water stress corrosion cracking
- crack initiation and growth due to stress corrosion cracking or irradiation-assisted stress corrosion cracking
- loss of preload due to stress relaxation
- loss of section thickness due to erosion
- crack initiation and growth due to PWSCC, ODSCC, or intergranular attack or loss of material due to wastage and pitting corrosion or loss of section thickness due to fretting and wear or denting due to corrosion of carbon steel tube support plate
- loss of section thickness due to flow-accelerated corrosion

- ligament cracking due to corrosion
- loss of material due to flow-accelerated corrosion

Project team Evaluation. For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the project team audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues that were further evaluated. In addition, the project team reviewed the applicant's further evaluations against the criteria contained in Section 3.1.3.2 of the SRP-LR. The project team's evaluation of is discuss below.

7.1.*1.2.2.*1 Cumulative Fatigue Damage

PBNP LRA Section 3.1.2.2.1 is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed separately in Section 4 of the PBNP SER and is reviewed by the NRR DE staff. Therefore, the project team did not review this item.

7.1.*1.2.2.*2 Loss of Material Due to Pitting and Crevice Corrosion

The project team reviewed LRA Section 3.1.2.2.2 against the criteria in SRP-LR Section 3.1.2.2.2.

In LRA Section 3.1.2.2.2, the applicant addressed loss of material of steam generator assemblies due to pitting and crevice corrosion.

SRP-LR Section 3.1.2.2.2 stated that loss of material due to pitting and crevice corrosion could occur in the steam generator shell assembly. The existing program relied on control of water chemistry to mitigate corrosion and ISI to detect cracking due to loss of material. NRC Information Notice (IN) 90-04, "Cracking of the Upper Shell-to-Transition Cone Girth Welds in Steam Generators," stated that if general corrosion pitting of the shell exists, the existing program may not be sufficient. In that case the GALL Report recommends augmented inspections to manage the aging effect.

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," to detect loss of material and GALL AMP XI.M2, "Water Chemistry," to mitigate corrosion. The GALL Report also recommends a plant-specific program to conduct augmented inspections.

The applicant stated, in the LRA, that its PBNP AMP B2.1.24, "Water Chemistry Control Program" and inservice inspections performed in accordance with its PBNP AMP B2.1.1, "ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program," are used to manage loss of material due to pitting and crevice corrosion on the internal surfaces of the steam generator shell. The applicant also stated that it augments its water chemistry control program and inservice inspections with a plant-specific aging management program, PBNP AMP B2.1.19, "Steam Generator Integrity Program," that provides all-inclusive guidance for the management of steam generator assets.

The project team reviewed the applicant's water chemistry control program, ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program, and steam generator integrity program. Evaluation of water chemistry control program, ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program are documented in Sections 7.1.17 and 7.1.1 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.19, Steam

Generator Integrity Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMP B2.1.19. The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.1.2.2.2 for further evaluation. For those line items that apply to LRA Section 3.1.2.2.2, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.1.*1.2.2.*3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

PBNP LRA Section 3.1.2.2.3 is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed separately in Section 4 of the PBNP SER and is reviewed by the NRR DE staff. Therefore, the project team did not review this item.

7.1.*1.2.2.*4 Crack Initiation and Growth Due to Thermal and Mechanical Loading or Stress Corrosion Cracking

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

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

SRP-LR Section 3.1.2.2.4 stated that the GALL Report recommends that a plant-specific destructive examination or a nondestructive examination (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 period of extended operation. The applicant should verify that service-induced weld cracking is not occurring in small-bore piping less than NPS 4. A one-time inspection of a sample of locations is an acceptable method to ensure that the aging effect is not occurring and that the component'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 GALL AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," to detect loss of material, and GALL AMP XI.M2, "Water Chemistry," to mitigate SCC.

The applicant stated, in the LRA, that its PBNP AMP B2.1.24, "Water Chemistry Control Program," and inservice inspections performed in accordance with its PBNP AMP B2.1.1, "ASME Section XI, Subsections IWB, IWC, and IWD, Inservice Inspection Program," are used to manage crack initiation and growth due to thermal and mechanical loading or stress corrosion cracking. The project team reviewed the applicant's water chemistry control program and ASME Section XI, Subsections IWB, IWC, and IWD, inservice inspection program and its evaluation is documented in Section 7.1.17 and Section 7.1.1 of this SER, respectively.

The applicant further stated, to address the GALL Report recommendation that a plant-specific destructive examination or an NDE that permits inspection of the inside surfaces of the piping be conducted, in the LRA, that it has implemented a risk-informed (RI) inservice inspection (ISI) methodology, in lieu of the requirements specified in ASME Section XI, to select RCS piping

welds for inspection. To address the GALL Report for an inspection of piping less than NPS 4, the application stated that small-bore pipe butt-welded connections are included in the final weld selection for performance of volumetric examination. The project team verified that the applicant used the RI-ISI process to determine the most susceptible locations for performing the volumetric examination and did not eliminate small-bore pipe welds from examination with the RI-ISI process. The project team verified that the applicant's RI-ISI plan will perform a volumetric examination.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.1.2.2.4 for further evaluation. For those line items that apply to LRA Section 3.1.2.2.4, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.1.*1.2.2.*5 Crack Growth Due to Cyclic Loading

PBNP LRA Section 3.1.2.2.5 is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed separately in Section 4 of the PBNP SER and is reviewed by the NRR DE staff. Therefore, the project team did not review this item.

7.1.*1.2.2.*6 Changes in Dimension Due to Void Swelling

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

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

SRP-LR Section 3.1.2.2.6 stated that the GALL Report recommends that changes in dimension due to void swelling in reactor internals 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 fracture toughness associated with swelling.

The applicant stated, in the LRA, that the void swelling of reactor vessel internals is managed by its PBNP AMP B2.1.17, "Reactor Vessel Internals Program." Further, the applicant stated that transmission electron microscopy studies of thin foils prepared from an intact baffle/former bolt and locking device removed from the Point Beach Unit 2 RVI in 1999 indicate that voids were present in the threaded end of the bolt but not in the head or the 304 stainless steel locking device. The maximum void volume observed in the 347 stainless steel bolt material—0.03%—is small, and preliminary extrapolation to the end of extended life using a simple square law suggests that void swelling should not be a concern. The industry is currently developing technical guidance to address the issue of void swelling, and the applicant has committed to further understanding of this aging effect through industry programs that may provide additional bases for supplemental examinations or component-specific evaluations.

The project team evaluated the applicant's reactor vessel internals program and its evaluation is documented in Section 7.1.14 of this report. 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. The applicant has committed to implement the appropriate recommendations resulting from the

industry efforts. The applicant also committed, through an LRA supplement letter, dated July 12, 2004, that the revised program description, including a comparison with the 10 program elements of the NUREG-1801 program, will be submitted to the NRC for approval two years prior to the period of extended operation.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.1.2.2.6 for further evaluation. For those line items that apply to LRA Section 3.1.2.2.6, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.1.*1.2.2.*7 Crack Initiation and Growth Due to Stress Corrosion Cracking or Primary Water Stress Corrosion Cracking

The project team reviewed LRA Section 3.1.2.2.7 against the criteria in SRP-LR Section 3.1.2.2.7, which recommends plant-specific programs to address these aging mechanisms.

In the LRA Section 3.1.2.2.7, the applicant addresses (1) crack initiation and growth due to SCC and primary water stress corrosion cracking (PWSCC) in the 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; (2) crack initiation and growth due to SCC in the pressurizer surge line piping and fittings fabricated of CASS; and (3) crack initiation and growth due to PWSCC in nickel-based alloy material such as the pressurizer instrumentation nozzles, heater sheaths and sleeves, and thermal sleeves.

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 or material guidelines of NUREG 0313.

- 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 Inconel 182 weld.

The applicant, in LRA Section 3.2.2.7, stated that the applicant uses the following plant-specific programs for each of the three SRP-LR criteria:

- The core support pads and the bottom head instrument penetrations are fabricated from Alloy 600. Crack initiation and growth of the bottom head penetrations due to

SCC/PWSCC is managed at PBNP by a combination of the PBNP AMP B2.1.24, "Water Chemistry Control Program" and the PBNP AMP B2.1.16, "Reactor Coolant System Alloy 600 Inspection Program." The RCS Alloy 600 inspection program is a plant-specific program that includes participation in industry initiatives related to management of Alloy 600 penetration cracking issues. The core support pads are susceptible to crack initiation and growth due to SCC/PWSCC and are managed at PBNP by a combination of the PBNP AMP B2.1.24, "Water Chemistry Control Program," and the PBNP AMP B2.1.1, "ASME Section XI, Subsections IWB, IWC, and IWD In-service Inspection Program." The reactor vessel leak detection line is outside the primary pressure boundary, and is therefore not in-scope. The pressurizer spray head performs no license renewal intended function at PBNP, including Appendix R considerations (the pressurizer cool-down rate required for an Appendix R scenario is achievable without a functioning spray head). The steam generator instrument nozzles are low-alloy steel, not Alloy 600 or stainless steel, and therefore are not included in this component group.

- The primary loop elbows are CASS material and are subject to these aging effects. PBNP AMP B2.1.24, "Water Chemistry Control Program," monitors and controls primary water chemistry in accordance with the guidelines of EPRI TR-(105714) and therefore effectively manages crack initiation and growth due to SCC. PBNP AMP B2.1.1, "ASME Section XI, Subsections IWB, IWC, and IWD In-service Inspection Program," is also credited with confirming the effectiveness of the water chemistry control program.

- There are no components fabricated from Alloy 600 in the PBNP pressurizer, and therefore this line item was not used. Instrument penetrations, heater well tubes, and adapters are stainless steel.

The project team reviewed the applicant's water chemistry control program, the reactor coolant system Alloy 600 inspection program, and the ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program and its evaluation is documented in Section 7.1.17, Section 7.1.14 and Section 7.1.1 of this report, respectively. The project team finds that these programs will mange the aging effects of crack initiation and growth due to SCC and PWSCC in the reactor coolant system components.

In LRA Section 3.1.2.2.7.1, the applicant stated that the reactor vessel leak detection line is outside the primary pressure boundary, and is therefore not in-scope. The pressurizer spray head performs no license renewal intended function at PBNP, including Appendix R considerations (the pressurizer cooldown rate required for an Appendix R scenario is achievable without a functioning spray head). The steam generator instrument nozzles are low-alloy steel, not Alloy 600 or stainless steel, and therefore are not included in this component group.

The project team has reviewed the applicant's claims that these components are not in the scope of the PBNP license renewal scoping and screening. DSSA has reviewed this and accepted it in sections 2.3.1.2.2 and 2.3.1.4.2 of the SER. On the basis of its review, the staff determined that these components are not in scope.

In LRA Section 3.1.2.2.7.2, the applicant stated the primary loop elbows are CASS material and are subject to these aging effects. The applicant proposed to manage these aging effects using PBNP AMP B2.1.24, "Water Chemistry Control Program" and PBNP AMP B2.1.1, "ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program."

The project team reviewed the applicant's water chemistry control program and the ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program and its evaluation is documented in Section 7.1.17 and Section 7.1.1 of this SER, respectively. On the basis of its

review, the project team finds that these programs will mange the aging effects of crack initiation and growth due to SCC and PWSCC in the reactor coolant system components.

In LRA Section 3.1.2.2.7.3, the applicant stated that there are no components fabricated from Alloy 600 in the PBNP pressurizer, and therefore this line item was not used. Instrument penetrations, heater well tubes, and adapters are stainless steel.

During the audit, the project team held discussions the applicant's technical staff. The project team confirmed that there are no Alloy 600 components in the PBNP pressurizes. On this basis, the project team finds this is acceptable.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.1.2.2.7 for further evaluation. For those line items that apply to LRA Section 3.1.2.2.7, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.1.*1.2.2.*8 Crack Initiation and Growth Due to Stress Corrosion Cracking or Irradiation-Assisted Stress Corrosion Cracking

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

In LRA Section 3.1.2.2.8, the applicant addressed crack initiation and growth due to SCC or irradiation-assisted stress corrosion cracking (IASCC) that could occur in baffle/former 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 bolts in the reactors. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

PBNP LRA Section 3.2.2.8 provides the following discussion for managing this aging effect:

> Crack initiation and growth due to SCC and IASCC were identified as aging effects requiring management for PBNP baffle/former bolts. A combination of the PBNP AMP B2.1.24, "Water Chemistry Control Program" and PBNP AMP B2.1.17, "Reactor Vessel Internals Program," is used to manage this aging effect. During the 1998 refueling outage, the entire population of 728 Type 347 stainless steel baffle/former bolts was selected for inspection by UT at Point Beach Unit 2. A total of 175 bolts were replaced with Type 316 stainless steel bolts during the outage. These bolts were part of a pre-qualified minimum bolt pattern for PBNP. The Westinghouse Owners Group developed a an NRC-approved methodology (WCAP-15029-P-A), to determine number and distribution of intact and functional baffle bolts required to ensure safe plant operation. Plant specific applications of the Westinghouse methodology were performed in support of the inspection and replacement programs at Point Beach Unit 2. Maintaining the structural integrity of the bolts within this pattern assures compliance with requirements of ASME III, Subsection NG (1989), considering dynamic loads generated by a 10" line break in the reactor coolant system. This LOCA load bounds those that are generated by effects of earthquake, thermal, deadweight, and flow-induced vibration. No further inspections of baffle/former or barrel/former bolts are warranted for Unit 2 in view of this inspection and replacement. Point Beach will continue to monitor and participate in industry initiatives with regard to baffle/former and barrel/former

bolt performance to support aging management for the Unit 1 bolting. As new information and technology becomes available, the plant-specific PBNP AMP B2.1.17, "Reactor Vessel Internals Program," will be modified to incorporate enhanced surveillance techniques.

The project team's evaluation of the water chemistry control program and the reactor vessel internals program is documented in Section 7.1.17 of this report. The project team evaluated the applicant's reactor vessel internals program and its evaluation is documented in Section 7.1.14 of this report. The applicant has committed to implement the appropriate recommendations resulting from the industry efforts. The applicant also committed, through an LRA supplement letter, dated July 12, 2004, that the revised program description, including a comparison with the 10 program elements of the NUREG-1801 program, will be submitted to the NRC for approval two years prior to the period of extended operation.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.1.2.2.8 for further evaluation. For those line items that apply to LRA Section 3.1.2.2.8, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.1.*1.2.2.*9 Loss of Preload Due to Stress Relaxation

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

In the LRA Section 3.1.2.2.9, the applicant addressed loss of preload due to stress relaxation that could occur in baffle/former 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 bolts in the reactor. The GALL Report recommends a plant-specific AMP to ensure that these aging effects are adequately managed.

The applicant stated, in LRA Section 3.1.2.2.9, that loss of preload due to stress relaxation was identified as an aging effect requiring management for PBNP baffle/former bolts. Loss of preload due to stress relaxation will be managed by its PBNP AMP B2.1.17, "Reactor Vessel Internals Program." PBNP will continue to participate in industry investigations of aging effects applicable to reactor vessel internals as well as initiatives to develop advanced inspection techniques. Aging management activities or surveillance techniques resulting from these initiatives will be incorporated, as required, as enhancements to its reactor vessel internals program.

The project team evaluated the applicant's reactor vessel internals program and its evaluation is documented in Section 7.1.14 of this report. The applicant has committed to implement the appropriate recommendations resulting from the industry efforts. The applicant also committed, through an LRA supplement letter, dated July 12, 2004, that the revised program description, including a comparison with the 10 program elements of the NUREG-1801 program, will be submitted to the NRC for approval two years prior to the period of extended operation.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.1.2.2.9 for further evaluation. For those line items that apply to LRA Section 3.1.2.2.9, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10

CFR 54.21(a)(3).

7.1.*1.2.2.*10 Loss of Section Thickness Due to Erosion

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

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

SRP-LR Section 3.1.2.2.10 stated that loss of section thickness due to erosion could occur in steam generator feedwater impingement plates and supports. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed.

The applicant stated, in LRA Section 3.1.2.2.10, that for the PBNP steam generator design, this component group is not applicable. The feedwater delivery to the steam generators at PBNP is through feed rings to J-tubes. The feed rings and J-tubes perform no license renewal intended function. The project team verified through discussions with the applicant's technical project team that the J-tubes perform no license renewal function and that the applicant does not have any components for which this aging effect needs to be managed. Staff questioned the applicant in RAI 3.1.1-2 to provide a better justification. The applicant has agreed to put the feed rings and J-tubes into the scope of license renewal and mange the aging effect of cracking and erosion. This is confirmatory item RAI 3.1.1-2. Based on the conformity item this staff finds this acceptable.

7.1.*1.2.2.*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

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

In the LRA Section 3.1.2.2.11, the applicant addressed crack initiation and growth due to PWSCC, SCC, 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 steam generator tubes and plugs.

SRP-LR Section 3.1.2.11 states that crack initiation and growth due to PWSCC, outside diameter stress corrosion cracking, 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 steam generator tubes, repair sleeves, and plugs. All PWR licensees have committed voluntarily to a steam generator (SG) degradation management program described in NEI 97-06; these guidelines are currently under project team review. The GALL Report recommends that an AMP, based on the recommendations of project team approved NEI 97-06 guidelines or alternative regulatory basis for SG degradation management, be developed to ensure that this aging effect is adequately managed.

The applicant stated, in the LRA, that crack initiation and growth due to PWSCC, SCC, or IGA or loss of material due to wastage and pitting corrosion or deformation due to corrosion could occur in nickel-based alloy components of the SG tubes and plugs. The applicant credited its PBNP AMP B2.1.19, "Steam Generator Integrity Program," supplemented by its PBNP AMP B2.1.24, "Water Chemistry Control Program" to mange this aging effect.

The project team's evaluation of the water chemistry control programs are documented in 7.1.17. For general and pitting corrosion, assessment of tube integrity, and plugging or repair criteria of flawed tubes, the steam generator structural integrity program acceptance criteria are in accordance with NEI 97-06 guidelines. The NRR DE staff evaluation of PBNP LRA AMP B2.1.19, Steam Generator Integrity Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMP B2.1.19. On the basis of its review of the steam generator integrity and water chemistry control programs, the project team finds that the applicant appropriately evaluated AMR results involving plant-specific programs to address these aging mechanisms, as recommended in the GALL Report.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.1.2.2.11 for further evaluation. For those line items that apply to LRA Section 3.1.2.2.11, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.1.*1.2.2.*12 Loss of Section Thickness Due to Flow-Accelerated Corrosion

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

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

SRP-LR Section 3.1.2.2.12 states the 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 AMP be evaluated and, on the basis of the guidelines of NRC GL 97-06, an inspection program for steam generator internals be developed to ensure that this aging effect is adequately managed.

The applicant stated, in the LRA, that the PBNP steam generator tube support lattice bars are fabricated from either stainless steel or Alloy 600 in the PBNP replacement steam generators. These materials are not susceptible to FAC. However, these materials are susceptible to cracking, which is managed by PBNP AMP B2.1.24, "Water Chemistry Control Program," and augmented by PBNP AMP B2.1.19, "Steam Generator Integrity Program," which provides for secondary side inspections to verify the effectiveness of water chemistry control.

The project team confirmed that the lattice bars are not made for carbon steel. The project team considered industry experience and agrees that lattice bars made from stainless steel or Alloy 600 are not susceptible to flow assisted corrosion. Furthermore, base on industry experience project team agrees that components made from stainless steel or Alloy 600 in treated water- secondary ($T<120^{o}F$) are susceptible to cracking due to SCC. The project team's evaluation of the water chemistry control programs is documented in Section 7.1.17.
The NRR DE staff evaluation of PBNP LRA AMP B2.1.19, Steam Generator Integrity Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMP B2.1.19. The project team agrees that the water chemistry program will mitigate cracking and that the steam generator integrity program will confirm that cracking is not occurring . On the basis of its review of the steam generator integrity and water chemistry control programs and that the component is made from either stainless steel or Alloy 600, the project team finds that the applicant appropriately evaluated AMR results involving plant-specific programs to address these aging mechanisms.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.1.2.2.12 for further evaluation. For those line items that apply to LRA Section 3.1.2.2.12, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.1.*1.2.2.*13 Ligament Cracking Due to Corrosion

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

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

The applicant stated, in the LRA, that carbon steel components are not part of the PBNP SG tube support-plate. However, cracking due to SCC was identified as the aging effect requiring management for the stainless steel tube support plates in the PBNP steam generators. The applicant also stated that this aging effect is managed by PBNP AMP B2.1.24, "Water Chemistry Control Program," and augmented by PBNP AMP B2.1.19, "Steam Generator Integrity Program," which provides for secondary side inspections to verify the effectiveness of water chemistry control.

The project team confirmed that the these components are not made for carbon steel. Furthermore, base on industry experience project team agrees that components made from stainless steel or Alloy 600 in treated water- secondary ($T>120^{o}F$) are susceptible to cracking due to SCC. The project team's evaluation of the water chemistry control programs are documented in 7.1.17. The NRR DE staff evaluation of PBNP LRA AMP B2.1.19, Steam Generator Integrity Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMP B2.1.19. The project team agrees that the water chemistry program will mitigate cracking and that the steam generator integrity program will confirm that cracking is not occurring.
On the basis of its review of the steam generator integrity and water chemistry control programs, the project team finds that the applicant appropriately evaluated AMR results involving plant-specific programs to address these aging mechanisms.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.1.2.2.13 for further evaluation. For those line items that apply to LRA Section 3.1.2.2.13, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.1.*1.2.2.*14 Loss of Material Due to Flow-Accelerated Corrosion

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

In the LRA Section 3.1.2.2.14, the applicant stated that this item is applicable to PWR (CE) only. PBNP Unit 1 and Unit 2 reactors are Westinghouse designed.

On the basis that these components are not part of the PBNP design, the project team finds that this aging effect is not applicable to PBNP.

Conclusion. On the basis of its review, for component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the project team determines that (1) those attributes or features for which the applicant claimed consistency with the GALL Report were indeed consistent, and (2) the applicant adequately addressed the issues that were further evaluated. 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 for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.*1.2.3* *AMR Results That Are Not Consistent With or Not Addressed in the GALL Report*

Summary of Technical Information in the Application. In Tables 3.1.2-1 through 3.1.2-6 of the LRA, the applicant provided additional details of the results of the AMRs for material, environment, aging effect requiring management, and AMP combinations that are not consistent with the GALL Report or are not addressed in the GALL Report.

In Tables 3.1.2-1 through 3.1.2-6, the applicant indicated, via Notes F through J, that neither the identified component nor the material and environment combination is evaluated in the GALL Report and provided information concerning how the aging effect will be managed.

Project Team Evaluation. For component type, material and environment combination that are not evaluated in the GALL Report, the project team reviewed the applicant's evaluation to determine whether the applicant had demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained during the period of extended operation.

The project team's evaluation is discussed below.

7.2.*1.2.3*.1 Reactor Coolant System Components That Have No Aging Effect (LRA Table 3.1.2.-1 to Table 3.1.2- 6)

In LRA Table 3.1.2.-1 to Table 3.1.2- 6, the applicant identified line items where no aging effects were identified as a result of the its aging review process. Specifically, instances in which the applicant stated that no aging effects were identified occurred when components fabricated from carbon, stainless steel, copper alloy or stainless steel clad material were exposed to air or to an inert gas (nitrogen as an example). Neither air nor inert gas is identified in the GALL Report as an environment for these components and materials. No aging effects are considered to be applicable to carbon steel, stainless steel or stainless steel clad components exposed to dry air, or to an inert gas environments.

On the basis of its review of current industry research and operating experience, the project team finds that dry air on metal will not result in aging that will be of concern during the period of extended operation. These RCS components are exposed to high-temperature internal flow, which creates a dry air environment. Stainless steel and nickel-based alloy components in air or an inert gas environment are not susceptible to general corrosion that would affect their intended function. Therefore, the project team concludes that there are no applicable aging effects requiring management for carbon steel, stainless steel or stainless steel clad components exposed to air, or to an inert gas environments.

7.2.*1.2.3*.2 Class 1 Piping/Components System - Summary of Aging Management Evaluation - LRA Table 3.1.2-1

The project team reviewed Table 3.1.2-1 of the LRA, which summarized the results of AMR evaluations for the Class 1 piping/components system component groups.

The applicant proposed to manage loss of material in stainless steel, low-alloy stainless steel clad and nickel based alloy components types including orifices and reducers, piping and fittings, piping welds, vent connections, piping elbows, reactor coolant pump lugs, reactor coolant pumps, thermal barrier heat exchanger tubing, thermowells, and valves in the reactor coolant pressure boundary exposed to treated, borated water using PBNP AMP B2.1.24, “Water Chemistry Control Program.”

The project team reviewed the applicant’s water chemistry control program and its evaluation of this AMP is documented in Section 7.1.17 of this report. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that the effects of loss of material (pitting and crevice corrosion) on stainless steel and nickel-based alloy components in chemically treated, borated water are effectively managed using water chemistry controls program. On this basis, the project team finds that management of loss of material in class 1 piping/components system is acceptable.

The applicant proposed to manage cracking in stainless steel, nickel-based alloy and low-alloy steel clad with stainless steel components exposed to treated borated water using the PBNP LRA AMP B2.1.24, “Water Chemistry Control Program,” and AMP B2.1.13, “One-Time Inspection Program,” or AMP B2.1.1, “ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program.”

The project team reviewed the applicant’s water chemistry control program, one-time inspection program, and ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program and its evaluation of these AMP is documented in Sections 7.1.17, 7.1.11, and Section 7.1.1 of this report, respectively. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that the effects of cracking in stainless steel, nickel-based alloy and low-alloy steel clad with stainless steel components exposed to treated borated water are effectively managed using the water chemistry control program, the one-time inspection program, and the ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program. On this basis, the project team finds that management of cracking in class 1 piping/components system is acceptable.

The applicant proposed to manage erosion of stainless steel orifices and reducers exposed to treated borated water using the PBNP LRA AMP B2.1.13, “One-Time Inspection Program.” The applicant stated that when used to detect the aging effect of loss of wall thickness due to erosion, the one-time inspection program uses wall thickness as a parameter that must be monitored and visual (VT-3) and/or volumetric (RT or UT) as the appropriate inspection method. Volumetric NDE methods to measure wall thickness are currently used by industry to detect and monitor erosion/corrosion in piping systems at nuclear power plants. The applicant stated that it will use wall thickness measurements and compare those wall thickness measurements against criteria based upon design criteria for the subject component.

The project team reviewed the applicant’s one-time inspection program and its evaluation of this AMP is documented in Section 7.1.11 of this report. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that the effects of erosion of stainless steel orifices and reducers exposed to treated borated water are effectively managed using one-time inspection program. On this basis, the project team finds that management of loss of material in class 1 piping/components system is acceptable.

7.2.*1.2.3*.3 Reactor Vessel - Summary of Aging Management Evaluation - LRA Table 3.1.2-2

The project team reviewed Table 3.1.2-2 of the LRA, which summarized the results of AMR evaluations for the reactor vessel component groups.

The applicant proposed to manage loss of material for stainless steel and nickel based alloy components or components clad using stainless steel or nickel alloy cladding including bottom mounted instrumentation guides, control element drive mechanism housing and flanges, seal table fittings, instrumentation tubes and safe ends and vent pipes exposed to treated, borated water using PBNP AMP B2.1.24, “Water Chemistry Control Program.” These components are also subject to inspection under the requirements of the ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program, which provide a combination of volumetric and visual examinations that will detect loss of material and confirm the effectiveness of the water chemistry program.

The project team reviewed the applicant’s water chemistry control program and the ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program and its evaluation of these AMPs is documented in Section 7.1.17 and 7.1.1 of this report, respectively. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that the effects of loss of material for stainless steel and nickel based alloy components or components clad using stainless steel or nickel alloy cladding including bottom mounted instrumentation guides, control element drive mechanism housing and flanges, seal table fittings, instrumentation tubes and safe ends and vent pipes exposed to treated, borated water are effectively managed using water chemistry controls program and the ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program. On this basis, the project team finds that management of loss of material in reactor vessel is acceptable.

7.2.*1.2.3*.4 Reactor Vessel Internals - Summary of Aging Management Evaluation - LRA Table 3.1.2-3

The project team reviewed the LRA Table 3.1.2-3, which summarizes the results of AMR evaluations in the SRP-LR for the reactor vessel internals component groups.

The applicant proposed to manage loss of material in stainless steel material of reactor vessel internals component types exposed to treated water using the PBNP AMP B2.1.24, “Water Chemistry Control Program.”

The project team reviewed the applicant’s water chemistry control program and its evaluation of this AMP is documented in Section 7.1.17 of this report. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that the loss of material in stainless steel for component types of reactor vessel internals exposed surfaces and crevice locations exposed to treated water are effectively managed using water chemistry controls program. On this basis, the project team finds that management of loss of material in reactor vessel is acceptable.

The applicant proposed to manage loss of fracture toughness due to neutron irradiation embrittlement in stainless steel components in the fuel zone, including the reactor vessel upper core plate and the reactor vessel upper core plate fuel pin alignment, using PBNP AMP B2.1.17, “Reactor Vessel Internals Program.”

The applicant stated that it has performed destructive examinations of PBNP baffle/former bolts removed during the 1999 refueling outage suggest that void swelling and loss of fracture toughness should not represent a concern during the period of extended operation. The reactor vessel upper core plate and the reactor vessel upper core plate fuel pin alignment components are not included among the components subject to significant irradiation embrittlement because of their location remote from the fuel zone.

The project team finds that, based on its review of the description of the applicant's reactor pressure vessel internals program and on the commitment that the applicant will provide the reactor pressure vessel internals program for staff review prior to the period of extended operation, as discussed in Section 7.1.14 of this report, management of loss of fracture toughness using PBNP AMP B2.1.17, "Reactor Vessel Internals Program," is acceptable.

7.2.*1.2.3.*5 Pressurizer - Summary of Aging Management Evaluation - LRA Table 3.1.2-4

The project team reviewed the LRA Table 3.1.2-4, which summarizes the results of AMR evaluations in the SRP-LR for the pressurizer component groups.

The applicant proposed to manage the loss of material of stainless steel, low-alloy carbon steel with stainless steel clad and nickel-alloy for pressurizer components including pressurizer instrument nozzles, pressurizer manway cover, pressurizer relief nozzle, pressurizer relief nozzle safe end, pressurizer safety nozzle, pressurizer nozzle safe end, pressurizer shell, pressurizer spray nozzle, pressurizer nozzle thermal sleeve, pressurizer surge nozzle, pressurizer surge nozzle thermal sleeve and pressurizer upper head exposed to treated borated water using PBNP AMP B2.1.24, "Water Chemistry Control Program." During the audit the applicant clarified that they considered use of only the water chemistry control program sufficient fo manage these components because during previous work on the pressurizes these components were visually observed and no records of material loss was recorded. The applicant considered this operating observations equivalent to the purpose of a one-time inspection program. Furthermore the applicant stated that industry operating experience on these components has not identified record of material loss.

The project team reviewed the applicant's water chemistry control program and its evaluation of this AMP is documented in Section 7.1.17 of this report. On the basis of its review of the water chemistry program, the applicants visual observations of the components and the lack of industry operating experience identifying material loss, the project team finds that the effects of loss of material of stainless steel, low-alloy carbon steel with stainless steel clad and nickel-alloy components in treated borated water are effectively managed using water chemistry controls program. On this basis, the project team finds that management of loss of material in pressurizer is acceptable.

7.2.*1.2.3.*6 Steam Generators - Summary of Aging Management Evaluation - LRA Table 3.1.2-5

The project team reviewed Table 3.1.2-5 of the PBNP LRA, which summarizes the results of AMR evaluations in the SRP-LR for the steam generator component groups.

The applicant proposed to manage loss of material of nickel-alloy for SGs components including tube plugs, U-tubes, divider plate, steam generator blow down piping nozzles, steam generator components in contact with primary water, steam generator flow limiter and tube plate exposed to treated, borated water, using PBNP AMP B2.1.24, "Water Chemistry Control Program." The applicant also proposed to manage cracking in the same material component type environment conditions using both PBNP AMP B2.1.24, "Water Chemistry Control Program" and PBNP AMP B2.1.1, " ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program," to confirm the effectiveness of the water chemistry control program. The PBNP AMP B2.1.24 states that for low-flow or stagnant portions of a system, a one-time inspection of selected components at susceptible locations provides verification of the effectiveness of the Water Chemistry Control Program. No verification inspections are required for intermediate and high flow regions. The applicant stated that for the applications using only the water chemistry control program have flows that are either medium or high flows and therefore, augmented inspections are not needed.

The GALL Report states in Appendix B, Section XI.M1, Water Chemistry that GALL Report

"identifies those circumstances in which the water chemistry program is to be augmented to manage the effects of aging for license renewal. For example, the water chemistry program may not be effective in low flow or stagnant flow areas. Accordingly, in certain cases as identified in the GALL report, verification of the effectiveness of the chemistry control program is undertaken to ensure that significant degradation is not occurring and the component intended function will be maintained during the extended period of operation. As discussed in the GALL report for these specific cases, an acceptable verification program is a one-time inspection of selected components at susceptible locations in the system." The staff considers the statement contained in LRA AMP B2.1.24 consistent with the GALL report statement and therefore, finds use of the water chemistry control AMP without an augmented inspection consistent with the GALL Report.

The project team reviewed the applicant's water chemistry control program and the ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program and its evaluation of these AMPs is documented in Section 7.1.17 and 7.1.1 of this report, respectively. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that degradation mechanism of pitting and crevice corrosion on stainless steel components in chemically treated borated water is effectively managed using water chemistry control program. Also, on the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that the effects of cracking in stainless steel components exposed to chemically treated borated water are effectively managed using the water chemistry control program and the ASME Section XI, Subsections IWB, IWC, and IWD inservice inspection program. On this basis, the project team finds that management of loss of material in steam generators is acceptable.

7.2.*1.2.3*.7 Non-Class 1 RCS Components - Summary of Aging Management Evaluation LRA Table 3.1.2-6

The project team reviewed Table 3.1.2-6 of the PBNP LRA, which summarizes the results of AMR evaluations in the SRP-LR for the non-Class 1 RCS components groups.

The applicant proposed to manage loss of material of stainless steel material for non-Class 1 RCS components types including flow indicators, flywheel, heat exchanger, instrument assembly valves, piping, fittings, valves and tanks exposed to treated borated water using both PBNP AMP B2.1.24, "Water Chemistry Control Program," and PBNP AMP B2.1.13, "One-Time Inspection Program."

The project team reviewed the applicant's water chemistry control program and one-time inspection program and its evaluation of these AMPs is documented in Section 7.1.17 and Section 7.1.11 of this report, respectively. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that the effects of loss of material (pitting and crevice corrosion) on stainless steel material for components in chemically treated, borated water are effectively managed using water chemistry controls program and one-time inspection program. On this basis, the project team finds that management of loss of material in non-class 1 RCS components is acceptable.

All AMRs in Tables 3.1.2-1 through 3.1.2-6 were evaluated. The project team finds them to be acceptable.

Conclusion. On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving material, environment, aging effect requiring management, and

AMP combinations that are not evaluated 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 for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.1.3 Conclusion

On the basis of its review, the project team concludes that the applicant has demonstrated that the aging effects associated with the reactor coolant system components will be adequately managed so that the intended functions will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The project team also reviewed the applicable FSAR supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging of the reactor coolant systems as required by 10 CFR 54.21(d).

7.2.2 Aging Management of Engineered Safety Features

This section of the Report documents the project team's review of the applicant's aging management review (AMR) results for the engineered safety features components and component groups associated with the following systems:

- safety injection system
- containment spray system
- residual heat removal system
- containment isolation components system

7.2.2.1 Summary of Technical Information in the Application

In LRA Section 3.2, the applicant provided AMR results for the engineered safety features components and component groups.

In Table 3.2.1, "Summary of Aging Management Evaluations in Chapter IV of NUREG-1801 for Engineered Safety Features," of the LRA, the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the engineered safety features components and component groups that are relied on for license renewal. In Section 3.2.2.2 of the LRA, the applicant provided information concerning Table 3.2.1 components for which further evaluation is recommended by the GALL Report.

The applicant's AMRs incorporated applicable operating experience in the determination of aging effects requiring management (AERMs). These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

7.2.2.2 Project Team Evaluation

The project team reviewed LRA Section 3.2 to determine if the applicant provided sufficient information to demonstrate that the effects of aging for the engineered safety features that are within the scope of license renewal and subject to an AMR will be adequately managed so that

the intended functions will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Also, the project team performed an onsite audit of AMRs to confirm the applicant's claim that certain identified AMRs were consistent with the GALL Report. The project team did not repeat its review of the matters described in the GALL Report. However, the project team did verify that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL AMRs. The project team's evaluations of the AMPs are documented in Section 7.1 of this Report. Detail of the project team's audit evaluation are documented in Section 7.2.2.2.1 of this report.

The project team also performed an onsite audit of those selected AMRs that were consistent with the GALL Report and for which further evaluation is recommended. The project team confirmed that the applicant's further evaluations were consistent with the acceptance criteria in Section 3.2.2.2 of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," dated July 2001. The project team's audit evaluation are documented in its PBNP audit and review report and are summarized in Section 7.2.2.2.2 of this report.

The project team performed an onsite audit and conducted a technical review of the remaining AMRs that were not consistent with or not address in the GALL Report. The audit and technical review included evaluating whether all plausible aging effects were identified and the aging effects listed were appropriate for the combination of materials and environments specified. The project team's audit evaluation is documented in Section 7.2.2.2.3 of this report.

Finally, the project team reviewed the AMP summary descriptions in the FSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the engineered safety features components.

7.2.2.2.1 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Not Recommended

Summary of Technical Information in the Application. In Section 3.2.2.1 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects related to safety injection system, containment spray system, residual heat removal system, and containment isolation components system:

- bolting integrity program
- boric acid corrosion program
- closed-cycle cooling water system surveillance program
- one-time inspection program
- periodic surveillance and preventive maintenance program
- systems monitoring program
- water chemistry control program

Project Team Evaluation. In Tables 3.2.2-1 through 3.2.2-4 of the LRA, the applicant provided a summary of AMRs for safety injection system, containment spray system, residual heat removal system, and containment isolation components system and identified which AMRs it considered to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report does not recommend further evaluation, the project team performed an audit and review to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant provided a note for each AMR line item. The notes described how the information in the tables aligns with the information in the GALL Report. The project team audited those AMRs with Notes A through E, which indicated the AMR was consistent with the GALL Report.

Note A indicated that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the AMP identified in the GALL Report. The project team audited these line items to verify consistency with the GALL Report and the validity of the AMR for the site-specific conditions.

Note B indicated 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 audited these line items to verify consistency with the GALL Report. The project team verified that the identified exceptions to the GALL AMPs had been reviewed and accepted by the project team. The project team also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

Note C indicated 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 is consistent with the AMP identified by the GALL Report. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report. However, the applicant identified a different component in the GALL Report that had the same material, environment, aging effect, and AMP as the component that was under review. The project team audited these line items to verify consistency with the GALL Report. The project team also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicated 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 audited these line items to verify consistency with the GALL Report. The project team verified whether the AMR line item of the different component was applicable to the component under review. The project team verified whether the identified exceptions to the GALL AMPs had been reviewed and accepted by the project team. The project team also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

Note E indicated that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited. The project team audited these line items to verify consistency with the GALL Report. The project team also determined whether the identified AMP would manage the aging effect consistent with the AMP identified by the GALL Report and whether the AMR was valid for the site-specific conditions.

The project team conducted an audit and review of the information provided in the LRA, as documented in its PBNP audit and review report. The project team did not repeat its review of

the matters described in the GALL Report. However, the project team did verify that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL Report AMRs. The project team reviewed the 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 engineered safety features 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 LRA Table 3.2.1 (Table 1), the applicant's references to the GALL Report are acceptable and no further project team review is required.

Conclusion. The project team has evaluated the applicant's claim of consistency with the GALL Report. The project team also has reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the project team finds that the AMR results which the applicant claimed to be consistent with the GALL Report, are consistent with the AMRs in the GALL Report. Therefore, the project team finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.2.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In Section 3.2.2.2 of the LRA, the applicant provided further evaluation of aging management as recommended by the GALL Report for safety injection system, containment spray system, residual heat removal system, and containment isolation components system components. The applicant provided information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to pitting and crevice corrosion
- local loss of material due to pitting and crevice corrosion
- local loss of material due to microbiologically influenced corrosion
- changes in properties due to elastomer degradation
- local loss of material due to erosion
- buildup of deposits due to corrosion

Project team Evaluation. For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the project team audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues that were further evaluated. In addition, the project team reviewed the applicant's further evaluations against the criteria contained in Section 3.2.3.2 of the SRP-LR. The project team's evaluation is discuss below.

7.2.2.2.2.1 Cumulative Fatigue Damage

PBNP LRA Section 3.2.2.2.1 is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4 of the SER and is reviewed by the NRR DE staff; therefore, the project team did not review this item.

7.2.2.2.2.2 Loss of Material Due to Pitting and Crevice Corrosion

The project team reviewed LRA Section 3.2.2.2.2 against the criteria in SRP-LR Section 7.2.2.2.2.2.

In LRA Section 3.2.2.2.2, the applicant addressed loss of material due to general corrosion for external and internal environments in engineered safety features components.

SRP-LR Section 3.2.2.2.2 states that loss of material due to general corrosion could occur in the containment spray, containment isolation valves and associated piping, 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 stated, in the LRA, that it has carbon steel components in the ESF systems, loss of material due to general corrosion is an applicable aging effect/mechanism.
The applicant stated that it addressed this aging effect for external environments in LRA Table 3.2.1, Item 3.2.1-10, and credited the plant-specific PBNP AMP B2.1.21,"Systems Monitoring Program" for aging management. The applicant also stated that internal environments are addressed in LRA Table 3.2.1, Item 3.2.1-05, for loss of material due to pitting and crevice corrosion because detection and prevention of these aging effects/mechanisms would also detect and prevent general corrosion. In these cases, the applicant credited PBNP AMP B.2.1.24, "Water Chemistry Control Program" and PBNP AMP B2.1.13, "One-Time Inspection Program."

During the audit, the applicant stated that one-time inspections for general corrosion will monitor component wall thickness. Monitoring methods will include visual (VT-3) and/or volumetric (RT/UT) examinations. Visual inspections will be performed only when the components are drained/opened and the component surface of interest is accessible. If degradation is identified through a visual inspection, additional NDE may be performed to characterize the degradation and determine the extent of the condition. The applicant stated that the NDE exams will be performed as a part of its one-time inspection program and will be conducted in accordance with the requirements of ASME Section XI and 10 CFR 50, Appendix B.

The project team reviewed the applicant's one-time inspection program, systems monitoring program, and water chemistry control program and its evaluation is documented in Section 7.1.11, Section 7.1.16, and Section 7.1.17 of this report, respectively.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.2.2.2.2 for further evaluation. For those line items that apply to LRA Section 3.2.2.2.2, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.2.2.2.3 Local Loss of Material Due to Pitting and Crevice Corrosion

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

In LRA Section 3.2.2.2.3.2, the applicant addressed local loss of material from pitting and crevice corrosion. LRA Table 3.2.1, Item 3.2.1-05 and LRA Section 3.2.2.2.3.2 also are used for managing general corrosion and MIC.

SRP-LR Section 3.2.2.2.3.1 states that the existing aging management program relies on monitoring and control of primary water chemistry based on the guidelines presented in EPRI TR-105714 for PWRs to mitigate degradation. However, control of coolant water chemistry does not preclude loss of material due to crevice and pitting corrosion at locations of stagnant flow conditions. Therefore, verification of the effectiveness of the water chemistry control program should be performed to ensure that corrosion is not occurring. (The GALL Report recommends further evaluation of programs to manage the loss of material due to pitting and crevice corrosion to confirm the effectiveness of the water chemistry control program). A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly so that the component's intended function will be maintained during the period of extended operation.

In LRA Section 3.2.2.2.3.1, the applicant states that SRP-LR Section 3.2.2.2.3.1 is applicable to BWRs only.

SRP-LR Section 3.2.2.2.3.2 states that local loss of material from pitting and crevice corrosion could occur in the containment spray components, containment isolation valves and associated piping, and the buried portion of the refueling water tank external surface. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed consistent with the acceptance criteria as described in Branch Technical Position RSLB 1 (NUREG-1800, Appendix A.1).

In LRA Table 3.2.1, Item 3.2.1-05, the applicant refers to LRA Section 3.2.2.2.3.2 for the plant-specific further evaluation. In LRA Section 3.2.2.2.3.2, the applicant stated that the refueling water storage tank (RWST) is located indoors, not buried, and not susceptible to a wetted environment, and therefore is not subject to this aging effect/mechanism. The applicant also stated that pitting and crevice corrosion typically are managed by PBNP AMP B2.1.24, "Water Chemistry Control Program" and by PBNP AMP B2.1.13, " One-Time Inspection Program." In LRA 3.2.2.2.3.2, the applicant does not discuss or summarize the evaluation findings, nor does LRA 3.2.2.2.3.1 make reference to the applicability of SRP-LR Section 3.2.2.2.3.1.

During the audit, the applicant stated that the evaluation of whether the aging management programs specified adequately manage the effects of aging identified in the Table 3.2.1 line item that require "further evaluation" was performed and is described in Appendix B of the LRA and its supporting plant documents. The applicant stated that its water chemistry control program conforms to the guidelines in EPRI TR-105714 Revision 4 and EPRI TR-102134 Revision 5. The water chemistry control program mitigates aging effects such as loss of material due to general, pitting, and crevice corrosion, and MIC, by controlling the environment to which components and associated piping are exposed. This aging effect is minimized by controlling the chemical species that cause the underlying mechanisms that result in this aging effect. The program provided assurance that an elevated level of contaminants and oxygen does not exist and thus minimizes the occurrences of this aging effect. The applicant stated that

its water chemistry control program has been in effect since initial plant operation and has been effective at maintaining the desired system water chemistry and detecting abnormal conditions, which have been corrected in an expedient manner.

The applicant further stated that because water chemistry alone will not preclude the loss of material due to pitting and crevice corrosion, a one time inspection of susceptible locations will be performed to confirm the effectiveness of the water chemistry program. For general corrosion the one-time inspections will monitor wall thickness, and the examination methods will include visual (VT-3) and/or volumetric (RT/UT). For pitting and crevice corrosion, these one-time inspections will monitor wall thickness, and the examination methods will include visual (VT-1) and/or volumetric (RT/UT). Visual inspections will be performed only when the components are drained or opened and the component surface of interest is accessible. If degradation is identified through a visual inspection, additional NDE may be performed to characterize the degradation and determine the extent of condition. The applicant stated that the NDE exams will be performed as a part of the one-time inspection program and will be conducted in accordance with the requirements of ASME Section XI and 10 CFR 50, Appendix B.

The project team reviewed the applicant's water chemistry control program and one-time inspection program, and its evaluation is documented in Section 7.1.17 and Section 7.1.11 of this report, respectively.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.2.2.2.3 for further evaluation. For those line items that apply to LRA Section 3.2.2.2.3, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.2.2.2.4 Local Loss of Material Due to Microbiologically Influenced Corrosion

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

In the LRA Section 3.2.2.2.4, the applicant addresses local loss of material due to microbiologically induced corrosion (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.

In LRA Section 3.2.2.2.4, the applicant stated that although PBNP have components in the ESF systems that are subject to MIC, this line item was not used. The applicant stated that this internal environment is addressed in LRA 3.2.1, Item 3.2.1-05 for loss of material due to pitting and crevice corrosion, because detection and prevention of these aging effects/mechanisms would also detect and prevent MIC. In these cases, the LRA credited PBNP AMP B.2.1.24, " Water Chemistry Control Program" or PBNP AMP B.2.1.13, "One-time Inspection Program."

In the letter dated July 12, 2004, the applicant stated that for MIC one-time inspections, the parameter monitored will be wall thickness and the examination methods will include visual (VT-3) and/or volumetric (RT/UT). Visual inspections will be performed only when the

components are drained or opened and the component surface of interest is accessible. If degradation is identified through a visual inspection, additional NDE may be performed to characterize the degradation and determine the extent of condition.

The project team reviewed the applicant's water chemistry control program and one-time inspection program, and its evaluation is documented in Section 7.1.17 and Section 7.1.11 of this report, respectively.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.2.2.2.4 for further evaluation. For those line items that apply to LRA Section 3.2.2.2.4, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.2.2.2.5 Changes in Material Properties Due to Elastomer Degradation

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

In LRA Section 3.2.2.2.5, the applicant stated that this aging effect applies to BWRs only.

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. SRP Table 3.2-1 states that the further evaluation for this aging effect in the in standby gas treatment system seals is applicable to BWR types of plants only.

The project team finds that this aging effect is not applicable to PBNP.

7.2.2.2.2.6 Local Loss of Material Due to Erosion

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

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

SRP-LR Section 3.2.2.2.6 states that local loss of material due to erosion could occur in the high-pressure safety injection pump miniflow orifice. This aging mechanism and its effect will apply only to pumps that are normally used as charging pumps in the chemical and volume control systems. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed consistent with the acceptance criteria as described in Branch Technical Position RSLB 1 (NUREG-1800, Appendix A.1).

LRA Table 3.2.1, Item 3.2.1-08 stated that this further recommended evaluation is not applicable at PBNP as safety injection pumps are not normally in use. Therefore, the applicant stated, in LRA Section 3.2.2.2.6, that loss of material due to erosion of miniflow orifices is not applicable at PBNP.

During the audit, the project team held discussion with the applicant. The applicant was asked to discuss its evaluation of erosion susceptibility in the residual heat removal pump miniflow

orifice lines that justify either the absence of erosion or the aging management programs that will be relied on to manage the aging mechanism. By letter dated July 12, 2004, the applicant provided its response. In its response, the applicant stated that a review of the potential for loss of material due to cavitation was completed and concluded that erosion-cavitation could not be ruled out. The applicant stated that, as part of the 2005 annual LRA update, the downstream piping in the vicinity of the low head safety injection (residual heat removal) pump mini-flow orifices will be examined under the one-time inspection program.

The project team finds that, based on reviewed of the applicant's July 12, 2004 letter, the applicant has met the criteria of SRP-LR Section 3.2.2.2.6 for further evaluation. For those line items that apply to LRA Section 3.2.2.2.6, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.2.2.2.7 Buildup of Deposits Due to Corrosion

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

In LRA Section 3.2.2.2.7, the applicant stated that this aging effect applies to BWRs only

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 of BWRs.

The project team finds that this aging effect is not applicable to PBNP.

Conclusion. On the basis of its review, for component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the project team determines that (1) those attributes or features for which the applicant claimed consistency with the GALL Report were indeed consistent, and (2) the applicant adequately addressed the issues that were further evaluated. 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 for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.2.2.3 AMR Results That Are Not Consistent With or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In Tables 3.2.2-1 through 3.2.2-4 of the LRA, the applicant provided additional details of the results of the AMRs for material, environment, aging effect requiring management, and AMP combinations that are not consistent with the GALL Report or are not addressed in the GALL Report.

In Tables 3.2.2-1 through 3.2.2-4, the applicant indicated, via Notes F through J, that neither the identified component nor the material and environment combination is evaluated in the GALL Report and provided information concerning how the aging effect will be managed.

Project team Evaluation. For component type, material and environment combination that are

not evaluated in the GALL Report, the project team reviewed the applicant's evaluation to determine whether the applicant had demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained during the period of extended operation.

The project team's evaluation is discussed below.

7.2.2.2.3.1 Engineered Safety Features Components That Have No Aging Effect (LRA Table 3.2.2-1 to Table 3.2.2- 4)

The applicant stated, in the LRA, that there is no aging effects identified for several of the line items in LRA Table 3.2.2-1 to Table 3.2.2- 4 for the following material and environment combinations: (1) carbon steel, low-alloy steel, stainless steel, and cast stainless steel component internal surfaces in contact with air (the applicant defined an air environment as dehumidified atmospheric air, dry/filtered instrument air) and gas environment, (2) stainless steel and cast stainless steel component external surfaces exposed to an indoor air environment with no air-conditioning; and (3) carbon steel, low-alloy steel, stainless steel, and cast stainless steel component external surfaces exposed to containment air environment. The applicant describes the above environment groups in LRA Tables 3.0-1 and 3.0-2.

The applicant, in LRA Table 3.0-1, stated that component internal surfaces in an air and gas environment may be exposed to dehumidified atmospheric air, dry/filtered instrument air and nitrogen, hydrogen, helium, or halon inert gases. The project team considers this air and gas environment benign and that its contact with the carbon steel, low-alloy steel, stainless steel, and cast stainless steel surfaces will not result in aging effects in those component identified in LRA Table 3.2.2-1 to Table 3.2.2- 4.

The applicant, in LRA Table 3.0-2, described the indoor air environment with no air conditioning as moist air at an average temperature of 85°F and maximum relative humidity of 100%. The external surfaces are not directly exposed to weather, and the environment may be climate-controlled (heating and/or cooling), which may not prevent local condensation. The project team finds that the stainless steel and cast stainless steel surfaces in contact with this indoor air environment will not result in aging effects in those components identified in LRA Table 3.2.2-1 to Table 3.2.2-4.

The applicant, in LRA Table 3.0-2, also stated that the containment air temperatures in generally accessible areas is 50°F to 105°F and can be has high as 135°F to 150°F in some specific locations. The maximum relative humidity could reach 100%. The applicant stated, in the LRA, that the nominal 40 year radiation dose is estimated to be 5.8E+7 rads. The project team finds that, for those components identified in LRA Table 3.2.2-1 to Table 3.2.2- 4, stainless steel, and cast stainless steel component external surfaces in contact with the containment environment will not result in any significant aging effects. Because the stainless steel and cast stainless steel components are not subjected to high fast neutron flux, irradiation embrittlement for these components is not a concern. Ionization due to gamma rays or to beta and alpha particle radiation will have little effect on metals. Also, because the containment temperatures are low, thermal aging embrittlement of cast stainless steel components is not applicable.

On the basis of its review of current industry research and operating experience, the project team finds that dry air on metal will not result in aging that will be of concern during the period of extended operation. These engineered safety features components are exposed to high-temperature internal flow, which creates a dry air environment. Stainless steel and

nickel-based alloy components in air or an inert gas environment are not susceptible to general corrosion that would affect their intended function. Therefore, the project team concludes that there are no applicable aging effects requiring management for carbon steel, stainless steel or stainless steel clad components exposed to air, or to an inert gas environments.

7.2.2.2.3.2 Safety Injection System - Summary of Aging Management Evaluation - LRA Table 3.2.2-1

The project team reviewed Table 3.2.2-1 of the LRA, which summarized the results of AMR evaluations for the safety injection system component groups.

The applicant proposed to manage loss of heat transfer due to fouling of stainless steel material of heat exchanger component type exposed to stagnant (flow less than 3 fps) treated water environment by using PBNP AMP B.2.1.9, “Closed-Cycle Cooling Water System Surveillance Program” and PBNP AMP B.2.1.13, ”One-Time Inspection Program.”

The applicant stated that its closed-cycle cooling water system surveillance program relies on periodic or one time surveillance testing and inspections to evaluate system and component performance. Inspection methods may include VT, UT, and ETC. The closed-cycle cooling water system surveillance program monitors the performance of selected heat exchangers by performing heat balance testing to confirm the thermal performance function, and it credits the one-time inspection program for the inspection of selected heat exchangers and a representative sample of stagnant portions of the system piping. These inspections will check for fouling and evidence of corrosion or cracking.

The project team reviewed the applicant’s closed-cycle cooling water system surveillance program and one-time inspection program and its evaluation is documented in Section 7.1.7 and Section 7.1.7.11 of this report, respectively. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of heat transfer due to fouling of stainless steel material of heat exchanger component type exposed to stagnant (flow less than 3 fps) treated water are effectively managed using closed-cycle cooling water system surveillance program and one-time inspection program . On this basis, the project team finds that management of loss of heat transfer due to fouling in safety injection system is acceptable.

The applicant proposed to manage loss of heat transfer due to fouling of stainless steel material of heat exchanger component type exposed to treated borated water environment at temperatures less than 140°F environment by using PBNP AMP B2.1.24, “Water Chemistry Control Program” and PBNP AMP B.2.1.13, ”One-Time Inspection Program.”

LRA Table 3.2.2-1 also references Item 3.2.1-15 for this line item. However, LRA Table 3.2.1, Item 3.2.1-15, does not discuss the basis for selecting the PBNP AMP B2.1.24, “Water Chemistry Control Program” for this aging effect.

During the audit, the project team held technical discussions the applicant. The applicant stated that in a treated water system, the primary source for fouling is expected to be corrosion product buildup on the tubes and as long as corrosion products are controlled, fouling would, in turn, also be controlled. The applicant also stated that its water chemistry control program conforms to the guidelines of EPRI TR-105714 and controls corrosion product buildup by controlling levels of contaminants and oxygen in the treated water environment that could cause corrosion. In addition, since water chemistry control program alone does not preclude this corrosion product buildup, the applicant will perform a one time inspection to confirm the effectiveness of

the water chemistry control program. The applicant also stated that for loss of heat transfer due to fouling, one-time inspection parameters monitored will be tube fouling and that general or remote visual examination methods will be used and performed in accordance with the requirements of ASME Section XI and 10 CFR 50, Appendix B.

The project team reviewed the applicant's water chemistry control program and one-time inspection program and its evaluation is documented in Section 7.1.17 and Section 7.1.11 of this Report, respectively. The project team finds that service experience suggests that fouling of the stainless steel heat transfer surfaces exposed to treated borated water environment at relatively low temperatures is minor where the existing water chemistry controls program has been in place along with normal preventive maintenance practices. As such, the performance of these heat exchangers has been good. Therefore, the project team finds that the water chemistry control program is able to manage the loss of heat transfer aging effect. Because fouling effects are expected to be relatively minor, the use of a one-time inspection of selected components at susceptible locations is an appropriate and acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly so that the component's intended function will be maintained during the period of extended operation. On this basis, the project team finds that management of loss of heat transfer due to fouling in safety injection system is acceptable.

The applicant proposed to manage loss of material due to pitting and crevice corrosion of stainless steel material for component type bolting and fasteners, instrument valve assemblies, level elements, piping and fittings, pump casings, tanks, flow elements, valve bodies, and restricting orifices exposed internally to treated borated water environment at temperatures less than140°F using PBNP AMP B2.1.24, "Water Chemistry Control Program" and PBNP AMP B.2.1.13, "One-Time Inspection Program."

For these items, LRA Table 3.2.2-1 references GALL Report items V.D1.1-a, VD1.4-b, and VA.1-d. These GALL references address SCC aging effect, not loss of material due to pitting or crevice corrosion, and stated that the water chemistry control program in EPRI TR-105714 may be used to manage SCC aging effects with no further evaluation is required. However, SRP-LR Section 3.2.2.2.3 requires that a plant-specific further evaluation be performed to ensure that the aging effect is adequately managed consistent with the acceptance criteria as described in Branch Technical Position RSLB 1 (NUREG-1800, Appendix A.1). LRA Table 3.2.2-1 references LRA Table 3.2.1, Item 3.2.1-15, which only described the relevance of the aging effect and does not refer to a plant-specific evaluation that provides justification for the use of the water chemistry control program and one-time inspection program to manage this aging effect.

During the audit, the project team held discussions with the applicant. The applicant was asked to provide justification for the use of its water chemistry control program and one-time inspection program to manage loss of material due to pitting and crevice corrosion for these component types. The applicant stated that its water chemistry control program conforms to the guidelines in EPRI TR-105714 Revision 4 and mitigates aging effects such as loss of material due to general, crevice, or pitting corrosion, and cracking due to SCC, by controlling contaminants and oxygen levels in the water environment. The control of these parameters has been shown to minimize these aging effects. The applicant stated that because water chemistry alone will not preclude the loss of material due to pitting and crevice corrosion, a one time inspection of susceptible locations will be performed to confirm the effectiveness of the water chemistry control program. For general corrosion the one-time inspections will monitor wall thickness, and the examination methods will include visual (VT-3) and/or volumetric (RT/UT). For pitting and

crevice corrosion, these one-time inspections will monitor wall thickness, and the examination methods will include visual (VT-1) and/or volumetric (RT/UT). Visual inspections will be performed only when the components are drained/opened and the component surface of interest is accessible. If degradation is identified through a visual inspection, additional NDE may be performed to characterize the degradation and determine the extent of condition. The applicant stated that the NDE exams performed as a part of the one-time inspection program will be conducted in accordance with the requirements of ASME Section XI and 10 CFR 50, Appendix B.

The project team reviewed the applicant's water chemistry control program and one-time inspection program and its evaluation is documented in Section 7.1.17 and Section 7.1.11 of this Report, respectively. The project team finds that because loss of material due to pitting and crevice corrosion on stainless steel components in chemically treated borated water is expected to be a minor concern and that a one time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly so that the component's intended function will be maintained during the period of extended operation. On this basis, the project team finds that management of loss of heat transfer due to fouling in safety injection system is acceptable.

7.2.2.2.3.3 Containment Spray System - Summary of Aging Management Evaluation - LRA Table 3.2.2-2

The project team reviewed Table 3.2.2-2 of the LRA, which summarized the results of AMR evaluations for the containment spray system component groups.

The applicant proposed to manage loss of heat transfer due to fouling of stainless steel material of heat exchanger component type exposed to stagnant (flow less than 3 fps) treated water environment by using PBNP AMP B.2.1.9, "Closed-Cycle Cooling Water System Surveillance Program" and PBNP AMP B.2.1.13, "One-Time Inspection Program."

The applicant stated that its closed-cycle cooling water system surveillance program relies on periodic or one time surveillance testing and inspections to evaluate system and component performance. Inspection methods may include VT, UT, and ETC. The closed-cycle cooling water system surveillance program monitors the performance of selected heat exchangers by performing heat balance testing to confirm the thermal performance function, and it credits the one-time inspection program for the inspection of selected heat exchangers and a representative sample of stagnant portions of the system piping. These inspections will check for fouling and evidence of corrosion or cracking.

The project team reviewed the applicant's closed-cycle cooling water system surveillance program and one-time inspection program and its evaluation is documented in Section 7.1.7 and Section 7.1.11 of this report, respectively. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of heat transfer due to fouling of stainless steel material of heat exchanger component type exposed to stagnant (flow less than 3 fps) treated water are effectively managed using closed-cycle cooling water system surveillance program and one-time inspection program. On this basis, the project team finds that management of loss of heat transfer due to fouling in containment spray system is acceptable.

The applicant proposed to manage loss of heat transfer due to fouling of stainless steel material of heat exchanger component type exposed to treated borated water environment at temperatures less than 140°F by using PBNP AMP B2.1.24, "Water Chemistry Control

Program" and PBNP AMP B.2.1.13, "One-Time Inspection Program."

LRA Table 3.2.2-2 also references Item 3.2.1-15 for this line item. However, LRA Table 3.2.1, Item 3.2.1-15, does not discuss the basis for selecting the PBNP AMP B2.1.24, "Water Chemistry Control Program" for this aging effect.

During the audit, the project team held technical discussions the applicant. The applicant stated that in a treated water system, the primary source for fouling is expected to be corrosion product buildup on the tubes and as long as corrosion products are controlled, fouling would, in turn, also be controlled. The applicant also stated that its water chemistry control program conforms to the guidelines of EPRI TR-105714 and controls corrosion product buildup by controlling levels of contaminants and oxygen in the treated water environment that could cause corrosion. In addition, since water chemistry control program alone does not preclude this corrosion product buildup, the applicant will perform a one time inspection to confirm the effectiveness of the water chemistry control program. The applicant also stated that for loss of heat transfer due to fouling, one-time inspection parameters monitored will be tube fouling and that general or remote visual examination methods will be used and performed in accordance with the requirements of ASME Section V and 10 CFR 50, Appendix B.

The project team reviewed the applicant's water chemistry control program and one-time inspection program and its evaluation is documented in Section 7.1.17 and Section 7.1.11 of this Report, respectively. The project team finds that service experience suggests that fouling of the stainless steel heat transfer surfaces exposed to treated borated water environment at relatively low temperatures is minor where the existing water chemistry controls program has been in place along with normal preventive maintenance practices. As such, the performance of these heat exchangers has been good. Therefore, the project team finds that the water chemistry control program is be able to manage the loss of heat transfer aging effect. Because fouling effects are expected to be relatively minor, the use of a one-time inspection of selected components at susceptible locations is be an appropriate and acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly so that the component's intended function will be maintained during the period of extended operation. On this basis, the project team finds that management of loss of heat transfer due to fouling in containment spray system is acceptable

The applicant proposed to manage loss of material due to pitting and crevice corrosion of stainless steel material for eductor, flow elements, instrument valve assemblies, piping and fittings, valve bodies, and restricting orifice component type exposed internally to treated borated water environment at temperatures less than 140°F using PBNP AMP B2.1.24, "Water Chemistry Control Program" and PBNP AMP B.2.1.13, "One-Time Inspection Program." For these line items, LRA Table 3.2.2-2 references GALL Report Items V.A.1-a, V.A.1-c, and V.A1.4-b.

During the audit, the project team noted that these GALL Report references address SCC aging effect, not loss of material due to pitting or crevice corrosion, and states that the water chemistry control program in EPRI TR-105714 may be used to manage SCC aging effects with no further evaluation is required. Furthermore, SRP-LR Section 3.2.2.2.3 requires that a plant-specific further evaluation be performed to ensure that the aging effect is adequately managed consistent with the acceptance criteria are described in Branch Technical Position RSLB 1 (NUREG-1800, Appendix A.1). Also, the project team noted that LRA Table 3.2.2-2 references LRA Table 3.2.1, Item 3.2.1-15, which described the relevance of the aging effect and does not refer to a plant-specific evaluation that provides justification for the use of the water chemistry

control program and one-time inspection program to manage this aging effect.

During the audit, the project team held technical discussions the applicant. The applicant was asked to provide justification for the use of the water chemistry control program and one-time inspection program to manage loss of material due to pitting and crevice corrosion for these component types. The applicant stated that its water chemistry control program conforms to the guidelines in EPRI TR-105714 Revision 4 and mitigates aging effects such as loss of material due to general, crevice, or pitting corrosion, and cracking due to SCC, by controlling contaminants and oxygen levels in the water environment. The control of these parameters has been shown to minimize these aging effects. The applicant stated that because water chemistry alone will not preclude the loss of material due to pitting and crevice corrosion, a one time inspection of susceptible locations will be performed to confirm the effectiveness of the Water chemistry control program. For general corrosion, the applicant stated that the one-time inspections will monitor wall thickness, and the examination methods will include visual (VT-3) and/or volumetric (RT/UT). For pitting and crevice corrosion, these one-time inspections will monitor wall thickness, and the examination methods will include visual (VT-1) and/or volumetric (RT/UT). Visual inspections will be performed only when the components are drained or opened and the component surface of interest is accessible. If degradation is identified through a visual inspection, additional NDE may be performed to characterize the degradation and determine the extent of the condition. The applicant stated that the NDE exams performed as a part of the One-Time Inspection Program will be conducted in accordance with the requirements of ASME Section XI and 10 CFR 50, Appendix B.

The project team reviewed the applicant's water chemistry control program and one-time inspection program and its evaluation is documented in Section 7.1.17 and Section 7.1.11 of this report, respectively.. The project team finds that because loss of material due to pitting and crevice corrosion on stainless steel components in chemically treated borated water is expected to be a minor concern and that a one time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly so that the component's intended function will be maintained during the period of extended operation. On this basis, the project team finds that management of loss of material due to pitting and crevice corrosion of stainless steel material for these component types in the containment spray system is acceptable.

The applicant proposed to manage loss of material due to pitting and crevice corrosion of cast stainless steel material for valve body component type exposed internally to treated borated water environment at temperatures less than 140°F using PBNP AMP B2.1.24, "Water Chemistry Control Program" and PBNP AMP B.2.1.13, "One-Time Inspection Program." In addition, LRA Table 3.2.1, Item 3.2.1-05, refers to the applicant's plant-specific further evaluation in LRA Section 3.2.2.2.3.2, which credited water chemistry control and one-time inspection programs to manage the loss of material due to pitting and crevice corrosion in containment spray system components.

The project team reviewed the applicant's water chemistry control program and one-time inspection program and its evaluation is documented in Section 7.1.17 and Section 7.1.11 of this Report, respectively. The project team finds that loss of material due to pitting and crevice corrosion on cast stainless steel components in chemically treated borated water is expected to be a minor concern, and a one time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly so that the component's intended function will be maintained during the period of extended operation. On this basis, the project team finds that management loss of material due to pitting and crevice corrosion of cast stainless steel material for valve body in the

containment spray system is acceptable.

7.2.2.2.3.4 Residual Heat Removal System - Summary of Aging Management Evaluation - LRA Table 3.2.2-3

The project team reviewed Table 3.2.2-3 of the LRA, which summarized the results of AMR evaluations for the residual heat removal system component groups.

The applicant proposed to manage loss of heat transfer due to fouling of stainless steel material of residual heat removal system heat exchanger component type exposed to a stagnant (flow less than 3 fps) treated water environment using PBNP AMP B2.1.9, “Closed-Cycle Cooling Water (CCC) System Surveillance Program” and PBNP AMP B2.1.13, “One-Time Inspection Program.”

The applicant stated that its closed-cycle cooling water system surveillance program relies on periodic or one time surveillance testing and inspections to evaluate system and component performance. Inspection methods may include visual testing, UT, and ETC. This program monitors the performance of selected heat exchangers by performing heat balance testing to confirm the thermal performance function and it credits the one-time inspection program for the inspection of selected heat exchangers and a representative sample of stagnant portions of the system piping. These inspections will check for fouling and evidence of corrosion or cracking.

The project team reviewed the applicant’s closed-cycle cooling water system surveillance program and one-time inspection program and its evaluation is documented in Section 7.1.7 and Section 7.1.11 of this report, respectively. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of heat transfer due to fouling of stainless steel material of heat exchanger component type exposed to stagnant (flow less than 3 fps) treated water are effectively managed using closed-cycle cooling water system surveillance program and one-time inspection program . On this basis, the project team finds that management of loss of heat transfer due to fouling in residual heat removal system is acceptable.

The applicant proposed to manage loss of heat transfer due to fouling of stainless steel material of residual heat removal system heat exchanger component type exposed to treated borated water environment at temperatures less than 140°F environment using PBNP AMP B2.1.24, “Water Chemistry Control Program” and PBNP AMP B.2.1.13, ”One-Time Inspection Program.”

During the audit, the project team held technical discussions the applicant. The applicant stated that in a treated water system, the primary source for fouling is expected to be corrosion product buildup on the tubes and as long as corrosion products are controlled, fouling would, in turn, also be controlled. The applicant also stated that its water chemistry control program conforms to the guidelines of EPRI TR-105714 and controls corrosion product buildup by controlling levels of contaminants and oxygen in the treated water environment that could cause corrosion. In addition, since water chemistry control program alone does not preclude this corrosion product buildup, the applicant will perform a one time inspection to confirm the effectiveness of the water chemistry control program. The applicant also stated that for loss of heat transfer due to fouling, one-time inspection parameters monitored will be tube fouling and that general or remote visual examination methods will be used and performed in accordance with the requirements of ASME Section V and 10 CFR 50, Appendix B.

The project team reviewed the applicant’s water chemistry control program and one-time

inspection program and its evaluation is documented in Section 7.1.17 and Section 7.1.11 of this report, respectively. The project team finds that service experience suggests that fouling of the stainless steel heat transfer surfaces exposed to treated borated water environment at relatively low temperatures is minor where the existing water chemistry controls program has been in place along with normal preventive maintenance practices. As such, the performance of these heat exchangers has been good. Therefore, the project team finds that the water chemistry control program is able to manage the loss of heat transfer aging effect. Because fouling effects are expected to be relatively minor, the use of a one-time inspection of selected components at susceptible locations is an appropriate and acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly so that the component's intended function will be maintained during the period of extended operation. On this basis, the project team finds that management of loss of heat transfer due to fouling in residual heat removal system is acceptable.

The applicant proposed to manage loss of material due to pitting and crevice corrosion of stainless steel material for eductor, flow elements, instrument valve assemblies, piping and fittings, valve bodies, and restricting orifice component type exposed internally to treated borated water environment at temperatures less than 140°F using PBNP AMP B2.1.24, "Water Chemistry Control Program" and PBNP AMP B.2.1.13, "One-Time Inspection Program." For these line items, LRA Table 3.2.2-3 references GALL Report Items V.D1.1 a, VD1.4-b, and V.A.1-a.

During the audit, the project team noted that these GALL Report references address SCC aging effect, not loss of material due to pitting or crevice corrosion, and state that the water chemistry control program in EPRI TR-105714 may be used to manage SCC aging effects with no further evaluation is required. Furthermore, SRP-LR Section 3.2.2.2.3 requires that a plant-specific further evaluation be performed to ensure that the aging effect is adequately managed consistent with the acceptance criteria are described in Branch Technical Position RSLB 1 (NUREG-1800, Appendix A.1). Also, the project team noted that LRA Table 3.2.2-2 references LRA Table 3.2.1, Item 3.2.1-15, which described the relevance of the aging effect and does not refer to a plant-specific evaluation that provides justification for the use of the water chemistry control program and one-time inspection program to manage this aging effect.

During the audit, the project team held technical discussions the applicant. The applicant was asked to provide justification for the use of the water chemistry control program and one-time inspection program to manage loss of material due to pitting and crevice corrosion for these component types. The applicant stated that its water chemistry control program conforms to the guidelines in EPRI TR-105714 Revision 4 and mitigates aging effects such as loss of material due to general, crevice, or pitting corrosion, and cracking due to SCC, by controlling contaminants and oxygen levels in the water environment. The control of these parameters has been shown to minimize these aging effects. The applicant stated that because water chemistry alone will not preclude the loss of material due to pitting and crevice corrosion, a one time inspection of susceptible locations will be performed to confirm the effectiveness of the Water chemistry control program. For general corrosion, the applicant stated that the one-time inspections will monitor wall thickness, and the examination methods will include visual (VT-3) and/or volumetric (RT/UT). For pitting and crevice corrosion, these one-time inspections will monitor wall thickness, and the examination methods will include visual (VT-1) and/or volumetric (RT/UT). Visual inspections will be performed only when the components are drained or opened and the component surface of interest is accessible. If degradation is identified through a visual inspection, additional NDE may be performed to characterize the degradation and determine the extent of the condition. The applicant stated that the NDE exams performed as a part of the One-Time Inspection Program will be conducted in accordance with the requirements of ASME

Section XI and 10 CFR 50, Appendix B.

The project team reviewed the applicant's water chemistry control program and one-time inspection program and its evaluation is documented in Section 7.1.17 and Section 7.1.11 of this Report, respectively. The project team finds that because loss of material due to pitting and crevice corrosion on stainless steel components in chemically treated borated water is expected to be a minor concern and that a one time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly so that the component's intended function will be maintained during the period of extended operation. On this basis, the project team finds that management of loss of material due to pitting and crevice corrosion of stainless steel material for these component types in the residual heat removal system is acceptable.

7.2.2.2.3.5 Containment Isolation Components System - Summary of Aging Management Evaluation - LRA Table 3.2.2-4

The project team reviewed Table 3.2.2-4 of the LRA, which summarized the results of AMR evaluations for the containment isolation components system component groups.

The applicant proposed to manage loss of material due to pitting and crevice corrosion of stainless steel materials for valve bodies component type exposed to a treated other (stagnant) water environment PBNP AMP B2.1.24, "Water Chemistry Control Program" and PBNP AMP B.2.1.13, "One-Time Inspection Program." The applicant, in LRA Table 3.0.1, defined this treated water environment as demineralized water that may be deaerated and include corrosion inhibitors and biocides or some combination of these treatments.

The applicant further stated that chemistry of this water is monitored and controlled in accordance with the requirements of the its water chemistry control program and that treated water systems include the chemical volume and control, emergency power, and component cooling water systems. Water treatment includes consideration of stagnant, low flow (i.e., less than 3 fps). In addition, LRA Table 3.2.1, Item 3.2.1-05 refers to the plant-specific further evaluation in LRA Section 3.2.2.2.3.2, which credits the water chemistry control and one-time inspection programs to manage the loss of material due to pitting and crevice corrosion in containment penetrations system components.

The project team reviewed the applicant's closed-cycle cooling water system surveillance program and one-time inspection program and its evaluation is documented in Section 7.1.7 and Section 7.1.11 of this Report, respectively. The project team finds that loss of material due to pitting and crevice corrosion on stainless steel components in borated water is expected to be a minor concern and that a one time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly so that the component's intended function will be maintained during the period of extended operation. On this basis, the project team finds that management of material due to pitting and crevice corrosion of stainless steel materials for valve bodies component type in containment isolation components system is acceptable.

All AMRs in Tables 3.2.2-1 through 3.2.2-4 were evaluated. The project team finds them to be acceptable.

Conclusion. On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving material, environment, aging effect requiring management, and

AMP combinations that are not evaluated 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 for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.2.3 Conclusion

On the basis of its review, the project team concludes that the applicant has demonstrated that the aging effects associated with the engineered safety features components will be adequately managed so that the intended functions will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The project team also reviewed the applicable FSAR supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging of the engineered safety features as required by 10 CFR 54.21(d).

7.2.3 Aging Management of Auxiliary Systems

This section of the documents the project team's review of the applicant's aging management review (AMR) results for the auxiliary systems components and component groups associated with the following systems:

- chemical and volume control system
- component cooling water system
- spent fuel cooling system
- waste disposal system
- service water system
- fire protection system
- heating steam system
- emergency power system
- containment ventilation system
- essential ventilation system
- treated water system
- circulating water system
- fuel handling system
- plant sampling system
- plant air system
- containment hydrogen detectors and recombiner system

7.2.3.1 Summary of Technical Information in the Application

In LRA Section 3.3, the applicant provided AMR results for the auxiliary systems components and component groups.

In Table 3.3.1, "Summary of Aging Management Evaluations in Chapter IV of NUREG-1801 for Auxiliary Systems," of the LRA, the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the auxiliary systems components and component groups that are relied on for license renewal. In Section 3.3.2.2 of the LRA, the applicant provided information concerning Table 3.3.1 components for which further evaluation is recommended by the GALL Report.

The applicant's AMRs incorporated applicable operating experience in the determination of aging effects requiring management (AERMs). These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

7.2.3.2 Project Team Evaluation

The project team reviewed LRA Section 3.3 to determine if the applicant provided sufficient information to demonstrate that the effects of aging for the auxiliary systems components that are within the scope of license renewal and subject to an AMR will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Also, the project team performed an onsite audit of AMRs to confirm the applicant's claim that certain identified AMRs were consistent with the GALL Report. The project team did not repeat its review of the matters described in the GALL Report. However, the project team did verify that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL AMRs. The project team's evaluations of the AMPs are documented in Section 7.1 of this Report.

The project team also performed an onsite audit of those selected AMRs that were consistent with the GALL Report and for which further evaluation is recommended. The project team confirmed that the applicant's further evaluations were consistent with the acceptance criteria in Section 3.3.2.2 of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," dated July 2001.

The project team performed an onsite audit and conducted a technical review of the remaining AMRs that were not consistent with or not address in the GALL Report. The audit and technical review included evaluating whether all plausible aging effects were identified and the aging effects listed were appropriate for the combination of materials and environments specified.

Finally, the project team reviewed the AMP summary descriptions in the FSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the auxiliary systems components.

Table 3.3-1 below provides a summary of the project team's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.3 that are addressed in the GALL Report.

7.2.3.2.1 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Not Recommended

Summary of Technical Information in the Application. In Section 3.3.2.1 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects related to chemical and volume control system, component cooling water system, spent fuel cooling system, waste disposal system, service water system, fire protection system, heating steam system, emergency power system, containment ventilation system, essential ventilation system, treated

water system, circulating water system, fuel handling system, plant sampling system, plant air system, and containment hydrogen detectors and recombiner system:

- bolting integrity program
- boric acid corrosion program
- buried services monitoring program
- fire protection program
- fuel oil chemistry control program
- closed-cycle cooling water system surveillance program
- one-time inspection program
- open-cycle cooling (service) water system surveillance program
- periodic surveillance and preventive maintenance program
- systems monitoring program
- tank internal inspection program
- water chemistry control program

Project Team Evaluation. In Tables 3.3.2-1 through 3.3.2-16 of the LRA, the applicant provided a summary of AMRs for chemical and volume control system, component cooling water system, spent fuel cooling system, waste disposal system, service water system, fire protection system, heating steam system, emergency power system, containment ventilation system, essential ventilation system, treated water system, circulating water system, fuel handling system, plant sampling system, plant air system, and containment hydrogen detectors and recombiner system, components system and identified which AMRs it considered to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report does not recommend further evaluation, the project team performed an audit and review to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant provided a note for each AMR line item. The notes described how the information in the tables aligns with the information in the GALL Report. The project team audited those AMRs with Notes A through E, which indicated the AMR was consistent with the GALL Report.

Note A indicated that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the AMP identified in the GALL Report. The project team audited these line items to verify consistency with the GALL Report and the validity of the AMR for the site-specific conditions.

Note B indicated 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 audited these line items to verify consistency with the GALL Report. The project team verified that the identified exceptions to the GALL AMPs had been reviewed and accepted by the project team. The project team also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

Note C indicated 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 is consistent with the AMP identified by the GALL Report. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report. However, the applicant identified a

different component in the GALL Report that had the same material, environment, aging effect, and AMP as the component that was under review. The project team audited these line items to verify consistency with the GALL Report. The project team also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicated 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 audited these line items to verify consistency with the GALL Report. The project team verified whether the AMR line item of the different component was applicable to the component under review. The project team verified whether the identified exceptions to the GALL AMPs had been reviewed and accepted by the project team. The project team also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

Note E indicated that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited. The project team audited these line items to verify consistency with the GALL Report. The project team also determined whether the identified AMP would manage the aging effect consistent with the AMP identified by the GALL Report and whether the AMR was valid for the site-specific conditions.

The project team conducted an audit and review of the information provided in the LRA, as documented in its PBNP audit and review report. The project team did not repeat its review of the matters described in the GALL Report. However, the project team did verify that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL Report AMRs.

The project team reviewed the 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 engineered safety features 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 LRA Table 3.3.1 (Table 1), the applicant's references to the GALL Report are acceptable and no further project team review is required.

Conclusion. The project team has evaluated the applicant's claim of consistency with the GALL Report. The project team also has reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the project team finds that the AMR results which the applicant claimed to be consistent with the GALL Report, are consistent with the AMRs in the GALL Report. Therefore, the project team finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.3.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In Section 3.3.2.2 of the LRA, the

applicant provided further evaluation of aging management as recommended by the GALL Report for chemical and volume control system, component cooling water system, spent fuel cooling system, waste disposal system, service water system, fire protection system, heating steam system, emergency power system, containment ventilation system, essential ventilation system, treated water system, circulating water system, fuel handling system, plant sampling system, plant air system, and containment hydrogen detectors and recombiner system components. The applicant provided information concerning how it will manage the following aging effects:

- loss of material due to general, pitting, and crevice corrosion
- hardening and cracking or loss of strength due to elastomer; degradation or loss of material due to wear
- cumulative fatigue damage
- crack initiation and growth due to cracking or stress corrosion cracking
- loss of material due to general, microbiologically influenced, pitting, and crevice corrosion
- loss of material due to general, galvanic, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and biofouling
- loss of material due to general, pitting, and crevice corrosion
- crack initiation and growth due to stress corrosion cracking and cyclic loading
- reduction of neutron-absorbing capacity and loss of material due to general corrosion
- loss of material due to general, pitting, crevice, and microbiologically influenced corrosion

Project team Evaluation. For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the project team audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues that were further evaluated. In addition, the project team reviewed the applicant's further evaluations against the criteria contained in Section 3.3.3.2 of the SRP-LR. The project team's evaluation of is discuss below.

7.2.3.2.2.1 Loss of Material Due to General, Pitting, and Crevice Corrosion

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

In LRA, Section 3.3.2.2.1, the applicant addressed 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 tube sheets of the heat

exchanger in the spent fuel pool cooling and cleanup system. For these components, made of carbon steel with elastomer lining, the GALL Report Table VII.A3, recommends managing the aging effects with a combination of the XI.M2, Water Chemistry" and XI.M32, One-Time Inspection," AMPs.

The applicant stated, in the LRA, that NUREG-1801, Volume 2, items identified in Item 3.3.1-01 (A3.2-a, A3.3-a, and A3.5-a) relate to carbon steel components with elastomer linings. The applicant's spent fuel cooling system does not contain any carbon steel components with elastomer linings. All of the components in the spent fuel cooling system are stainless steel. The applicant further stated that, due to the absence of this material/environment combination in the auxiliary systems section, the applicant used LRA Table 3.2.1, Item 3.2.1-15 (ESF) to address aging effects of these components. The water chemistry control program is credited with managing these aging effects. The one-time inspection program is also used to verify the effectiveness of water chemistry control.

The project team confirmed that these components are made of stainless steel during discussions with the applicant and therefore, the applicant not implementing the further evaluation defined in SRP-LR Section 3.3.2.2.1 is appropriate. The project team agrees that use of the water chemistry and on-time inspection AMPS are appropriate programs to manage the loss of material due to general, pitting, and crevice corrosion in the channel head and access cover, tubes, and tube sheets of the heat exchanger in the spent fuel pool cooling and cleanup system. The project team reviewed PBNP AMP B2.1.24 and PBNP AMP B2.1.13, and their evaluations are documented in Section 7.1.17 and Section 7.1.11 of this report, respectively. Based on the choice of aging management programs, the verification that the subject components are made of stainless steel and not carbon steel components with elastomer linings, the project team finds this further evaluation acceptable.

The project team finds that, based on the programs identified above, the applicant has appropriately addressed the SRP-LR Section 3.3.2.2.1 further evaluation. For those line items that apply to LRA Section 3.3.2.2.1, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.3.2.2.2 Hardening and Cracking or Loss of Strength Due to Elastomer Degradation or Loss of Material Due to Wear

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

In LRA Section 3.3.2.2.2, the applicant addressed the potential for degradation of elastomers in collars and seals in spent fuel cooling systems 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 ventilation systems, as well as 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.

The applicant stated, in the LRA, that the spent fuel cooling system at PBNP contains no components that are elastomer lined; however, the elastomer seals for the spent fuel pool gates are included in the LRA. PBNP AMP B2.1.15, “Periodic Surveillance and Preventive Maintenance Program” is credited for managing the hardening and cracking. For ventilation systems, the applicant also credited the PBNP AMP B2.1.15, ”Periodic Surveillance and Preventive Maintenance Program,” for managing the hardening and cracking or loss of strength aging effects, where applicable. In many cases, the temperature, radiation, and ultraviolet exposure do not support these aging effects; therefore, no aging management is required.

The project team reviewed the applicant’s periodic surveillance and preventive maintenance program and its evaluation is documented in 7.1.13 of this report. On the basis of its review, the project team finds that the applicant adequately manage the hardening and cracking or loss of strength aging effects.

Regarding the ventilation system, during the audit, the project team was concerned that many of the identified elastomer or nonmetallic components, as stated in LRA Note 16 (LRA page 3-361), are in areas where the temperatures in the identified environment (indoor air: no air conditioning, where temperatures may range from 70°F to 120°F with 100% humidity and air and gas : wetted, where temperatures may exceed 140°F) may exceed the 95°F threshold established by industry for aging to occur to elastomers. In addition, the project team was concerned also about the possibility of aging to occur to those neoprene components exposed to a raw water environment, which is not addressed in NUREG-1801.

The applicant stated that no aging effects exist for this material in these environments and that this is substantiated by PBNP plant-specific operating experience. LRA Note 16, for a particular component, stated that elastomer (e.g., neoprene, rubber) components are indoors and not subject to ultraviolet light or ozone, and they are not in locations that are subject to radiation exposure. These locations also are not subject to temperatures where change in material properties or cracking could occur (>95°F); therefore, no aging management is required. Although LRA Table 3.0-2 stated that the indoor air-no air conditioning environment may achieve temperature variations between 70°F to 120°F with 100% humidity, this is provided as a generic environment, whereas LRA Note 16 is a specific environment for this specific material in a specific location. These components were evaluated individually for both an internal raw water and external plant indoor (no air conditioning) environment with regard to these criteria and, as a result, either were managed due to the potential for applicable effects/mechanisms for these environments or noted as not applicable where these criteria did not apply.

The project team reviewed the information provided by the applicant, as documented in its PBNP audit and review report, the project team finds that the applicant has completed an individual assessment for each of the elastomer/nonmetallic components. All of these components in the auxiliary systems are in environments where aging is not expected to occur; therefore, no aging management program is required. On this basis, the project team finds this acceptable.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.2 for further evaluation. For those line items that apply to LRA Section 3.3.2.2.2, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10

CFR 54.21(a)(3).

7.2.3.2.2.3 Cumulative Fatigue Damage

PBNP LRA Section 3.2.2.2.1 is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4 of the SER and is reviewed by the NRR DE staff; therefore, the project team did not review this item.

7.2.3.2.2.4 Crack Initiation and Growth Due to Cracking or Stress Corrosion Cracking

The project team reviewed LRA Section 3.3.2.2.4 against the criteria in SRP-LR Section 3.3.2.2.4.

In LRA Section 3.3.2.2.4, the applicant addressed 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 pump for the chemical and volume control system. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

The applicant stated, in the LRA, that although the GALL report references a temperature gate of less than 90°C (200°F) and a single aging effect (cracking due to SCC), materials science supports (1) a temperature gate of greater than 140°F for cracking due to SCC and (2) loss of material due to pitting (stagnant or low flow conditions) and crevice corrosion for all temperatures. The applicant further stated that although the aging effect identified (loss of material) for temperatures less than 140°F differs from that of the GALL Report, the water chemistry control program, which is credited for managing the aging effects for all temperatures, will preclude the possibility of cracking due to SCC. A one-time inspection program is also credited to confirm the adequacy of water chemistry control.

The project team reviewed the applicant's water chemistry control program and one-time inspection program and its evaluation is documented in Section 7.1.17 and Section 7.1.11 of this report, respectively. The project team finds that the applicant's use of the water chemistry control program (which is applicable to all temperature ranges) for managing the aging effect of crack initiation and growth due to cracking or stress corrosion cracking to be consistent with the GALL Report. The project team also finds that the applicant's use of the one-time inspection program to supplement the water chemistry control program is an additional measure to the GALL Report program that will ensure identification of aging, should it occur in all areas including those subject to stagnant flow conditions.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.4 for further evaluation. For those line items that apply to LRA Section 3.3.2.2.4, the project team finds that the applicant is consistent with the GALL Report and 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).

7.2.3.2.2.5 Loss of Material Due to General, Microbiologically Influenced, Pitting, and Crevice Corrosion

The project team reviewed the LRA Section 3.3.2.2.5 against the criteria in SRP-LR Section 3.3.2.2.5.

In LRA Section 3.3.2.2.5, the applicant addressed the loss of material due to general, microbiologically influenced, pitting, and crevice corrosion.

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 emergency diesel generator system. Loss of material due to general, pitting, crevice, and microbiologically induced corrosion could occur in the duct fittings, access doors, and closure bolts, equipment frames and housing of the duct. Loss of material due to pitting and crevice corrosion could occur in the heating/cooling coils of the air handler heating/cooling, and due to 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 stated, in the LRA, that (1) for the internal environments of applicable auxiliary systems, the applicant credited PBNP AMP B2.1.15, “Periodic Surveillance and Preventive Maintenance Program,” PBNP AMP B2.1.14, ” Open-Cycle Cooling (Service) Water System Surveillance Program,” PBNP AMP B2.1.13, ”One-Time Inspection Program, PBNP AMP B2.1.10, ”Fire Protection Program, and PBNP AMP B2.1.22, “Tank Internal Inspection Program,” for managing these aging effects; and (2) for the external surfaces of all carbon steel components in auxiliary systems, the applicant credited PBNP AMP B2.1.21, “Systems Monitoring Program” or PBNP AMP B2.1.4, “Bolting Integrity Program,” for managing the aging effect of loss of material. Also, in some cases, the applicant credited PBNP AMP B2.1.14, ”Open-Cycle Cooling (Service) Water System Surveillance Program,” or PBNP AMP B2.1.10,” Fire Protection Program,” to augment the systems monitoring program for managing external aging effects. Closure bolting associated with these components are addressed in LRA Table 3.3-1, Item 3.3.1-24.

During the audit, the project team held technical discussion with the applicant. The applicant stated that this section of the LRA deals with the management of loss of material due to general, pitting, and crevice corrosion, and microbiologically induced corrosion for internal surfaces within ventilation and emergency power systems and for external surfaces of carbon steel component in auxiliary systems. The internal environments associated with this line item are those in which the internal surfaces are subject to normal atmospheric air and are also prone to wetting or condensation. The periodic surveillance and preventive maintenance program provides for inspections of these elected internal surfaces, which will look for and be able to detect this aging effect. The tank internal inspection program also provides for the inspection of selected tank internals, which will look for and be able to detect this aging effect; therefore, application of the periodic surveillance and preventive maintenance program or the tank internal inspection program provides adequate assurance that this aging effect will be managed throughout the period of extended operation. For external surfaces, the systems monitoring program provides for visual inspections and monitoring of external surfaces of piping, tanks, and other components and equipment, for leakage and evidence of material degradation. These inspections and monitoring are able to identify the aging effect of concern (loss of

material) on external surfaces prior to a loss of intended function of these components. The open-cycle cooling water surveillance program and the fire protection program both provide for wall thickness assessments (looking for loss of material) to be performed. These wall thickness assessments are typically performed from the outside of the components and therefore are able to detect any external surface degradation. For that reason, these two programs augment the systems monitoring program for managing loss of material on the external surfaces of components within the service water system and the fire protection system. The bolting integrity program provides for visual inspection and monitoring of fasteners and bolting for loss of material. These inspections and monitoring are able to identify loss of material on the external surfaces of these items prior to a loss of intended function of these items. The one-time inspection program provides for inspections of components for various reasons. During this inspection, the external surfaces of the components are inspected to identify this aging effect. Therefore, the systems monitoring program, augmented in selected cases by the open-cycle cooling water surveillance program, the fire protection program, the bolting integrity program, or the one-time inspection program, provides adequate assurance that loss of material on the external surfaces of components will be managed for the period of extended operation.

The project team reviewed the applicant's periodic surveillance and preventive maintenance program, open-cycle cooling (service) water system surveillance program, one-time inspection program, fire protection program, bolting integrity program, and tank internal inspection program. The project team's evaluation of periodic surveillance and preventive maintenance program, open-cycle cooling (service) water system surveillance program, one-time inspection program, and the fire protection program are documented in Section 7.1.13, Section 7.1.12, Section 7.1.11, and Section 7.1.8 of this report respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.4, Bolting Integrity Program and PBNP AMP B2.1.22, Tank Internal Inspection Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.4 and B2.1.22. The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.5 for further evaluation. For those line items that apply to LRA Section 3.3.2.2.5, the project team finds that the applicant is consistent with the GALL Report and 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).

7.2.3.2.2.6 Loss of Material Due to General, Galvanic, Pitting, and Crevice Corrosion

The project team reviewed the LRA Section 3.3.2.2.6 against the criteria in SRP-LR Section 3.2.2.2.6.

In Section 3.3.2.2.6, the applicant addressed further evaluation of programs to manage loss of material in the reactor coolant pump oil collection system to confirm 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 reactor coolant pump oil collection system in fire protection. The fire protection program relies on a combination of visual and volumetric examinations in accordance with the guidelines of 10 CFR Part 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 may accumulate. 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 confirm the effectiveness of the program. A one time inspection of the bottom half of the interior surface of the tank of the reactor coolant pump 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 stated, in the LRA, that it credited the PBNP AMP B2.1.13,"One-Time Inspection Program" for managing the aging effects of components within the reactor coolant pump oil collection sub-system.

During the audit, the project team held technical discussion with the applicant. The applicant stated that loss of material due to general, galvanic, pitting, and crevice corrosion could occur in the reactor coolant pump oil collection subsystem. The one-time inspection program, which is credited to manage this aging effect, addressed the potentially long incubation period for this aging effect and provides a means of confirming that this aging effect is either not occurring or progressing so slowly as to have negligible effect on the intended function(s) of the reactor coolant pump oil collection subsystem.

The project team reviewed the applicant's one-time inspection program and its revaluation is documented in Section 7.1.11 of this report. On the basis of its review, the project team finds that the one-time inspection program adequately the aging effects of components within the reactor coolant pump oil collection sub-system.

The NRC project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.6 for further evaluation. For those line items that apply to LRA Section 3.3.2.2.6, the project team finds that the applicant is consistent with the GALL Report and 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).

7.2.3.2.2.7 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion and Biofouling

The project team reviewed LRA Section 3.3.2.2.7 against the criteria in SRP-LR Section 3.3.2.2.7.

In LRA Section 3.3.2.2.7, the applicant addressed further evaluation of programs to manage loss of material in the diesel fuel oil system to confirm the effectiveness of the diesel fuel monitoring 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 surface 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 emergency diesel generator system. The existing AMP relies on the Fuel Oil Chemistry Control Program for monitoring and control of fuel oil contamination in accordance with the guidelines of ASTM Standards D4057, D1796, D2709, and D2276 to manage loss of material due to corrosion or biofouling. Corrosion or biofouling may occur at locations where contaminants accumulate. 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 corrosion/biofouling to confirm 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 AMPs recommended by the GALL Report are GALL AMP XI.M30, "Fuel Oil Chemistry," and GALL AMP XI.M32, "One-Time Inspection," for management of this aging effect.

The applicant stated, in the LRA, that PBNP AMP B2.1.12, "Fuel Oil Chemistry Control Program," is credited with managing the applicable aging effects in the fuel oil systems. The applicant further stated that PBNP AMP B2.1.13, "One-Time Inspection Program," is also used to verify the adequacy of the fuel oil chemistry program in managing these aging effects.

During the audit, the project team held technical discussion with the applicant. The applicant stated that loss of material due to general, pitting and crevice corrosion, MIC, and biofouling could occur on the internal surfaces of fuel oil tanks. The fuel oil chemistry control program mitigates and manages these aging effects on the internal surfaces of fuel oil storage tanks and associated components in systems that contain fuel oil. The program includes (1) surveillance and monitoring procedures for maintaining fuel oil quality by controlling contaminants in accordance with applicable ASTM standards, (2) periodic draining of water from fuel oil tanks, (3) periodic or conditional visual inspections of internal surfaces or wall thickness measurements (e.g., by UT) from external surfaces of fuel oil tanks, and (4) one-time inspections of a representative sample of components in systems that contain fuel oil. The objective of the fuel oil chemistry control program is to minimize the introduction and presence of contaminants in the plant's fuel oil system that could cause degradation of components in systems that contain fuel oil. A representative sample of components in systems that contain fuel oil will be inspected via the one-time inspection program. The one-time inspection program addresses the potentially long incubation periods for these aging effects and provides a means of confirming that these aging effects are either not occurring or progressing so slowly as to have negligible effect on the intended function(s) of these components; therefore, a combination of the fuel oil chemistry control program and one-time inspection program is used to manage these aging effects.

The project team reviewed the applicant's fuel oil chemistry control program and one-time inspection program and its evaluation of these program is documented in Section 7.1.10 and Section 7.1.11 of this report, respectively. On the basis of its review, the project team finds that these programs adequately managing the applicable aging effects in the fuel oil systems

The NRC project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.7 for further evaluation. For those line items that apply to LRA Section 3.3.2.2.7, the project team finds that the applicant is consistent with the GALL Report and 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).

7.2.3.2.2.8 Quality Assurance for Aging Management of Non-Safety-Related Components

PBNP LRA Section 3.2.2.2.8 is reviewed by NRR DIPM staff and addressed in Section 3 of the PBNP SER related to the PBNP LRA. Therefore, the project team did not review this item.

7.2.3.2.2.9 Crack Initiation and Growth Due to Stress Corrosion Cracking and Cyclic Loading

The project team reviewed the LRA Section 3.3.2.2.9 against the criteria in SRP-LR Section 3.3.2.2.9.

In 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 confirm 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, tube sheet, tubes, shell and access cover, and closure bolting of the regenerative heat exchanger and in the channel head and access cover, tube sheet, 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 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 confirm 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 operation.

The applicant stated, in the LRA, that although the GALL Report references a temperature gate of less than 90° C (200°F) and a single aging effect (cracking due to SCC), materials science supports (1) a temperature gate greater than 140°F for cracking due to SCC and (2) loss of material due to pitting (stagnant or low flow conditions) and crevice corrosion for all temperatures. Although the aging effect identified (loss of material) for temperatures less than 140°F differs from that of the GALL Report, PBNP AMP B.2.124, "Water Chemistry Control Program," which is credited for managing the aging effects for all temperatures, will preclude the possibility of cracking due to SCC. In some cases, PBNP AMP B2.1.9, "Closed-Cycle Cooling Water System Surveillance Program," is credited, which includes water chemistry controls for closed-cycle cooling water. In all cases, PBNP AMP B.2.1.13, "One-Time Inspection Program," is also credited to confirm the adequacy of water chemistry control.

The project team reviewed the applicant's water chemistry control program, closed-cycle cooling water system surveillance program, and one-time inspection program and its evaluation of these program is documented in Section 7.1.17, Section 7.1.7, and Section 7.1.11 of this report, respectively. The project team finds the applicant's use of the water chemistry control program (which is applicable to all temperature ranges) for managing the aging effect crack initiation and growth due to SCC and cyclic loading to be consistent with the GALL Report. The project team finds that the applicant's use of the one-time inspection program to supplement the water chemistry control program is consistent with the GALL Report to ensure identification of aging, should it occur in all areas including those that might be subject to stagnant or low-flow conditions. The project team finds that the applicant's use of the closed-cycle cooling water system surveillance program to supplement the water chemistry control program, which includes water chemistry controls for closed-cycle cooling water, is an additional measure that supplements the requirements of the GALL Report and is an acceptable addition to ensure management of aging effects in the closed-cycle cooling water system. On this basis, the project team finds this acceptable.

The project team finds that, based on the programs identified above, the applicant has met the

criteria of SRP-LR Section 3.3.2.2.9 for further evaluation. For those line items that apply to LRA Section 3.3.2.2.9, the project team finds that the applicant is consistent with the GALL Report and 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).

7.2.3.2.2.10 Reduction of Neutron-Absorbing Capacity and Loss of Material Due to General Corrosion

The project team reviewed LRA Section 3.3.2.2.10 against the criteria in SRP-LR Section 3.3.2.2.10.

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. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

The applicant states that this neutron-absorbing material, Boral, is not used at PBNP. Consequently, no aging management program is required.

On the basis that this component is not part of the PBNP design, the project team finds that this aging effect is not applicable to PBNP.

7.2.3.2.2.11 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

The project team reviewed LRA Section 3.3.2.2.11 against the criteria in SRP-LR Section 3.3.2.2.11.

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 (service) water system (SW 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 AMP recommended by the GALL Report is GALL AMP XI.M34, "Buried Piping and Tanks Inspection."

The applicant stated, in the LRA, that PBNP AMP B2.1.7, "Buried Services Monitoring Program," is credited for managing these aging effects for buried components. The applicant also stated that external surfaces of buried components are visually examined during maintenance activities (inspections of opportunity). No evidence of age-related degradation has been detected from inspections performed to date.

During the its review, the project team questioned in RAI B.2.1.7-1, how the applicant established that program components are all coated in light of the limited operating experience. In a letter dated March 15, 2005, the applicant provided its response. In its response, the applicant stated that its buried services monitoring program includes visual inspections of the

external surfaces of buried carbon steel, cast iron, and low alloy steel components that are within the scope of license renewal in the PBNP service water, fuel oil, and fire protection systems.

The applicant also stated that inspections of the PBNP service water, fuel oil, and fire protection systems will be performed based on plant operating experience and opportunities for inspection. In addition, a susceptible location in the fire protection system (i.e., uncoated unwrapped piping) will be scheduled to be inspected once prior to the period of extended operation and at least every 10 years during the period of extended operation. The intent of these scheduled inspections is to ensure that buried components within the fire protection system are periodically inspected. Therefore, if an opportunity for inspection occurs prior to the scheduled inspection, the inspection of opportunity can be credited for satisfying the scheduled inspection.

The applicant also stated that groundwater/lake water at PBNP is analyzed periodically, and that analyses performed to date confirm that the water is nonaggressive.

The project team reviewed the applicant's buried services monitoring program and its evaluation is documented in Section 7.1.5 of this report. The project team finds that operating history confirms that the buried services monitoring program is adequately managing the aging effects associated with loss of material due to general, pitting, and crevice corrosion and MIC that could occur in the underground piping and fittings in the service water system and in the diesel fuel oil system. The project team also finds that the applicant has measures currently in place that will adequately identify any degradation to components due to these aging effects.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.11 for further evaluation. For those line items that apply to LRA Section 3.3.2.2.11, the project team finds that the applicant is consistent with the GALL Report and 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).

7.2.3.2.3 AMR Results That Are Not Consistent With or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In Tables 3.3.2-1 through 3.3.2-16 of the LRA, the applicant provided additional details of the results of the AMRs for material, environment, aging effect requiring management, and AMP combinations that are not consistent with the GALL Report or are not addressed in the GALL Report.

In Tables 3.3.2-1 through 3.3.2-16, the applicant indicated, via Notes F through J, that neither the identified component nor the material and environment combination is evaluated in the GALL Report and provided information concerning how the aging effect will be managed.

Project Team Evaluation. For component type, material and environment combination that are not evaluated in the GALL Report, the project team reviewed the applicant's evaluation to determine whether the applicant had demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained during the period of extended operation.

The project team's evaluation is discussed below.

7.2.3.2.3.1 Auxiliary System Components That Have No Aging Effects (LRA Table 3.3.2-1 to LRA Table 3.3.2-1-16)

In LRA Table 3.3.2.-1 to Table 3.3.2- 16, the applicant identified line items where no aging effects were identified as a result of the its aging review process. Specifically, instances in which the applicant stated that no aging effects were identified occurred when components fabricated from stainless steel, copper alloy or stainless steel clad material were exposed to air or to an inert gas (nitrogen as an example). The applicant, in the LRA defined an air environment as dehumidified atmospheric air, dry/filtered instrument air. Neither air nor inert gas is identified in the GALL Report as an environment for these components and materials. No aging effects are considered to be applicable to carbon steel, stainless steel or stainless steel clad components exposed to air, or to an inert gas environments.

On the basis of its review of current industry research and operating experience, the project team finds that dry air on metal will not result in aging that will be of concern during the period of extended operation. These RCS components are exposed to high-temperature internal flow, which creates a dry air environment. Stainless steel and nickel-based alloy components in air or an inert gas environment are not susceptible to general corrosion that would affect their intended function. Therefore, the project team concludes that there are no applicable aging effects requiring management for carbon steel, stainless steel or stainless steel clad components exposed to air, or to an inert gas environments.

7.2.3.2.3.2 Chemical and Volume Control System - Summary of Aging Management Evaluation - LRA Table 3.3.2-1

In Section 3.3.2.1.1 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the chemical and volume control system and associated pressure boundary components:

- bolting integrity program
- boric acid corrosion program
- closed-cycle cooling water system surveillance program
- one-time inspection program
- systems monitoring program
- water chemistry control program

In Table 3.3.2-1 of the LRA, the applicant provided a summary of AMRs for the chemical and volume control system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The project team reviewed Table 3.3.2-1 of the LRA, which summarized the results of AMR evaluations for the chemical and volume control system component groups.

The applicant proposed to manage loss of material of carbon low-alloy steel, stainless steel and cast austenitic steel materials for component type of fasteners, bolting, filters, strainers, flow elements, heat exchangers, instrument valve assemblies, piping, fittings, pump casings, tanks, thermowells, and valve bodies in the CVCS pressure boundary and mechanical closures exposed to treated water-borated, primary, and other, containment (external), indoor-no air conditioning environment using PBNP AMP B2.1.6, “Boric Acid Corrosion Program;” PBNP AMP B2.1.4, “Bolting Integrity Program;” PBNP AMP B2.1.13, “One-Time Inspection Program;”

PBNP AMP B2.1.24, “Water Chemistry Control Program;” PBNP AMP B2.1.21, “Systems Monitoring Program;” and PBNP AMP B2.1.9, “Closed-Cycle Cooling Water System Surveillance Program.”

The project team reviewed the applicant’s boric acid corrosion program, bolting integrity program, one-time inspection program, water chemistry control program, systems monitoring program, and closed-cycle cooling water system surveillance program. The project team’s evaluation of one-time inspection program, water chemistry control program, systems monitoring program, and closed-cycle cooling water system surveillance program are addressed in Section 7.1.11, Section 7.1.17, Section 7.1.16, and Section 7.1.7 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.4, Bolting Integrity Program and PBNP AMP B2.1.6, Boric Acid Corrosion Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.4 and AMP B2.1.6. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material of carbon low-alloy steel, stainless steel and cast austenitic steel materials for component types in the chemical and volume control system are effectively managed using the boric acid corrosion program, bolting integrity program, one-time inspection program, water chemistry control program, systems monitoring program, and closed-cycle cooling water system surveillance program. On this basis, the project team finds that management of loss of material in the chemical and volume control system is acceptable.

The applicant proposed to manage cracking due to SCC of stainless steel material for component types of heat exchanger, piping, and fitting pressure boundaries, exposed to treated primary and borated water between temperatures of 140°F and 480°F environment using the PBNP AMP B.2.1.13, “One-Time Inspection Program,” and PBNP AMP B.2.1.24, “Water Chemistry Control program.”

The project team reviewed the applicant’s one-time inspection program and water chemistry control program. The project team’s evaluation of these program are addressed in Section 7.1.11 and Section 7.1.17 of this report, respectively. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that cracking due to SCC of stainless steel material for component types in the chemical and volume control system are effectively managed using the one-time inspection program and water chemistry control program. On this basis, the project team finds that management of cracking due to SCC in the chemical and volume control system is acceptable.

7.2.3.2.3.3 Component Cooling Water System - Summary of Aging Management Evaluation - LRA Table 3.3.2-2

In Section 3.3.2.3.2 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the component cooling water system and associated pressure boundary components:

- bolting integrity program
- boric acid corrosion program
- closed-cycle cooling water system surveillance program
- one-time inspection program
- open-cycle cooling (service) water system surveillance program
- systems monitoring program

- water chemistry control program

In Table 3.3.2-2 of the LRA, the applicant provided a summary of AMRs for the component cooling water system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The applicant proposed to manage loss of material of carbon low-alloy steel, stainless steel, cast iron, copper alloy (Zn less than 15%) and copper alloy (Zn greater than 15%) materials for component types of CS components, fasteners, bolting, flow elements, heat exchangers, radiation monitor, instrument valve assemblies, piping, fittings, pump casings, tanks, thermowells, and valve bodies in the component cooling water system pressure boundary and mechanical closures exposed to borated water leaks (external), treated water - other (velocity), raw water (velocity), treated water - primary, temperature greater than 480°F., treated water - primary, temperature between 140°F and 480°F., treated water - secondary, temperature greater than 120°F., treated water - other (stagnant), air and gas - wetted, temperature less than 140°F, containment (external), indoor-no air conditioning environment using PBNP AMP B2.1.6, “Boric Acid Corrosion Program”; PBNP AMP B2.1.4, “Bolting Integrity Program”; PBNP AMP B2.1.13, “One-Time Inspection Program”; PBNP AMP B2.1.24, “Water Chemistry Control Program”; PBNP AMP B2.1.21, “Systems Monitoring Program”; PBNP AMP B2.1.14, “Open-Cycle Cooling (Service) Water System Surveillance Program”; and PBNP AMP B2.1.9, “Closed-Cycle Cooling Water System Surveillance Program.”

The project team reviewed the applicant’s boric acid corrosion program, bolting integrity program, one-time inspection program, water chemistry control program, systems monitoring program, open-cycle cooling (service) water system surveillance program, and closed-cycle cooling water system surveillance program. The project team’s evaluation of the one-time inspection program, water chemistry control program, systems monitoring program, open-cycle cooling (service) water system surveillance program, and closed-cycle cooling water system surveillance program is documented in Section 7.1.11, Section 7.1.17, Section 7.1.16, Section 7.1.12, and Section 7.1.7 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.4, Bolting Integrity Program and PBNP LRA AMP B2.1.6, Boric Acid Corrosion Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.4 and B2.1.6. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of materials for component types in the component cooling water system are effectively managed using the boric acid corrosion program, bolting integrity program, one-time inspection program, water chemistry control program, systems monitoring program, open-cycle cooling (service) water system surveillance program, and closed-cycle cooling water system surveillance program. On this basis, the project team finds that management of loss of material in the component cooling water system is acceptable.

The applicant proposed to manage loss of heat transfer due to fouling of stainless steel material for component type of heat exchanger exposed to treated water - other (velocity), raw water (velocity) environment using PBNP AMP B2.1.14, “Open-Cycle Cooling (Service) Water System Surveillance Program,” and PBNP AMP B2.1.9, “Closed-Cycle Cooling Water System Surveillance Program.”

The project team reviewed the applicant’s open-cycle cooling (service) water system surveillance program and closed-cycle cooling water system surveillance program. The project team’s evaluation is documented in Section 7.1.12 and Section 7.1.7 of this report, respectively.

On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of heat transfer due to fouling for component types in the component cooling water system are effectively managed using the open-cycle cooling (service) water system surveillance program and closed-cycle cooling water system surveillance program. On this basis, the project team finds that management of loss of heat transfer due to fouling in the component cooling water system is acceptable.

The applicant proposed to manage cracking due to SCC of stainless steel materials for component type of heat exchanger pressure boundaries exposed to treated water - primary, temperature greater than 480°F and treated water - primary, temperature between 140°F and 480°F, and treated water - secondary, T greater than 120°F environments using PBNP AMP B2.1.24, "Water Chemistry Control Program." The applicant also stated that PBNP AMP B2.1.13, "One-Time Inspection Program," is used for managing cracking in the treated water - secondary, temperature greater than 120°F environment.

However, in LRA Table 3.3.2-2 (Page 3-221), the applicant proposed to manage cracking due to IGA/IGSCC of stainless steel in heat exchanges exposed to primary treated water with T>480ºF (internal) using only the Water Chemistry Control Program. RAI 3.3-7 was issued requesting clarification why an inspection was not performed to verify the effectiveness of the water chemistry program. <Unresolved Issue 3.3-7>

The project team reviewed the applicant's water chemistry control program and one-time inspection program and its evaluation is documented in Section 7.1.17 and 7.1.11 of this report. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that cracking due to SCC for component types in the component cooling water system are effectively managed using the water chemistry control program and one-time inspection program. On this basis, the project team finds that management of cracking due to SCC in the component cooling water system is acceptable.

The applicant proposed to manage cracking due to IGA/IGSCC of stainless steel material for component of heat exchanger pressure boundaries exposed to treated water - primary, T greater than 480°F environment using PBNP AMP B2.1.24, "Water Chemistry Control Program."

The project team reviewed the applicant's water chemistry control program and its evaluation is documented in Section 7.1.17 of this report. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that cracking due to IGA/IGSCC for component types in the component cooling water system are effectively managed using the water chemistry control program. On this basis, the project team finds that management of cracking due to IGA/IGSCC in the component cooling water system is acceptable.

7.2.3.2.3.4 Spent Fuel Cooling System - Summary of Aging Management Evaluation LRA Table 3.3.2-3

In Section 3.3.2.3.3 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the spent fuel cooling system and associated pressure boundary components:

- bolting integrity program
- boric acid corrosion program

- one-time inspection program
- open-cycle cooling (service) water system surveillance program
- systems monitoring program
- water chemistry control program

In Table 3.3.2-3 of the LRA, the applicant provided a summary of AMRs for the spent fuel cooling system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The project team reviewed Table 3.2.2-3 of the LRA, which summarized the results of AMR evaluations for the spent fuel cooling system component groups.

The applicant proposed to manage loss of material of carbon low-alloy steel, stainless steel, and cast austenitic stainless steel materials for the components types of CS components, fasteners, bolting, flow elements, heat exchangers, instrument valve assemblies, piping, fittings, pump casings, and valve bodies in the spent fuel cooling system pressure boundary and mechanical closures exposed to borated water leaks (external), treated water - borated, temperature less than 140°F, raw water, and indoor no air conditioning environment using PBNP AMP B2.1.6, “Boric Acid Corrosion Program,” PBNP AMP B2.1.4, “Bolting Integrity Program,” PBNP AMP B2.1.13, “One-Time Inspection Program,” PBNP AMP B2.1.24, “Water Chemistry Control Program,” PBNP AMP B2.1.21, “Systems Monitoring Program,”and PBNP AMP B2.1.14, “Open-Cycle Cooling (Service) Water System Surveillance Program.”

The project team reviewed the applicant’s boric acid corrosion program, bolting integrity program, one-time inspection program, water chemistry control program, systems monitoring program, and open-cycle cooling (service) water system surveillance program. The project team’s evaluation of the one-time inspection program, water chemistry control program, systems monitoring program, and open-cycle cooling (service) water system surveillance program are documented in Section 7.1.11, Section 7.1.17, Section 7.1.16, and Section 7.1.12 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.4, Bolting Integrity Program and PBNP LRA AMP B2.1.6, Boric Acid Corrosion Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.4 and B2.1.6. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material for component types in the spent fuel cooling system are effectively managed using boric acid corrosion program, bolting integrity program, one-time inspection program, water chemistry control program, systems monitoring program, and open-cycle cooling (service) water system surveillance program. On this basis, the project team finds that management of loss of materials in the spent fuel cooling system is acceptable.

The applicant proposed to manage loss of heat transfer due to fouling of stainless steel material for component type of heat exchanger exposed to treated water - borated, temperature less than 140°F and raw water environment using PBNP AMP B2.1.14,”Open-Cycle Cooling (Service) Water System Surveillance Program,” The applicant stated that PBNP AMP B2.1.13, “One-Time Inspection Program,” and PBNP AMP B2.1.24, “Water Chemistry Control Program,” are used for components exposed to treated water - borated environment.

The project team reviewed the applicant’s open-cycle cooling (service) water system surveillance program, one-time inspection program, and water chemistry control program and its evaluation of these programs is documented in Section 7.1.12, Section 7.1.11, and

Section 7.1.17 of this report, respectively. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of heat transfer due to fouling for component types in the spent fuel cooling system are effectively managed using open-cycle cooling (service) water system surveillance program, one-time inspection program, and water chemistry control program. On this basis, the project team finds that management of loss of heat transfer due to fouling in the spent fuel cooling system is acceptable.

7.2.3.2.3.5 Waste Disposal System - Summary of Aging Management Evaluation LRA Table 3.3.2-4

In Section 3.3.2.1.4 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the waste disposal system and associated pressure boundary components:

- bolting integrity program
- boric acid corrosion program
- closed-cycle cooling water system surveillance program
- one-time inspection program
- periodic surveillance and preventive maintenance program
- systems monitoring program
- water chemistry control program

In Table 3.3.2-4 of the LRA, the applicant provided a summary of AMRs for the waste disposal system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The project team reviewed Table 3.3.2-4 of the LRA, which summarized the results of AMR evaluations for the waste disposal system component groups.

The applicant proposed to manage loss of material for carbon low-alloy steel, stainless steel, copper alloy (Zn greater than 15%), and cast austenitic stainless steel materials for component types of CS components, fasteners, bolting, flow elements, heat exchangers, instrument valve assemblies, piping, fittings, pump casings, and valve bodies exposed to borated water leaks (external), treated water - other, treated water - borated, temperature less than 140°F, air and gas - wetted, temperature less 140°F, raw water drainage, and indoor no air conditioning environment using PBNP AMP B2.1.6, "Boric Acid Corrosion Program," PBNP AMP B2.1.4, "Bolting Integrity Program," PBNP AMP B2.1.13, "One-Time Inspection Program," PBNP AMP B2.1.24," Water Chemistry Control Program," PBNP AMP B2.1.21, "Systems Monitoring Program," PBNP AMP B2.1.15, "Periodic Surveillance and Preventive Maintenance Program," and PBNP AMP B2.1.9, "Closed-Cycle Cooling Water System Surveillance Program.

The project team reviewed the applicant's boric acid corrosion program, bolting integrity program, one-time inspection program, water chemistry control program, systems monitoring program, periodic surveillance and preventive maintenance program, and closed-cycle cooling water system surveillance program. The project team's evaluation of the one-time inspection program, water chemistry control program, systems monitoring program, periodic surveillance and preventive maintenance program, and closed-cycle cooling water system surveillance program is documented in Section 7.1.11, Section 7.1.17, Section 7.1.13, and Section 7.1.7 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.4, Bolting Integrity Program and PBNP LRA AMP B2.1.6, Boric Acid Corrosion Program is documented in

Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.4 and B2.1.6. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material for component types in the waste disposal system are effectively managed using boric acid corrosion program, bolting integrity program, one-time inspection program, water chemistry control program, systems monitoring program, periodic surveillance and preventive maintenance program, and closed-cycle cooling water system surveillance program. On this basis, the project team finds that management of loss of materials in the waste disposal system is acceptable.

7.2.3.2.3.6 Service Water System - Summary of Aging Management Evaluation LRA Table 3.3.2-5

In Section 3.3.2.1.5 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the service water system and associated pressure boundary components:

- bolting integrity program
- boric acid corrosion program
- closed-cycle cooling water system surveillance program
- one-time inspection program
- periodic surveillance and preventive maintenance program
- systems monitoring program
- water chemistry control program

In Table 3.3.2-5 of the LRA, the applicant provided a summary of AMRs for the service water system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The project team reviewed Table 3.3.2-5 of the LRA, which summarized the results of AMR evaluations for the service water system component groups.

The applicant proposed to manage loss of material of carbon low-alloy steel, stainless steel, cast iron, copper alloy (Zn less than 15%), cast austenitic stainless steel, and copper alloy (Zn greater than 15%) materials for component types of CS components, expansion joints, filters, strainers, fasteners, bolting, flow elements, flow indicators, heat exchangers, heaters, coolers, hose real, restricting orifices, sight glass, radiation monitor, instrument valve assemblies, piping, fittings, pump casings, thermowells, and valve bodies in the service water system pressure boundary, filtration, restricts flow, and mechanical closures exposed to borated water leaks (external), treated water - other (velocity), raw water (velocity), raw water - submerged (external), raw water (internal), raw water (internal - stagnant), indoor - wetted (external), buried (external), containment (external), indoor-no air conditioning environment using PBNP AMP B2.1.6, "Boric Acid Corrosion Program," PBNP AMP B2.1.10, "Fire Protection Program," PBNP AMP B2.1.7, "Buried Services Monitoring Program," PBNP AMP B2.1.15, "Periodic Surveillance and Preventive Maintenance Program," PBNP AMP B2.1.21, "Systems Monitoring Program," and PBNP AMP B2.1.14, "Open-Cycle Cooling (Service) Water System Surveillance Program."

The project team reviewed the applicant's boric acid corrosion program, fire protection program, buried services monitoring program, periodic surveillance and preventive maintenance program,

systems monitoring program, and open-cycle cooling (service) water system surveillance program. The project team's evaluation of the fire protection program, buried services monitoring program, periodic surveillance and preventive maintenance program, systems monitoring program, and open-cycle cooling (service) water system surveillance program is documented in Section 7.1.8, Section 7.1.5, Section 7.1.13, Section 7.1.16, and Section 7.1.12 of this report, respectively.

The NRR DE staff evaluation of PBNP LRA AMP B2.1.6, Boric Acid Corrosion Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.6. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material for component types in the service water system are effectively managed using boric acid corrosion program, fire protection program, buried services monitoring program, periodic surveillance and preventive maintenance program, systems monitoring program, and open-cycle cooling (service) water system surveillance program. On this basis, the project team finds that management of loss of materials in the service water system is acceptable.

During the audit, the project team noted that the applicant used Note B in the LRA notes column for loss of material of copper alloy (Zn less than 15%) and copper alloys (Zn greater than15%) material for component type of valve bodies line item. Note B indicates that the component, material, environment, aging effect, and program are consistent with NUREG-1801 with minor exceptions. However, the GALL Report reference does not include copper alloys. The applicant was asked to provided clarification. The applicant stated that although NUREG-1801 Volume 2, reference VII.C1.2-a cited materials that include bronze and aluminum bronze, it does not specifically cite copper alloy. The applicant stated that Note F, which indicates material not in NUREG -1801 for this component, should be use. By letter dated July 12, 2004, the applicant stated that it will to change note from B to F,5 in the 2005 LRA update. On this basis, the project team finds this change acceptable.

During the audit, the project team noted that the applicant lists numerous line items that define components in an indoor-no air conditioning (external) or containment (external) environment and credited PBNP AMP B2.1.14, "Open-Cycle Cooling (Service) Water System Surveillance Program," for managing the aging effect loss of material. The open-cycle cooling (service) water system surveillance program description would indicate the program is intended to manage loss of material on the internal surfaces of these components. The applicant was requested to explain how the open-cycle cooling (service) water system surveillance program manages the loss of material of external surfaces of carbon steel thermowells (and other components) in these external environments. The applicant stated that the open-cycle cooling (service) water system surveillance program will be revised to include a visual inspection of external surfaces of these types of components. By letter dated July 12, 2004, the applicant committed to revise the PBNP AMP B2.1.14, "Open-Cycle (Service) Water System Surveillance Program," to include a visual inspection of external surfaces of carbon steel components. On this basis, the project team finds this acceptable.

During the audit, the project team also noted that GALL AMP XI.M33, "Selective Leaching of Materials," indicates the susceptibility of cast iron to the aging effect of selective leaching when exposed to a raw water environment. PBNP AMP B2.1.14, "Open-Cycle Cooling (Service) Water System Surveillance Program," is credited with managing the loss of material, but selective leaching is not defined as an aging effect of cast iron pump casing or valve bodies in a submerged raw water environment. The applicant was requested to clarify why this aging effect is not identified for this material, environment, and aging management program combination.

The applicant stated that selective leaching was identified as a potential aging effect, and that the open-cycle cooling (service) water system surveillance program will be revised to include a visual inspection to identify selective leaching to these components. By letter dated July 12, 2004, the applicant committed to revise the PBNP AMP B2.1.14, "Open-Cycle (Service) Water System Surveillance Program," to include a visual inspection to identify selective leaching of cast iron components.

The project team reviewed the applicant's boric acid corrosion program, fire protection program, buried services monitoring program, periodic surveillance and preventive maintenance program, systems monitoring program, and open-cycle cooling (service) water system surveillance program. The project team's evaluation of the fire protection program, buried services monitoring program, periodic surveillance and preventive maintenance program, systems monitoring program, and open-cycle cooling (service) water system surveillance program are documented in Section 7.1.8, Section 7.1.5, Section 7.1.13, Section 7.1.16, and Section 7.1.12 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.6, Boric Acid Corrosion Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.4. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material for component types in the service water system are effectively managed using boric acid corrosion program, fire protection program, buried services monitoring program, periodic surveillance and preventive maintenance program, systems monitoring program, and open-cycle cooling (service) water system surveillance program. On this basis, the project team finds that management of loss of materials in the service water system is acceptable.

The applicant proposed to manage loss of heat transfer due to fouling of copper alloy (Zn less than 15%) for component type of heater/coolers exposed to indoor - wetted (external) and raw water (velocity) environment using PBNP AMP B2.1.14, "Open-Cycle Cooling (Service) Water System Surveillance Program." and PBNP AMP B2.1.15, "Periodic Surveillance and Preventive Maintenance Program."

The project team reviewed the applicant's open-cycle cooling (service) water system surveillance program and periodic surveillance and preventive maintenance program and its evaluation is documented in Section 7.1.12 and Section 7.1.13 of this report, respectively. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of heat transfer due to fouling for component types in the service water system are effectively managed using open-cycle cooling (service) water system surveillance program and periodic surveillance and preventive maintenance program . On this basis, the project team finds that management of loss of heat transfer due to fouling in the service water system is acceptable.

The applicant stated, in LRA Table 3.3.2-5, that changes in material properties are identified by GALL Report as a potential aging effect for neoprene expansion joints pressure boundaries exposed to indoor - no air conditioning (external) environment. The applicant performed studies of plant locations with neoprene expansion joints pressure boundaries which demonstrated that these neoprene components operate at a temperatures less that the 95°F threshold for a change in material properties to occur, the applicant concluded that no aging effects are expected and no management programs are required.

The project team conducted discussions with the applicant and concurred that operating conditions experienced by these neoprene expansion joints pressure boundaries will not exceed

95°F. In addition, the project team agrees that 95°F is an appropriate threshold for a maximum operating temperature at which no material property changes will occur to neoprene seals. Based on the operating temperature and threshold limit project team agrees that the neoprene expansion joints pressure boundaries will not experience material property changes and therefore, do not require an aging management program.

Based on discussion with the applicant, the operating conditions, the threshold limit the project team concurs that material properties will not occur and that no management program is required. On this basis, the project team finds that management of change in material properties for neoprene is acceptable.

7.2.3.2.3.7 Fire Protection System - Summary of Aging Management Evaluation - LRA Table 3.3.2-6

In Section 3.3.2.1.6 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the fire protection system and associated pressure boundary components:

- bolting integrity program
- boric acid corrosion program
- buried services monitoring program
- fire protection program
- fuel oil chemistry control program
- one-time inspection program
- systems monitoring program

In Table 3.3.2-6 of the LRA, the applicant provided a summary of AMRs for the fire protection system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The project team reviewed Table 3.3.2-6 of the LRA, which summarized the results of AMR evaluations for the fire protection system component groups.

The applicant proposed to manage loss of material of carbon low-alloy steel, cast iron, copper alloy (Zn less than 15%), copper alloy (Zn greater than 15%), stainless steel and cast austenitic stainless steel materials for components types of accumulators, cylinders, compressor casing, CS components, fasteners, bolting, filters, strainers, fire hydrant, flame arrestors, hose reel, RCP oil collection, spray nozzles, sprinkler heads, heat exchangers, instrument valve assemblies, piping, fittings, pump casings, tanks, and valve bodies in the fire protection pressure boundary, filtration, flame suppression, flow control, and mechanical closures exposed to air and gas, air and gas - wetted, temperature less 140°F, borated water leaks, raw water (stagnant), outdoor, oil and fuel oil, treated water - other (stagnant), buried, oil and fuel oil - pooling, containment (external), indoor-no air conditioning environments using PBNP AMP B2.1.10, “Fire Protection Program,” PBNP AMP B2.1.6, “Boric Acid Corrosion Program,” PBNP AMP B2.1.4, “Bolting Integrity Program,” PBNP AMP B2.1.13, “One-Time Inspection Program,” PBNP AMP B2.1.7, “Buried Services Monitoring Program,” PBNP AMP B2.1.12, “Fuel Oil Chemistry Control Program,” PBNP AMP B2.1.21, “Systems Monitoring Program.”

The project team reviewed the applicant’s fire protection program, boric acid corrosion program, bolting integrity program, one-time inspection program, buried services monitoring program, fuel

oil chemistry control program and systems monitoring program. The project team's evaluation of the fire protection program, one-time inspection program, buried services monitoring program, fuel oil chemistry control program and systems monitoring program are documented in Section 7.1.8, Section 7.1.11, Section 7.1.5, Section 7.1.10, and Section 7.1.16 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.4, Bolting Integrity Program and PBNP AMP B2.1.6, Boric Acid Corrosion Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.4. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material for component types in the fire protection system are effectively managed using fire protection program, boric acid corrosion program, bolting integrity program, one-time inspection program, buried services monitoring program, fuel oil chemistry control program and systems monitoring program. On this basis, the project team finds that management of loss of materials in the fire protection system is acceptable.

The applicant stated in LRA Table 3.3.2-6, that change in material properties is identified by the GALL Report as a potential aging effect to neoprene expansion joints pressure boundaries, exposed to indoor - no air conditioning (external) environment. The applicant stated that it has performed a plant temperature survey and demonstrated that the areas, where these neoprene seals exist, function at a temperature less than the 95°F threshold limit for neoprene to exhibit aging effects. Therefore the applicant concluded in its LRA that no aging effects are expected and that no management programs are required.

The project team conducted discussions with the applicant and concurred that operating conditions experienced by these neoprene expansion joints pressure boundaries will not exceed 95°F. In addition, the project team agrees that 95°F is an appropriate threshold for a maximum operating temperature at which no material property changes will occur to neoprene seals. Based on the operating temperature and threshold limit project team agrees that the neoprene expansion joints pressure boundaries will not experience material property changes and therefore, do not require an aging management program.

Based on discussion with the applicant, the operating conditions, the threshold limit the project team concurs that material properties will not occur and that no management program is required. On this basis, the project team finds that management of change in material properties for neoprene is acceptable.

The applicant proposed to manage loss of heat transfer due to fouling of copper alloy (Zn less than 15%) material for component type of heater exchangers exposed to treated water - other (stagnant) and raw water (stagnant) environment using PBNP AMP B2.1.10, "Fire Protection Program."

The project team reviewed the applicant's fire protection program and its evaluation is documented in Section 7.1.8 of this report. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of heat transfer due to fouling component types in the fire protection system are effectively managed using fire protection program. On this basis, the project team finds that management of loss of heat transfer due to fouling in the fire protection system is acceptable.

The applicant stated in LRA Table 3.3.2-6, that cracking due to SCC is identified by the GALL Report as a potential aging effect of cast austenitic stainless steel material for component type of valve bodies pressure boundaries exposed to oil and fuel oil - pooling environment. The

applicant stated that its operating experience has shown no aging effects are expected and no management programs are required. The plant-specific note associated with this AMR line item stated that SCC is not a concern for this material/environment group, due to temperatures being less than 140 °F. This is the threshold for SCC that the project team uses in the GALL Report for cast austenitic stainless steel .

The project team reviewed the information provided in the LRA, held technical discussion with the applicant, assessed the plant operating experience and reviewed the 140 °F threshold suggested by the applicant. The project team agrees that the threshold limit of 140 °F is an acceptable threshold for below which SCC in cast austenitic stainless steel will not occur. Furthermore, the PBNP operating experience supports that SCC is not occurring in these CASS applicant experience. On these bases, the project team finds this acceptable.

During the audit, the project team noted that the LRA identified cast iron components in the fire protection system as being monitored by the PBNP AMP B2.1.10, “Fire Protection Program” and PBNP AMP B2.1.21, “Systems Monitoring Program.” Neither of these programs monitors for selective leaching of cast iron.

In applicant stated, in PBNP AMP B2.1.13, “One-Time Inspection Program,”: “Another metal that is susceptible to selective leaching is gray cast iron, which can display this type of aging mechanism even in relatively mild environments. Therefore, this program includes a one-time visual inspection of selected components that may be susceptible to selective leaching. The inspection may include hardness measurements. The one-time inspections will determine whether loss of material due to selective leaching is occurring, and whether the process will affect the ability of the components to perform their intended function(s) for the period of extended operation. A sample of the components (such as piping, valve bodies and bonnets, pump casings, and heat exchanger components), whose materials of construction may include cast iron, brass, bronze, or aluminum bronze, that are exposed to raw water, treated water, or ground water environment that may lead to selective leaching will be selected for inspection.”

In RAI B.2.1.13-1, the project team requested that the applicant to provide justification why the applicant does not perform a one-time inspection (hardness test) for selective cast iron components in the fire protection system. By letter dated October 15, 2004, the applicant committed as follow:

> As part of LRA Section B2.1.13, “one Time Inspection Program,” a one-time visual inspection and hardness measurement will be performed on accessible locations of a set of components of each material type (i.e., cast iron and brass) to determine whether selective leaching has occurred and whether the resulting loss of strength and/or material will affect the intended functions of these components during the period of extended operation.

The project team reviewed the applicants’s response to RAI # B.2.1.13-1. In its response, the applicant stated that its fire protection program and systems monitoring program will be revised to include an inspection of these types of components to identify the slowly progressing aging effect selective leaching. On the basis of its review, the project team finds that the aging management of fire protection system is acceptable.

During the audit, the project team noted that the LRA Table 3.3.2-6 stated that for fire system heat exchangers, the heat transfer function for copper alloy has no external environment or

aging effect. Typically there is a raw water environment (service water) or treated water environment (CCW) coolant medium on the shell side of the heat exchanger, which promotes scaling. Significant scaling would prevent heat transfer function. The heat transfer function is used to monitor the aging effect of scaling. The applicant was requested to identify the environment for the external portion of the heat exchanger tubes. The applicant stated that this, as well as several other similar items in the LRA, is an anomaly associated with how the LRA database identifies environments. Because the "external" environment of the heat exchanger tubes is also the "internal" environment of the heat exchanger, the applicant chose to identify the environment only once (e.g., internal environment of the heat exchanger). On the basis of its review, the project team finds this approach acceptable.

7.2.3.2.3.8 Emergency Power System - Summary of Aging Management Evaluation - LRA Table 3.3.2-7

In Section 3.3.2.1.7 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the emergency power system and associated pressure boundary components:

- bolting integrity program
- buried services monitoring program
- closed-cycle cooling water system surveillance program
- fuel oil chemistry control program
- one-time inspection program
- open-cycle cooling (service) water system surveillance program
- periodic surveillance and preventive maintenance program
- systems monitoring program
- tank internal inspection program

In Table 3.3.2-7 of the LRA, the applicant provided a summary of AMRs for the emergency power system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The project team reviewed Table 3.3.2-7 of the LRA, which summarized the results of AMR evaluations for the emergency power system component groups.

The applicant proposed to manage loss of material of carbon low-alloy steel, stainless steel, aluminum, cast iron, copper alloy (Zn less than 15%),cast austenitic stainless steel, and copper alloy (Zn greater than 15%) materials for components types of air motor, drain trap, fan and blower housing, flame arrestors, instrumentation, silencer, tanks, turbine casing, turbo-charger, expansion joints, filters, strainers, fasteners, bolting, flow elements, flow indicators, heat exchangers, heaters, coolers, hose real, restricting orifices, sight glass, instrument valve assemblies, piping, fittings, pump casings, and valve bodies in the service water system pressure boundary, flame suppression, filtration, restricts flow, and mechanical closures exposed to air and gas - wetted, temperature less than 140°F, oil and fuel oil - pooling, treated water - other (stagnant), outdoor, oil and fuel oil, raw water (internal), buried (external), indoor-no air conditioning environment using PBNP AMP B2.1.7, "Buried Services Monitoring Program," PBNP AMP B2.1.15, "Periodic Surveillance and Preventive Maintenance Program," PBNP AMP B2.1.21, "Systems Monitoring Program, PBNP AMP B2.1.13, "One-Time Inspection Program," PBNP AMP B2.1.12, "Fuel Oil Chemistry Control Program," PBNP AMP B2.1.4, "Bolting Integrity Program," PBNP AMP B2.1.14," Open-Cycle Cooling (Service) Water System

Surveillance Program," PBNP AMP B2.1.22, "Tank Internal Inspection Program," and PBNP AMP B2.1.9, "Closed -Cycle Cooling Water System Surveillance Program."

The project team reviewed the applicant's buried services monitoring program, periodic surveillance and preventive maintenance program, systems monitoring program, one-time inspection program, fuel oil chemistry control program, bolting integrity program, open-cycle cooling (service) water system surveillance program, tank internal inspection program, and closed -cycle cooling water system surveillance program. The project team's evaluation of the buried services monitoring program, periodic surveillance and preventive maintenance program, systems monitoring program, one-time inspection program, fuel oil chemistry control program, open-cycle cooling (service) water system surveillance program, and closed -cycle cooling water system surveillance program are documented in Section 7.1.5, Section 7.1.13, Section 7.1.16, Section 7.1.11, Section 7.1.10, Section 7.1.12, and Section 7.1.7 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.4, Bolting Integrity Program and PBNP LRA AMP B2.1.22, Tank Internal Inspection Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.4 and B2.1.22. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material for component types in the emergency power system are effectively managed using buried services monitoring program, periodic surveillance and preventive maintenance program, systems monitoring program, one-time inspection program, fuel oil chemistry control program, bolting integrity program, open-cycle cooling (service) water system surveillance program, tank internal inspection program, and close-cycle cooling water system surveillance program. On this basis, the project team finds that management of loss material in the emergency power system is acceptable.

The applicant proposed to manage loss of heat transfer due to fouling for HX copper alloy (Zn less than 15%), HX stainless steel, and HX copper alloy (Zn greater than 15%) materials for component type of heat exchangers and heater/coolers exposed to indoor - no air conditioning, raw water, air and gas - wetted, temperature less than 140°F, oil and fuel, outdoor, treated water - other (stagnant) environment using PBNP AMP B2.1.13, "One-time inspection Programma B2.1.9, "Closed-Cycle Cooling Water System Surveillance Program," PBNP AMP B2.1.14, Open-Cycle Cooling (service) Water System Surveillance Program," and PBNP AMP B2.1.15, "Periodic Surveillance and Preventive Maintenance Program."

During the audit, the project team noted that the applicant's LRA Table 3.3.2-7 identified heat exchangers in the emergency power system experience the aging effect of loss of heat transfer due to fouling when exposed to an internal environment of air and gas, wetted (temperature less than 140°F). The applicant, in the LRA, credited PBNP AMP B2.1.15, "Periodic Surveillance and Preventive Maintenance Program" for managing the identified aging effects.

The project team also noted that the applicant's periodic surveillance and preventive maintenance program stated that "the condition of selected structures and components is monitored through inspection, examination, or testing for evidence of age-related degradation on a specified frequency based on operating experience or other requirements (e.g., Technical Specification or code requirements). Certain components are also replaced on a given frequency based on operating experience."

The applicant was requested to provide the technical basis for crediting the periodic surveillance and preventive maintenance program for maintaining the heat transfer function. The applicant stated that a functional test of the heat exchanger to confirm proper heat transfer is not

practical. The periodic surveillance and preventive maintenance program performs visual inspections of the heat exchanger to ensure surfaces are clean of scaling on other deposits that would negatively impact the heat transfer function. Other components (e.g., diesel generators managed by the closed-cycle cooling water surveillance program) rely on functional tests of the component systems to ensure adequate heat transfer. The applicant also stated that its operating experience also supports this evaluation. On the basis of its review, the project team finds this approach acceptable to ensure the proper aging management of the heat transfer function of these components.

The project team reviewed the applicant's closed-cycle cooling water system surveillance program, open-cycle cooling (service) water system surveillance program, and periodic surveillance and preventive maintenance program. The project team evaluation of these program is documented in Section 7.1.7, Section 7.1.12, and Section 7.1.13 of this report, respectively. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of heat transfer due to fouling for component types in the emergency power system are effectively managed using closed-cycle cooling water system surveillance program, open-cycle cooling (service) water system surveillance program, and periodic surveillance and preventive maintenance program. On this basis, the project team finds that management of loss of heat transfer due to fouling in the emergency power system is acceptable.

The applicant stated, in LRA Table 3.3.2-7, that change in material properties due to elevated temperatures, cracking due to elevated temperatures, cracking due to ultraviolet radiation, and ozone are identified by the GALL Report as a potential aging effect to neoprene and elastomer expansion joints pressure boundaries exposed to indoor - no air conditioning (external) and air and gas - wetted, temperature less than 140/F environments. As stated in the LRA Note 16, the applicant verified through specific studies of plant locations and the PBNP components are indoors and not subject to UV or ozone, nor are they in locations that are subject to radiation exposure. The plant specific studies also verified that the locations identified in the AMR line items are also not subject to temperatures where change in material properties or cracking could occur (greater than 95/F).

The project team reviewed the plant specific operating history, plant specific studies conducted by the applicant and held technical discussions with the applicant. On the basis of its review, the project team project team concludes that no aging effects are expected and no management programs are required. On this basis, the project team finds that management of the above aging effects for neoprene and elastomers is acceptable.

Also, during the audit, the project team finds that the applicant's LRA line item for filters and strainers did not list a function of "filtration." The applicant was requested to explain this discrepancy. The applicant stated that the only identified function for these components applicable to aging management is pressure boundary. The function "filtration" is not subject to aging management review. The project team concurs with this evaluation.

The applicant stated, in LRA Table 3.3.2-7, that cracking due to SCC is identified by the GALL Report as a potential aging effect of stainless steel material for component type of flow element pressure boundaries exposed to oil and fuel oil - pooling environment. The applicant stated that its operating experience has shown no aging effects are expected and no management programs are required.

During the audit, the project team held discussions with the applicant. The applicant stated that

it verified that the operating temperatures conditions for the locations identified by the AMR line items are less then 140 /F, therefore SCC is not an aging concern for the emergency power system .

The project team reviewed the plant specific operating history, plant specific studies conducted by the applicant and held technical discussions with the applicant. On the basis of its review, the project team project team concludes that no aging effects are expected and no management programs are required.

On this basis, the project team finds that cracking due to SCC for the components exposed to the environments in the emergency power system is and that the management of cracking is acceptable.

7.2.3.2.3.9 Containment Ventilation System - Summary of Aging Management Evaluation - Table 3.3.2-8

In Section 3.3.2.1.8 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the containment ventilation system and associated pressure boundary components:

- bolting integrity program
- boric acid corrosion program
- open-cycle cooling (service) water system surveillance program
- periodic surveillance and preventive maintenance program
- systems monitoring program

In Table 3.3.2-8 of the LRA, the applicant provided a summary of AMRs for the containment ventilation system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The project team reviewed Table 3.3.2-8 of the LRA, which summarized the results of AMR evaluations for the containment ventilation system component groups.

The applicant proposed to manage loss of material of carbon low-alloy steel and copper alloy (Zn less than 15%) materials for component types of accumulators and cylinders, CS components, damper housing, ductwork, an and blower housing, fasteners, bolting, filters and strainers, heat exchangers, heaters, coolers, piping, fittings, thermowells, and valve bodies in the containment ventilation system pressure boundary and mechanical closures exposed to containment, borated water leaks, indoor - wetted, raw water, indoor-no air conditioning environment using PBNP AMP B2.1.6, “Boric Acid Corrosion Program,” PBNP AMP B2.1.21, Systems Monitoring Program,” PBNP AMP B2.1.4, “Bolting Integrity Program,” and PBNP AMP B2.1.14, “Open -Cycle Cooling (Service) Water System Surveillance Program.”

The project team reviewed the applicant’s boric acid corrosion program, systems monitoring program, bolting integrity program, and open-cycle cooling (service) water system. The project team evaluation of the systems monitoring program and open-cycle cooling (service) water system documented in Section 7.1.16 and Section 7.1.12 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.4, Bolting Integrity Program and PBNP AMP B2.1.6, Boric Acid Corrosion Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA

AMPs B2.1.4. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material for component types in the containment ventilation system are effectively managed using closed-cycle cooling water system surveillance program, open-cycle cooling (service) water system surveillance program, and periodic surveillance and preventive maintenance program. On this basis, the project team finds that management of loss of material in the containment ventilation system is acceptable.

The applicant proposed to manage loss of heat transfer due to fouling of HX copper alloy (Zn less than 15%) and copper alloy (Zn less than 15%) materials for component types of heat exchangers and heater coolers exposed to containment and raw water environment using PBNP AMP B2.1.14, "Open-Cycle Cooling (service) Water System Surveillance Program," and PBNP AMP B2.1.15, "Periodic Surveillance and Preventive Maintenance Program."

The applicant, in LRA Table 3.3.2-8 identified that heaters/coolers in the containment ventilation system experience the aging effect of loss of heat transfer due to fouling when exposed to an internal environment of raw water and an external environment of containment. The applicant, in the LRA, credited the PBNP AMP B2.1.15, "Periodic Surveillance and Preventive Maintenance Program," for managing the identified aging effects.

During the review, the project team noted that the applicant's AMP B2.1.15, "Periodic Surveillance and Preventive Maintenance Program," states that "the condition of selected structures and components is monitored through inspection, examination, or testing for evidence of age-related degradation on a specified frequency based on operating experience or other requirements (e.g., Technical Specification or code requirements). Certain components are also replaced on a given frequency based on operating experience." The applicant was asked to provide the technical basis for crediting this program for maintaining the heat transfer function. The applicant stated that a functional test of the coolers/heat exchangers/heaters to confirm proper heat transfer is not practical. The periodic surveillance and preventive maintenance program performs visual inspections of the heat exchanger to ensure surfaces are clean of scaling or other deposits that would negatively impact the heat transfer function. In addition, the applicant stated that its operating experience also supports this evaluation. The project team finds this approach acceptable to ensure the proper aging management of the heat transfer function of these components.

The applicant stated, in LRA Table 3.3.2-8 that change in material properties due to elevated temperatures, cracking due to elevated temperatures, cracking due to ultraviolet radiation, and ozone are identified by the GALL Report as a potential aging effect to elastomer material of component type valve body pressure boundaries exposed to indoor - no air conditioning, air and gas, and containment environment. As stated in the LRA Note 16, the applicant verified through specific studies of plant locations and the components are indoors and not subject to UV or ozone, nor are they in locations that are subject to radiation exposure. The plant specific studies also verified that the locations identified in the AMR line items are also not subject to temperatures where change in material properties or cracking could occur (greater than 95/F).

The project team reviewed the plant specific operating history, plant specific studies conducted by the applicant and held technical discussions with the applicant. On the basis of its review, the project team project team concludes that no aging effects are expected and no management programs are required.

On this basis, the project team finds that management of the above aging effects for elastomers is acceptable.

7.2.3.2.3.10 Essential Ventilation System - Summary of Aging Management Evaluation - LRA Table 3.3.2-9

In Section 3.3.2.1.9 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the essential ventilation system and associated pressure boundary components:

- bolting integrity program
- closed-cycle cooling water system surveillance program
- one-time inspection program
- open-cycle cooling (service) water system surveillance program
- periodic surveillance and preventive maintenance program
- systems monitoring program

In Table 3.3.2-9 of the LRA, the applicant provided a summary of AMRs for the essential ventilation system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The project team reviewed Table 3.3.2-9 of the LRA, which summarized the results of AMR evaluations for the essential ventilation system component groups.

The applicant proposes to manage loss of material of carbon low-alloy steel, stainless steel, cast iron, and copper alloy (Zn less than 15%) material for component types of damper housing, ductwork, fan and blower housing, fasteners, bolting, filters and strainers, flow elements, humidifiers, instrument valve assemblies, heat exchangers, heaters, coolers, piping, fittings, thermowells, pump casings, tanks, and valve bodies in the essential ventilation system pressure boundary, filtration, and mechanical closures exposed to containment, borated water leaks, indoor - wetted, raw water, indoor-no air conditioning environment using PBNP AMP B2.1.13, “One-Time Inspection Program,” PBNP AMP B2.1.15, “Periodic Surveillance and Preventive Maintenance Program,” PBNP AMP B2.1.21, “Systems Monitoring Program,” PBNP AMP B2.1.4, “Bolting Integrity Program,” PBNP AMP B2.1.14, “Open-Cycle Cooling Water System Surveillance Program,” and PBNP AMP B2.1.9, “Closed-Cycle Cooling Water System Surveillance Program.”

The project team reviewed the applicant’s one-time inspection program, periodic surveillance and preventive maintenance program, systems monitoring program, bolting integrity program, open-cycle cooling water system surveillance program, and closed-cycle cooling water system surveillance program. The project team evaluation of the one-time inspection program, periodic surveillance and preventive maintenance program, systems monitoring program, open-cycle cooling water system surveillance program, and closed-cycle cooling water system surveillance program are documented in Section 7.1.11, Section 7.1.13, Section 7.1.16, Section 7.1.12, and Section 7.1.7 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.4, Bolting Integrity Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.4. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material for component types in the essential ventilation system are effectively managed using one-time inspection program, periodic surveillance and preventive maintenance program, systems monitoring program, bolting integrity program, open-cycle cooling water system surveillance program, and closed-cycle cooling water system surveillance program. On this basis, the project team finds that

management of loss of material in the essential ventilation system is acceptable.

The applicant stated, in LRA Table 3.3.2-9, that change in material properties due to elevated temperatures, cracking due to elevated temperatures, cracking due to ultraviolet radiation, and ozone are identified by the GALL Report as a potential aging effect of elastomer material for component type of ductwork pressure boundaries exposed to indoor - no air conditioning and air and gas - wetted, temperature less than 140/F environment. As stated in the LRA Note 16, the applicant verified through specific studies of plant locations and the components are indoors and not subject to UV or ozone, nor are they in locations that are subject to radiation exposure. The plant specific studies also verified that the locations identified in the AMR line items are also not subject to temperatures where change in material properties or cracking could occur (greater than 95/F).

The project team reviewed the plant specific operating history, plant specific studies conducted by the applicant and held technical discussions with the applicant. On the basis of its review, the project team project team concludes that no aging effects are expected and no management programs are required. On this basis, the project team finds that management of the above aging effects for elastomers is acceptable.

The applicant proposed to manage loss of heat transfer due to fouling of stainless steel and copper alloy (Zn less than 15%) materials for component type of heat exchangers and heater coolers exposed to treated water - other, air and gas wetted, temperature less than 140°F, raw water - velocity, and raw water environment using PBNP AMP B2.1.9, Closed-Cycle Cooling Water System Surveillance Program," PBNP AMP B2.1.14, "Open-Cycle Cooling (Service) Water System Surveillance Program," and PBNP AMP B2.1.15, "Periodic Surveillance and Preventive Maintenance Program."

The project team reviewed the applicant's periodic closed -cycle cooling water system surveillance program, open-cycle cooling water system surveillance program, and periodic surveillance and preventive maintenance program. The project team evaluation of these program is documented in Section 7.1.7, Section 7.1.12, and Section 7.1.13 of this report, respectively. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of heat transfer due to fouling for component types in the essential ventilation system are effectively managed using periodic closed -cycle cooling water system surveillance program, open-cycle cooling water system surveillance program, and periodic surveillance and preventive maintenance program. On this basis, the project team finds that management of loss of heat transfer due to fouling in the essential ventilation system is acceptable.

7.2.3.2.3.11 Plant Sampling System - Summary of Aging Management Evaluation - LRA Table 3.3.2-10

The applicant stated, in Section 3.3.2.1.10 of the LRA, that components requiring aging management within the plant sampling system are addressed in the following systems: class 1 piping/components (LRA Section 3.1.2.1.1), residual heat removal system (LRA Section 3.2.2.1.3), chemical and volume control system (LRA Section 3.3.2.1.1), and component cooling water system (LRA Section 3.3.2.1.2). Correspondently, in LRA Table 3.3.2-10, the applicant stated that components of LRA Table 3.3.2-10 are addressed in LRA Table 3.1.2-1, LRA Table 3.2.2-3, LRA Table 3.3.2-1, and LRA Table 3.3.2-2.

The project team reviewed these tables and verified that the components of LRA Table 3.3.2-10

are addressed in LRA Table 3.1.2-1, LRA Table 3.2.2-3, LRA Table 3.3.2-1, and LRA Table 3.3.2-2. Also, the project team reviewed LRA Table 3.1.2-1, LRA Table 3.2.2-3, LRA Table 3.3.2-1, and LRA Table 3.3.2-2 and its evaluation is documented in Section 3.1.2.3.2, Section 3.2.2.3.4, Section 3.3.2.3.2, and Section 3.3.2.3.3 of this SER, respectively. On the basis of its review, the project team finds this acceptable.

7.2.3.2.3.12 Plant Air System - Summary of Aging Management Evaluation - LRA Table 3.3.2-11

In Section 3.3.2.1.11 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the plant air system and associated pressure boundary components:

- bolting integrity program
- boric acid corrosion program
- periodic surveillance and preventive maintenance program
- systems monitoring program

In Table 3.3.2-11 of the LRA, the applicant provided a summary of AMRs for the plant air system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The project team reviewed Table 3.3.2-11 of the LRA, which summarized the results of AMR evaluations for the plant air system component groups.

The applicant proposed to manage loss of material of carbon low-alloy steel, stainless steel, cast iron, copper alloy (Zn greater than 15%), and copper alloy (Zn less than 15%) materials for component types of accumulators and cylinders, compressor casings, CS components, fasteners, bolting, filters and strainers, flow indicators, piping, fittings, tanks, and valve bodies in the plant air system pressure boundary and mechanical closures exposed to containment, borated water leaks, air and gas - wetted, temperature less than 140 °F, and indoor-no air conditioning environments using PBNP AMP B2.1.6, “Boric Acid Corrosion Program,” PBNP AMP B2.1.15, “Periodic surveillance and Preventive Maintenance Program,” PBNP AMP B2.1.21, “Systems Monitoring Program,” and PBNP AMP B2.1.4, “Bolting Integrity Program.”

During the review, the project team noted that the applicant also stated, in LRA Table 3.3.2-11, that a cast iron compressor exposed to an air/gas internal environment experiences no aging effects and no aging management program is required. T he applicant was requested to provide the technical basis for not considering any aging effect or aging management program for this specific material/environment. The applicant stated that the component was the charging pump speed controller backup compressor; and that although its plant-specific operating experience supports no aging effects for this component, the applicant acknowledged that the component is susceptible to general corrosion for cast iron in an air and gas (not dried) environment. The applicant also stated that it will revise the aging management review results to identify the aging effect loss of material (due to general corrosion) and identify PBNP AMP B2.1.15, “Periodic Surveillance and Preventive Maintenance Program” as the applicable aging management program. By letter dated July 12, 2004, the applicant committed to revise the aging management review results for the charging pump speed controller back-up air compressor to include loss of material due to general corrosion and will be managed by PBNP AMP B2.1.15,

"Periodic Surveillance and Preventive Maintenance Program." The project team finds this acceptable.

Also, the project team noted that the applicant stated, in LRA Table 3.3.2-11, that copper alloy material for component type of valve bodies in an air and gas wetted internal environment experience loss of material and the periodic surveillance and preventive maintenance program monitors this aging effect. The notes for this line item indicated that this is consistent with NUREG-1801 for material, environment, and aging effect, but a different aging management program is credited. The notes also stated that the material is not evaluated in NUREG-1801 for this component. The applicant was requested to provide a justification as to why this is not a contradiction to the term "consistent with NUREG-1801." The applicant stated that the note is incorrect and will be changed to Note F, 6 for material not in NUREG-1801 for this component.. By letter dated July 12, 2004, the applicant committed to correct the notes the annual LRA update. The project team finds this acceptable.

The project team reviewed the applicant's boric acid corrosion program, periodic surveillance and preventive maintenance program, systems monitoring program, bolting integrity program. The project team's evaluation of the periodic surveillance and preventive maintenance program, and systems monitoring program are documented in Section 7.1.13 and Section 7.1.16, of this report, respectively. The NRR DE staff evaluation of PBNP AMP B2.1.6, Boric Acid Corrosion Program and PBNP LRA AMP B2.1.4, Bolting Integrity Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.6 and B2.1.4. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material for component types in the plant air system are effectively managed using boric acid corrosion program, periodic surveillance and preventive maintenance program, systems monitoring program, bolting integrity program. On this basis, the project team finds that management of loss of material in the plant air system is acceptable.

7.2.3.2.3.13 Containment Hydrogen Detector and Recombiner System -Summary of Aging Management Evaluation LRA Table 3.3.2-12

In Section 3.3.2.1.12 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the containment hydrogen detector and recombiner system and associated pressure boundary components:

- bolting integrity program
- boric acid corrosion program
- systems monitoring program

In Table 3.3.2-12 of the LRA, the applicant provided a summary of AMRs for the containment hydrogen detector and recombiner system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The project team reviewed Table 3.3.2-12 of the LRA, which summarized the results of AMR evaluations for the containment hydrogen detector and recombiner system component groups.

The applicant proposed to manage loss of material of carbon low-alloy steel material for component types of CS components, fasteners, bolting, piping, fittings, and valve bodies in the plant air system pressure boundary and mechanical closures exposed to borated water leaks

and indoor-no air conditioning environment using PBNP AMP B2.1.6, “Boric Acid Corrosion Program,” PBNP AMP B2.1.21, “Systems Monitoring Program,” and PBNP AMP B2.1.4, “Bolting Integrity Program.”

The project team reviewed the applicant’s boric acid corrosion program, systems monitoring program, and bolting integrity program. The project team’s evaluation of the systems monitoring program is documented in Section 7.1.16 of this report. The NRR DE staff evaluation of PBNP LRA AMP B2.1.6, Boric Acid Corrosion Program, PBNP LRA AMP B2.1.4, and Bolting Integrity Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.6 and B2.1.4. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material for component types in the containment hydrogen detector and recombiner system are effectively managed using boric acid corrosion program, systems monitoring program, and bolting integrity program. On this basis, the project team finds that management of loss of material in the containment hydrogen detector and recombiner system is acceptable.

7.2.3.2.3.14 Circulating Water System - Summary of Aging Management Evaluation - LRA Table 3.3.2-13

In Section 3.3.2.1.13 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the circulating water system and associated pressure boundary components:

- bolting integrity program
- periodic surveillance and preventive maintenance program
- systems monitoring program

In Table 3.3.2-13 of the LRA, the applicant provided a summary of AMRs for the circulating water system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The project team reviewed Table 3.3.2-13 of the LRA, which summarized the results of AMR evaluations for the circulating water system component groups.

The applicant proposed to manage loss of material of carbon low-alloy steel and cast iron materials for component types of expansion joints, fasteners, bolting, piping, fittings, pump casing, and valve bodies in the circulating water system pressure boundary and mechanical closures exposed to borated water leaks and indoor -- no air conditioning environment using PBNP AMP B2.1.21, “Systems Monitoring Program,” PBNP AMP B2.1.15, “Periodic Surveillance and Preventive Maintenance Program,” and PBNP AMP B2.1.4, “Bolting Integrity Program.”

The project team reviewed the applicant’s systems monitoring program, periodic surveillance and preventive maintenance program, and bolting integrity program. The project team’s evaluation of the systems monitoring program, periodic surveillance and preventive maintenance program are documented in Section 7.1.16 and Section 7.1.13 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.4, Bolting Integrity Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.4. On the basis of its review

of the applicant's plant specific and industry operating experience, the project team finds that loss of material for component types in the circulating water system are effectively managed using systems monitoring program, periodic surveillance and preventive maintenance program, and bolting integrity program. On this basis, the project team finds that management of loss of material in the circulating water system is acceptable.

7.2.3.2.3.15 Treated Water System - Summary of Aging Management Evaluation - LRA Table 3.3.2-14

In Section 3.3.2.1.14 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the treated water system and associated pressure boundary components:

- bolting integrity program
- boric acid corrosion program
- one-time inspection program
- systems monitoring program

In Table 3.3.2-14 of the LRA, the applicant provided a summary of AMRs for the treated water system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The project team reviewed Table 3.3.2-14 of the LRA, which summarized the results of AMR evaluations for the treated water system component groups.

The applicant proposed to manage loss of material of carbon low-alloy steel, copper alloy (Zn less than 15%), stainless steel, and cast austenitic stainless steel materials for component types of CS components, fasteners, bolting, piping, fittings, and valve bodies in the treated water system pressure boundary and mechanical closures exposed to borated water leaks, raw water drainage, treated water - other, and indoor-no air conditioning environment using PBNP AMP B2.1.6, "Boric Acid Corrosion Program," PBNP AMP B2.1.4, "Bolting Integrity Program," PBNP AMP B2.1.13, "One-Time Inspection Program," and PBNP AMP B2.1.21, "Systems Monitoring Program."

The project team reviewed the applicant's bolting integrity program, boric acid corrosion program, one-time inspection program, and systems monitoring program. The project team's evaluation of the one-time inspection program and systems monitoring program are documented in Section 7.1.11 and Section 7.1.16 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.4, Bolting Integrity Program and PBNP AMP B2.1.6, Boric Acid Corrosion Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.4 and B2.1.6. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material for component types in the treated water system are effectively managed using bolting integrity program, boric acid corrosion program, one-time inspection program, and systems monitoring program. On this basis, the project team finds that management of loss of material in the treated water system is acceptable.

7.2.3.2.3.16 Heating Steam System - Summary of Aging Management Evaluation - LRA Table 3.3.2-15

In Section 3.3.2.1.15 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects requiring management for the heating steam system and associated pressure boundary components:

- bolting integrity program
- boric acid corrosion program
- one-time inspection program
- systems monitoring program
- water chemistry control program

In Table 3.3.2-15 of the LRA, the applicant provided a summary of AMRs for the heating steam system and associated pressure boundary components and identified which AMRs it considered to be consistent with the GALL Report.

The project team reviewed Table 3.3.2-15 of the LRA, which summarized the results of AMR evaluations for the heating steam system component groups.

The applicant proposed to manage loss of material of carbon low-alloy steel, copper alloy (Zn less than 15%), stainless steel, and cast iron material for component types of CS components, fasteners, bolting, filters, strainers, heaters, coolers, piping, fittings, pump casing, steam traps, tanks, and valve bodies in the heating steam system pressure boundary and mechanical closures exposed to borated water leaks, treated water - secondary, temperature greater than 120°F, and indoor-no air conditioning environment using PBNP AMP B2.1.6, “Boric Acid Corrosion Program,” PBNP AMP B2.1.4, “Bolting Integrity Program,” PBNP AMP B2.1.13, “One-Time Inspection Program,” PBNP AMP B2.1.24, “Water Chemistry Control Program,” and PBNP AMP B2.1.21, “Systems Monitoring Program.”

The project team reviewed the applicant’s boric acid corrosion program, bolting integrity program, one-time inspection program, water chemistry control program, and systems monitoring program. The project team’s evaluation of the one-time inspection program, water chemistry control program, and systems monitoring program are documented in Section 7.1.11, Section 7.1.17, and Section 7.1.16 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.4, Bolting Integrity Program and PBNP AMP B2.1.6, Boric Acid Corrosion Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review predicated on NRR DE acceptance of LRA AMPs B2.1.4 and AMP B2.1.6. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material for component types in the heating steam system are effectively managed using boric acid corrosion program, bolting integrity program, one-time. On this basis, the project team finds that management of loss of material in the heating steam system is acceptable.

7.2.3.2.3.17 Fuel Handling System - Summary of Aging Management Evaluation - LRA Table 3.3.2-16

The applicant stated, in Section 3.3.2.1.15 of the LRA, that components requiring aging management within the fuel handling system are addressed in the following systems: spent fuel cooling system (LRA Section 3.3.2.1.3), the primary auxiliary building structure (LRA Section 3.5.2.1.6), and the containment Unit ½ building structure (LRA Section 3.5.2.1.1). Correspondently, in LRA Table 3.3.2-16, the applicant stated that components of LRA Table 3.3.2-16 are addressed in LRA Table 3.2.2-3, LRA Table 3.5.2-1, and LRA Table 3.5.2-6.

The project team reviewed these tables and verified that the components of LRA Table 3.3.2-16 are addressed in LRA Table 3.2.2-3, LRA Table 3.5.2-1, and LRA Table 3.5.2-6. Also, the project team reviewed LRA Table 3.2.2-3, LRA Table 3.5.2-1, and LRA Table 3.5.2-6 and its evaluation is documented in Section 3.2.2.3.4, Section 3.5.2.3.3, and Section 3.5.2.3.7 of this report, respectively. On the basis of its review, the project team finds this acceptable.

All AMRs in Tables 3.3.2-1 through 3.3.2-16 were evaluated. The project team finds them to be acceptable.

Conclusion. On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving material, environment, aging effect requiring management, and AMP combinations that are not evaluated 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 for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.3.3 Conclusion

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

The project team also reviewed the applicable FSAR supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging of the auxiliary systems as required by 10 CFR 54.21(d).

7.2.4 Aging Management of Steam and Power Conversion Systems

This section documents the project team's review of the applicant's aging management review (AMR) results for the steam and power conversion systems components and component groups associated with the following systems:

- main and auxiliary steam system
- feedwater and condensate system
- auxiliary feedwater system

7.2.4.1 Summary of Technical Information in the Application

In LRA Section 3.4, the applicant provided AMR results for the steam and power conversion systems components and component groups.

In Table 3.4.1, "Summary of Aging Management Evaluations in Chapter IV of NUREG-1801 for Steam and Power Conversion Systems," of the LRA, the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the steam and power conversion systems components and component groups that are relied on for license renewal. In Section 3.4.2.2 of the LRA, the applicant provided information concerning Table 3.4.1 components for which further evaluation is recommended by the GALL Report.

The applicant's AMRs incorporated applicable operating experience in the determination of aging effects requiring management (AERMs). These reviews included evaluation of plant-

specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

7.2.4.2 Project Team Evaluation

The project team reviewed LRA Section 3.4 to determine if the applicant provided sufficient information to demonstrate that the effects of aging for the steam and power conversion systems components that are within the scope of license renewal and subject to an AMR will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Also, the project team performed an onsite audit of AMRs to confirm the applicant's claim that certain identified AMRs were consistent with the GALL Report. The project team did not repeat its review of the matters described in the GALL Report. However, the project team did verify that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL AMRs. The project team's evaluations of the AMPs are documented in Section 7.1 of this Report. Detail of the project team's audit evaluation are documented in Section 7.2.4.2.1 of this report.

The project team also performed an onsite audit of those selected AMRs that were consistent with the GALL Report and for which further evaluation is recommended. The project team confirmed that the applicant's further evaluations were consistent with the acceptance criteria in Section 3.4.2.2 of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," dated July 2001. The project team's audit evaluation are documented in its PBNP audit and review report and are summarized in Section 7.4.2.1.2of this report.

The project team performed an onsite audit and conducted a technical review of the remaining AMRs that were not consistent with or not address in the GALL Report. The audit and technical review included evaluating whether all plausible aging effects were identified and the aging effects listed were appropriate for the combination of materials and environments specified. The project team's audit evaluation is documented in Section 7.4.2.1.3 of this report.

Finally, the project team reviewed the AMP summary descriptions in the FSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the steam and power conversion systems components.

Table 3.4-1 below provides a summary of the project team's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.4 that are addressed in the GALL Report.

7.2.4.2.1 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Not Recommended

Summary of Technical Information in the Application. In Section 3.4.2.1 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects related to main and auxiliary steam system, feedwater and condensate system, and auxiliary feedwater system:

- bolting integrity program
- boric acid corrosion program
- flow-accelerated corrosion program
- one-time inspection program
- open-cycle cooling (service) water system surveillance program
- periodic surveillance and preventive maintenance program
- systems monitoring program
- tank internal inspection program
- water chemistry control program

Project team Evaluation. In Tables 3.4.2-1 through 3.4.2-3 of the LRA, the applicant provided a summary of AMRs for main and auxiliary steam system, feedwater and condensate system, and auxiliary feedwater system components system and identified which AMRs it considered to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report does not recommend further evaluation, the project team performed an audit and review to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant provided a note for each AMR line item. The notes described how the information in the tables aligns with the information in the GALL Report. The project team audited those AMRs with Notes A through E, which indicated the AMR was consistent with the GALL Report.

Note A indicated that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the AMP identified in the GALL Report. The project team audited these line items to verify consistency with the GALL Report and the validity of the AMR for the site-specific conditions.

Note B indicated 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 audited these line items to verify consistency with the GALL Report. The project team verified that the identified exceptions to the GALL AMPs had been reviewed and accepted by the project team. The project team also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

Note C indicated 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 is consistent with the AMP identified by the GALL Report. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report. However, the applicant identified a different component in the GALL Report that had the same material, environment, aging effect, and AMP as the component that was under review. The project team audited these line items to verify consistency with the GALL Report. The project team also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicated 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 audited these line items

to verify consistency with the GALL Report. The project team verified whether the AMR line item of the different component was applicable to the component under review. The project team verified whether the identified exceptions to the GALL AMPs had been reviewed and accepted by the project team. The project team also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

Note E indicated that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited. The project team audited these line items to verify consistency with the GALL Report. The project team also determined whether the identified AMP would manage the aging effect consistent with the AMP identified by the GALL Report and whether the AMR was valid for the site-specific conditions.

The project team conducted an audit and review of the information provided in the LRA, as documented in its PBNP audit and review report. The project team did not repeat its review of the matters described in the GALL Report. However, the project team did verify that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL Report AMRs.

The project team reviewed the 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 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 LRA Table 3.4.1 (Table 1), the applicant’s references to the GALL Report are acceptable and no further project team review is required.

Conclusion. The project team has evaluated the applicant's claim of consistency with the GALL Report. The project team also has reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the project team finds that the AMR results which the applicant claimed to be consistent with the GALL Report, are consistent with the AMRs in the GALL Report. Therefore, the project team finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.4.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In Section 3.4.2.2 of the LRA, the applicant provided further evaluation of aging management as recommended by the GALL Report for main and auxiliary steam system, feedwater and condensate system, and auxiliary feedwater system. The applicant provided information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to general, pitting, and crevice corrosion

- loss of material due to general, pitting, and crevice corrosion, microbiologically influenced corrosion, and biofouling

- general corrosion

- loss of material due to general, pitting, crevice, and microbiologically influenced corrosion

- loss of material due to general, pitting, crevice, and microbiologically influenced corrosion

Project Team Evaluation. For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the project team audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues that were further evaluated. In addition, the project team reviewed the applicant's further evaluations against the criteria contained in Section 3.4.3.2 of the SRP-LR. The project team's evaluation of is discuss below.

7.2.4.2.2.1 Cumulative Fatigue Damage

PBNP LRA Section 3.4.2.2.1 is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4 of the PBNP SER and is reviewed by the NRR DE staff. Therefore, the project team did not review this item.

7.2.4.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

The project team reviewed LRA Section 3.4.2.2.2 against the criteria in SRP-LR Section 3.4.2.2.2.

In LRA Section 3.4.2.2.2, the applicant addressed the GALL Report recommendation for further evaluation to confirm 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 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 confirm 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 stated, in the LRA, that for its steam and power conversion component, it credited PBNP LRA AMP B2.1.24, “Water Chemistry Control Program,“ and PBNP AMP B2.1.13, “One-Time Inspection Program” for managing these aging effects/mechanisms. The applicant stated that in addition to these programs, PBNP AMP B2.1.15, ”Periodic Surveillance and Preventive Maintenance Program,” or PBNP AMP B2.1.22, “Tank Internal Inspection Program” is also credited for managing a few selected components. Also, the applicant’s existing water chemistry control program relies on the guidelines of EPRI TR-102134 for secondary water chemistry to manage the effects of loss of material due to general, pitting, or crevice corrosion.

The project team reviewed the applicant’s water chemistry control program, one-time inspection program, periodic surveillance and preventive maintenance program, and tank internal inspection program. The project team’s evaluation water chemistry control program, one-time inspection program, periodic surveillance and preventive maintenance program are documented in Section 7.1.17, Section 7.1.11, and Section 7.1.13 of this report, respectively. The NRR DE staff evaluation of PBNP LRA AMP B2.1.22, Thimble Tube Inspection Program is documented in Section 3.0 of the SER related to the PBNP LRA. The project team performed its review d on NRR DE acceptance of LRA AMP B2.1.22. The project team finds that the applicant’s water chemistry control program minimizes loss of material by providing a non-aggressive material environment and the periodic surveillance and preventive maintenance program supplement water chemistry control for portions of the emergency feedwater system. In addition, the periodic surveillance and preventive maintenance program provides for the inspection of systems when they are opened for maintenance, which addresses the one-time inspection as recommended by GALL Report.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.4.2.2.2 for further evaluation. For those items that apply to LRA Section 3.4.2.2.2, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.4.2.2.3 Loss of Material Due to General, Pitting, and Crevice Corrosion, Microbiologically Influenced Corrosion, and Biofouling

The project team reviewed LRA Section 3.4.2.2.3 against the criteria in SRP-LR Section 3.4.2.2.3.

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 auxiliary feedwater system. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

In LRA Table 3.4.1, Item 3.4.1-03, the applicant stated that this line item is not used. The applicant stated, in the LRA, that the components identified in this line item is relate to portion of the auxiliary feedwater piping system that is exposed to the untreated water from the backup water supply. These components are evaluated in LRA Section 2.3.3.5, “Service Water System,” which addressed in NUREG-1801, Chapter VII (Auxiliary Systems), Section C1.

The aging programs identified by the applicant constitute the equivalent plant specific aging management program discussed in SRP-LR Section 3.4.2.2.3. As stated by the applicant, these components are not listed in LRA Section 3.4, “Steam and Power Conversion”, hence it is reasonable to not explicitly use the further evaluation criteria discussed in SRP-LR Section 3.4.2.2.3. However, the applicant does manage the aging effect for these components as part of the service water system in LRA Section 3.3, “Auxiliary Systems” based on the programs identified and in inspections that will be performed, the applicant has met the criteria of SRP-LR Section 3.4.2.2.2 for further evaluation.

The applicant stated, in the LRA, that the aging effects of the lines from the service water system to the emergency feedwater system that are exposed to untreated water are managed using the PBNP AMP B2.1.21, “Systems Monitoring Program” and PBNP AMP B2.1.13, “One-Time Inspection Program.”

The project team reviewed the applicant’s systems monitoring program and one-time inspection program and its evaluation is documented in Section 7.1.16 and Section 7.1.16.13 of this report. The project team find that these programs include scheduled walkdowns and selected high-susceptibility teardown and inspection to detect loss or material degradation. The project team finds that these program adequately manage the aging effects for these components. On the basis of its review, the project team finds this acceptable.

For those items that apply to LRA Section 3.4.2.2.2, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.4.2.2.4 General Corrosion

The project team reviewed LRA Section 3.4.2.2.4 against the criteria in SRP-LR Section 3.4.2.2.4.

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 SCs, including closure boltings, exposed to operating temperature less that 212°F. The GALL Report recommends further evaluation to ensure that this aging effect is adequately managed.

The applicant stated, in the LRA, that it credited PBNP AMP B2.1.21, “Systems Monitoring Program,” for managing aging effects for normally accessible, external surfaces of piping, tanks, and other components and equipment within the scope of license renewal. These aging effects are managed through visual inspection and monitoring of external surfaces for leakage and evidence of material degradation.

The project team reviewed the applicant’s systems monitoring program and its evaluation is documented in Section 7.1.16 of this report. On the basis of its review, the project team finds that the systems monitoring program adequately manage the loss of material due to general corrosion for the above components.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.4.2.2.4 for further evaluation. For those items that apply to LRA Section 3.4.2.2.4, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended

functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.4.2.2.5 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

The project team reviewed LRA Section 3.4.2.2.5 against the criteria in SRP-LR Section 3.4.2.2.5.

In LRA Section 3.4.2.2.5, the applicant addresses (1) the oil side of bearing oil coolers in the auxiliary feedwater system, and (2) line item relates to buried components in the auxiliary feedwater system.

SRP-LR Section 3.4.2.2.5 addresses loss of material due to general corrosion (carbon steel only), as well as 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 auxiliary feedwater system. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

SRP-LR 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, the emergency condensate storage tank in the auxiliary feedwater system, and the underground condensate storage tank in the condensate system.

The applicant, in the LRA, credited its plant-specific PBNP AMP B2.1.15, “Periodic Surveillance and Preventive Maintenance Program” for managing these aging effects/mechanisms. In addition, the applicant stated that it does not have buried components in the steam and power conversion systems, and therefore this line item is not applicable.

The project team reviewed applicant’s periodic surveillance and preventive maintenance program and its evaluation is documented in Section 7.1.13 of this Report. On the basis of its review, the project team finds that the periodic surveillance and preventive maintenance program adequately manages the effects of aging of loss of material for stainless and carbon steel components exposed to lubricating oil (with water contamination). Also, the project team finds that there are no buried components in steam and power conversion systems at PBNP, as documented in the project team’s audit and review report.

The project team finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.4.2.2.4 for further evaluation. For those items that apply to LRA Section 3.4.2.2.4, the project team finds that the applicant is consistent with the GALL Report and has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Conclusion. On the basis of its review, for component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the project team determines that (1) those attributes or features for which the applicant claimed consistency with the GALL Report were indeed consistent and (2) the applicant adequately addressed the issues that were further evaluated. 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).

7.2.4.2.3 AMR Results That Are Not Consistent With or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In Tables 3.4.2-1 through 3.4.2-3 of the LRA, the applicant provided additional details of the results of the AMRs for material, environment, aging effect requiring management, and AMP combinations that are not consistent with the GALL Report or are not addressed in the GALL Report.

In Tables 3.4.2-1 through 3.4.2-3 , the applicant indicated, via Notes F through J, that neither the identified component nor the material and environment combination is evaluated in the GALL Report and provided information concerning how the aging effect will be managed.

Project team Evaluation. For component type, material and environment combination that are not evaluated in the GALL Report, the project team reviewed the applicant's evaluation to determine whether the applicant had demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained during the period of extended operation.

The project team's evaluation is discussed below.

7.2.4.2.3.1 Steam and Power Conversion System Components That Have No Aging Effects - LRA Table 3.4.2-1 to Table 3.4.2-3)

In LRA Table 3.4.2-1 to Table 3.4.2-3 , the applicant identified line items where no aging effects were identified as a result of the aging review process. Specifically, instances in which the applicant stated that no aging effects were identified occurred when components fabricated from carbon/alloy steel, stainless steel, aluminum, copper alloy, or stainless steel clad material were exposed to air or to an inert gas (nitrogen as an example). Neither air nor inert gas is identified in the GALL Report as an environment for these components and materials. No aging effects are considered to be applicable to carbon/alloy steel, stainless steel, copper alloys, or stainless steel clad components in air (the PBNP LRA defines an air environment as dehumidified atmospheric air, dry/filtered instrument air) or inert gas environments.

On the basis of its review of current industry research and operating experience, the project team finds that dry air on metal will not result in aging that will be of concern during the period of extended operation. Stainless steel and nickel-based alloy components in air or an inert gas environment are not susceptible to general corrosion that would affect their intended function. Therefore, the project team concludes that there are no applicable aging effects requiring management for carbon steel, stainless steel or stainless steel clad components exposed to air, or to an inert gas environments.

7.2.4.2.3.2 Main and Auxiliary Steam System - Summary of Aging Management Evaluation - LRA Table 3.4.2-1

The project team reviewed Table 3.4.2-1 of the LRA, which summarized the results of AMR evaluations for the main and auxiliary steam system component groups.

The applicant proposed to manage loss of material and SCC of stainless steel material for component types of valves, piping/fittings, and tubing exposed to treated water above 270°F

environment using the PBNP AMP B2.1.24, ”Water Chemistry Control Program,” PBNP AMP B.2.1.13, “One-Time Inspection Program,” to provide confirmation of effectiveness.

The project team reviewed the applicant’s water chemistry control program and one-time inspection program and its evaluation is documented Sections 7.1.17 and 7.1.11 of this Report, respectively. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material and SCC for components in the main and auxiliary steam system are effectively managed using the water chemistry control program and one-time inspection program . On this basis, the project team finds that management of loss of material and SCC in the main and auxiliary steam system is acceptable.

The applicant proposed to manage loss of material of carbon and low-alloy steels materials for component type of piping and fittings, and valve bodies exposed to (1) air/gas (internal) environment using PBNP B2.1.15, ”Periodic Surveillance and Preventive Maintenance Program” and PBNP B2.1.13, “One-Time Inspection Program,” (2) containment (benign, external) using PBNP AMP B2.1.21, “Systems Monitoring Program” and PBNP AMP B2.1.13, “One-Time Inspection Program,” (3) treated water (internal, temperature less than 120/F) using PBNP AMP B2.1.24, “Water Chemistry Control Program” and PBNP B2.1.13, “One-Time Inspection Program,” (4) treated water (internal, Temperature greater than 120/F) using PBNP AMP B2.1.24, “Water Chemistry Control Program” and PBNP B2.1.13, “One-Time Inspection Program.”

The project team reviewed the applicant’s periodic surveillance and preventive maintenance program, one-time inspection, systems monitoring program and water chemistry control program. The project team’s evaluation of these program is documented in Section 7.1.13, Section 7.1.11, and Section 7.1.16, and Section 7.1.17 of this report, respectively. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material for component in the main and auxiliary steam system are effectively managed using the periodic surveillance and preventive maintenance program, one-time inspection, systems monitoring program and water chemistry control program. On this basis, the project team finds that management of loss of material in the main and auxiliary steam system is acceptable.

7.2.4.2.3.3 Feedwater and Condensate System - Summary of Aging Management Evaluation - LRA Table 3.4.2-2

The project team reviewed Table 3.4.2-2 of the LRA, which summarized the results of AMR evaluations for the feedwater and condensate system component groups.

The applicant proposed to manage loss of material and SCC of stainless steel material for component types of valves, piping/fittings, and tubing exposed to treated water above 270°F environment using the PNBP AMP B2.1.24, “Water Chemistry Control Program,” in conjunction with the PNBP AMP B2.1.13, “One-Time Inspection Program” to provide confirmation of effectiveness.

The project team reviewed the applicant’s water chemistry control program and one-time inspection program and its evaluation is documented in Section 7.1.17 and Section 7.1.11 of this report, respectively. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material and SCC in the feedwater and condensate system are effectively managed using the water chemistry control program and one-time inspection program. On this basis, the project team finds that management of loss of

material and SCC in the feedwater and condensate system is acceptable.

The project team also reviewed the use of the one-time inspection program in confirming the effectiveness of the water chemistry control program. The project team finds that the one-time inspection program will perform a one-time disassembly and visual inspection on selected components. The project team finds this acceptable.

7.2.4.2.3.4 Auxiliary Feedwater System - Summary of Aging Management Evaluation - LRA Table 3.4.2-3

The project team reviewed Table 3.4.2-3 of the LRA, which summarized the results of AMR evaluations for the auxiliary feedwater system component groups.

In LRA 3.4.2-3, the applicant stated that no aging management program is required for carbon/low alloy steel, stainless steel, aluminum, copper alloy (Zn greater than 15%) materials for component types of accumulators/cylinders, piping and fittings, tanks, and valve bodies exposed to air and gas (internal) environments.

The applicant proposed to manage loss of material of copper alloy environment for component type of valve bodies exposed to treated water -secondary temperature less than 120°F environment using the PBNP AMP B2.1.15, "Periodic Surveillance and Preventive Maintenance Program." The applicant stated that, under this program, the subject system is opened and inspected, and the component replaced on a regular basis; component replacement occurs prior to the end of its design life.

The project team reviewed the applicant's periodic surveillance and preventive maintenance program and its evaluation is documented in Section 7.1.13 of this report. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material for components in the auxiliary feedwater system are effectively managed using periodic surveillance and preventive maintenance program. On this basis, the project team finds that management of loss of material in the auxiliary feedwater system is acceptable.

All AMRs in Tables 3.4.2-1 through 3.4.2-3 were evaluated. The project team finds them to be acceptable.

Conclusion. On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving material, environment, aging effect requiring management, and AMP combinations that are not evaluated 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 for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.4.3 Conclusion

On the basis of its review, the project team concludes that the applicant has demonstrated that the aging effects associated with the power and steam conversion systems components will be adequately managed so that the intended functions will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The project team also reviewed the applicable FSAR supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging of the steam

and power conversion systems as required by 10 CFR 54.21(d).

7.2.5 Aging Management of Containments, Structures, and Component Supports

This section documents the project team's review of the applicant's aging management review (AMR) results for the containments, structures, and component supports components and component groups associated with the following systems:

- containment Unit 1 & 2 building structure
- control building structure
- circulating water pumphouse structure
- diesel generator building structure
- facade Unit 1 & 2 structure
- primary auxiliary building structure
- turbine building Unit 1 & 2 structure
- yard structures
- cranes, hoists, and lifting devices
- component supports commodity group
- fire barrier commodity group
- 13.8 KV switchgear building structure
- fuel oil pumphouse structure
- gas turbine building structure

7.2.5.1 Summary of Technical Information in the Application

In LRA Section 3.5, the applicant provided AMR results for the containments, structures, and component supports components and component groups.

In Table 3.5.1, "Summary of Aging Management Evaluations in Chapter IV of NUREG-1801 for Containments, Structures, and Component Supports," of the LRA, the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the containments, structures, and component supports components and component groups that are relied on for license renewal. In Section 3.5.2.2 of the LRA, the applicant provided information concerning Table 3.5.1 components for which further evaluation is recommended by the GALL Report.

The applicant's AMRs incorporated applicable operating experience in the determination of aging effects requiring management (AERMs). These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

7.2.5.2 Project Team Evaluation

The project team reviewed LRA Section 3.5 to determine if the applicant provided sufficient information to demonstrate that the effects of aging for the containments, structures, and component supports components that are within the scope of license renewal and subject to an AMR will be adequately managed so that the intended functions will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Also, the project team performed an onsite audit of AMRs to confirm the applicant's claim that certain identified AMRs were consistent with the GALL Report. The project team did not repeat its review of the matters described in the GALL Report. However, the project team did verify that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL AMRs. The project team's evaluations of the AMPs are documented in Section 7.1 of this report.

The project team also performed an onsite audit of those selected AMRs that were consistent with the GALL Report and for which further evaluation is recommended. The project team confirmed that the applicant's further evaluations were consistent with the acceptance criteria in Section 3.5.2.2 of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," dated July 2001.

The project team performed an onsite audit and conducted a technical review of the remaining AMRs that were not consistent with or not address in the GALL Report. The audit and technical review included evaluating whether all plausible aging effects were identified and the aging effects listed were appropriate for the combination of materials and environments specified. Finally, the project team reviewed the AMP summary descriptions in the FSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the containments, structures, and component supports components.

7.2.5.2.1 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Not Recommended

Summary of Technical Information in the Application. In Section 3.5.2.1 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects related to containment Unit 1 & 2 building structure, control building structure, circulating water pumphouse structure, diesel generator building structure, facade Unit 1 & 2 structure, primary auxiliary building structure, turbine building Unit 1 & 2 structure, yard structures, cranes, hoists, and lifting devices, component supports commodity group, fire barrier commodity group, 13.8 KV switchgear building structure, fuel oil pumphouse structure, and gas turbine building structure:

- ASME Section XI, Subsections IWE & IWL inservice inspection program
- boraflex monitoring program
- boric acid corrosion program
- fire protection program
- periodic surveillance and preventive maintenance program
- structures monitoring program
- water chemistry control program

Project Team Evaluation. In Tables 3.5.2-1 through 3.5.2-14 of the LRA, the applicant provided a summary of AMRs for containment Unit 1 & 2 building structure, control building structure, circulating water pumphouse structure, diesel generator building structure, facade Unit 1 & 2 structure, primary auxiliary building structure, turbine building Unit 1 & 2 structure, yard structures, cranes, hoists, and lifting devices, component supports commodity group, fire barrier commodity group, 13.8 KV switchgear building structure, fuel oil pumphouse structure, and gas turbine building structure components system and identified which AMRs it considered to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant has claimed

consistency with the GALL Report, and for which the GALL Report does not recommend further evaluation, the project team performed an audit and review to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant provided a note for each AMR line item. The notes described how the information in the tables aligns with the information in the GALL Report. The project team audited those AMRs with Notes A through E, which indicated the AMR was consistent with the GALL Report.

Note A indicated that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the AMP identified in the GALL Report. The project team audited these line items to verify consistency with the GALL Report and the validity of the AMR for the site-specific conditions.

Note B indicated 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 audited these line items to verify consistency with the GALL Report. The project team verified that the identified exceptions to the GALL AMPs had been reviewed and accepted by the project team. The project team also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

Note C indicated 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 is consistent with the AMP identified by the GALL Report. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report. However, the applicant identified a different component in the GALL Report that had the same material, environment, aging effect, and AMP as the component that was under review. The project team audited these line items to verify consistency with the GALL Report. The project team also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicated 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 audited these line items to verify consistency with the GALL Report. The project team verified whether the AMR line item of the different component was applicable to the component under review. The project team verified whether the identified exceptions to the GALL AMPs had been reviewed and accepted by the project team. The project team also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

Note E indicated that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited. The project team audited these line items to verify consistency with the GALL Report. The project team also determined whether the identified AMP would manage the aging effect consistent with the AMP identified by the GALL Report and whether the AMR was valid for the site-specific conditions.

The project team conducted an audit and review of the information provided in the LRA, as documented in its PBNP audit and review report. The project team did not repeat its review of

the matters described in the GALL Report. However, the project team did verify that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL Report AMRs.

The project team reviewed the 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 component supports components that are subject to an AMR. On the basis of its review, the project team determined that for AMRs not requiring further evaluation, as identified in LRA Table 3.5.1 (Table 1), the applicant's references to the GALL Report are acceptable and no further project team review is required.

Conclusion. The project team has evaluated the applicant's claim of consistency with the GALL Report. The project team also has reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the project team finds that the AMR results which the applicant claimed to be consistent with the GALL Report, are consistent with the AMRs in the GALL Report. Therefore, the project team finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.5.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In Section 3.5.2.2 of the LRA, the applicant provided further evaluation of aging management as recommended by the GALL Report for containment Unit 1 & 2 building structure, control building structure, circulating water pumphouse structure, diesel generator building structure, facade Unit 1 & 2 structure, primary auxiliary building structure, turbine building Unit 1 & 2 structure, yard structures, cranes, hoists, and lifting devices, component supports commodity group, fire barrier commodity group, 13.8 KV switchgear building structure, fuel oil pumphouse structure, and gas turbine building structure. The applicant provided information concerning how it will manage the following aging effects:

PWR Containments

- aging of inaccessible concrete areas
- cracking, distortion, and increase in component stress levels due to settlement; reduction of foundation strength due to erosion of porous concrete subfoundations, if not covered by structures monitoring program
- reduction of strength and modulus of concrete structures due to elevated temperature
- loss of material due to corrosion in inaccessible areas of steel containment shell or liner plate
- loss of prestress due to relaxation, shrinkage, creep, and elevated temperature
- cumulative fatigue damage

- cracking due to cyclic loading and SCC

Class I Structure

- aging of structures not covered by structures monitoring program
- aging management of inaccessible areas

Component Supports

- aging of supports not covered by structures monitoring program
- cumulative fatigue damage due to cyclic loading

Project Team Evaluation. For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the project team audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues that were further evaluated. In addition, the project team reviewed the applicant's further evaluations against the criteria contained in Section 3.5.3.2 of the SRP-LR. Details of the project team's audit are documented in the project team's PBNP audit and review report. The project team's evaluation of is discuss below.

7.2.5.2.2.1 PWR Containments

The project team reviewed LRA Section 3.5.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.1, which addresses several areas discussed below.

7.2.5.2..2 1.1 Aging of Inaccessible Concrete Areas.

The project team reviewed LRA Section 3.5.2.2.1.1 against the criteria in SRP-LR Section 3.5.2.2.1.1. In LRA Section 3.5.2.2.1.1, the applicant addressed aging of inaccessible concrete areas for the containment.

The ASME Code Subsection IWL exempts from examination portions of the concrete containment that are inaccessible (e.g., concrete covered by liner, foundation material, or backfill, or obstructed by adjacent structures or components). However, 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 addressed this with PBNP AMP B2.1.2, "ASME Section XI, Subsections IWE and IWL Inservice Inspection Program."

In GALL Report, Volume 2, Chapter II, Table A1, as updated by NRC Interim Project team Guidance 3 (ISG-03),"NRC letter dated November 23, 2001, "Proposed Revision of Chapters II and III of *Generic Lessons Learned (GALL) Report* on Aging Management of Concrete Elements," states that further evaluation is recommended for manage the aging effects for containment concrete components located in inaccessible areas for 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 addressed freeze-thaw as an aging mechanism for concrete containments because no further evaluation is recommended in the GALL Report. However, ISG-03 clarifies the project team position that further evaluation is appropriate if the applicant's facility is subject to moderate to severe weathering conditions unless the concrete meets certain specifications and subsequent inspections have confirmed that the aging mechanism has not caused degradation of the concrete.

The applicant stated that PBNP Units 1and 2 is located in a severe weathering region. In LRA Table 3.5.0-1, Part (11), the applicant stated that construction of the PBNP containment was performed under a contract containing concrete specifications. The specifications specified concrete entrained air content and water-to-cement ratio which meet the recommendations contained in the American Concrete Institute (ACI) specification ACI 318 63, "Building Code Requirements for Reinforced Concrete." Thus, loss of material and cracking due to freeze-thaw is not an applicable aging mechanism requiring management. Additionally, the entire containment structures are protected from the weather by the facade structure. However, the applicant stated that the inspections performed in accordance with the requirements of PBNP AMP B2.1.2 would detect freeze-thaw aging effects during the period of extended operation, should they occur.

During the audit, the project team interviewed members of the applicant's technical project team and reviewed relevant operating experience to confirm that loss of material from freeze-thaw has not been observed, either through ASME Section XI, Subsection IWE and IWL inservice inspection program or the structures monitoring program. The project team agrees that the concrete specification applied at PBNP would be expected to protect against the freeze thaw aging affect. The project team's review of operating experience did not identify any history of freeze thaw aging effects. During these discussions, the applicant stated that even though they do not believe freeze though is an active aging mechanism at PBNP, that the inspections performed in accordance with the requirements of PBNP AMP B2.1.2, "ASME Section XI, Subsections IWE & IWL Inservice Inspection Program," would detect freeze-thaw aging effects during the period of extended operation, should they occur. The project team agrees that this program adequately manages the aging effect of freeze thaw.

On the basis of its review, the project team finds that, based on the concrete specifications for the containment, in conjunction with the physical protection provided to the containment by the facade structure, the applicant is consistent with the GALL Report, Chapter II, Containment Structures, Item A1.1-a, as updated by ISG-03, and has demonstrated that loss of material and cracking due to freeze-thaw will be adequately managed.

(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-03, recommends further evaluation of plant-specific

programs to manage the aging effects for inaccessible areas if specific criteria cannot be satisfied.

The GALL Report, Chapter II, Containment Structures, Item A1.-b 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 likely if the concrete is constructed to ensure that it is dense, well-cured, has low permeability, and that cracking is well controlled. Cracking is controlled through proper arrangement and distribution of reinforcing bars. All of the above characteristics are assured if the concrete was constructed with the guidance of ACI 201.2R-77, "Guide to Durable Concrete."

In LRA, Table 3.5.0-1, Part (8), the applicant stated that PBNP concrete specification met the intent of ACI 201.2R and that the containment is not exposed to flowing water. Also, the containment structures are protected from the weather by the facade structure.

On the basis of its review, the project team finds that, based on the concrete specifications for the containment, lack of exposure to flowing water, and the protection from the weather provided to the containment by the facade structure, the applicant is consistent with the GALL Report, Chapter II, Containment Structures, Item A1.-b, as updated by ISG-03, and has demonstrated that cracking, spalling, and increases in porosity and permeability due to leaching of calcium hydroxide will be adequately managed.

(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, as updated by ISG-03, 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.

The GALL Report, Chapter II, Containment Structures, Item A1.1-c, states that for below-grade exterior reinforced concrete (basemat, embedded walls), a plant-specific aging management program is required only if the below-grade environment is aggressive (pH less than 5.5, chlorides are greater than 500 ppm, or sulfates are greater than 1500 ppm). Examination of representative samples of below-grade concrete, when excavated for any reason, is to be included as part a plant-specific program. ISG-03 also states that a plant-specific aging management program is required for inaccessible areas if the below-grade environment is found to be aggressive.

The applicant stated, in the LRA, that the below grade/lake-water environment is not aggressive. Also, the applicant stated that its structure monitoring program requires periodic monitoring of ground/lake water to confirm chemistry remains nonaggressive.

On the basis of its review, the project team finds that based on the nonaggressive below-grade/lake-water environment and the periodic confirmatory water monitoring, the applicant is consistent with the GALL Report, Chapter II, Containment Structures, Item A1-c, as updated by ISG-03, and has demonstrated that cracking, spalling, and increases in porosity and permeability due to aggressive chemical attack will be adequately managed.

(4) Reaction with aggregates - SRP-LR Section 3.5.2.2.1.1 does not address cracking due to reaction with aggregates as an aging mechanism for concrete containments because no further evaluation is recommended in the GALL Report. However, ISG-03 clarifies the project team position that further evaluation is appropriate if investigations, tests, or examinations have demonstrated that the aggregates are reactive.

ISG-03 recommends using GALL AMP XI.S6, "Structures Monitoring Program" to mange aggregate reactions in accessible areas. ISG-03 states that inspections and evaluations performed in accordance with "Structures Monitoring Program" will indicate the presence of expansion and cracking due to reaction with aggregates. For inaccessible areas, the ISG states that evaluation is needed if investigations, tests, and petrographic examinations of aggregates performed in accordance with ASTM C295-54, ASTM C227-50, or ACI 201.2R-77 (NUREG-1557) demonstrate that the aggregates are reactive.

In LRA Table 3.5.0-1 Part (8), the applicant stated that PBNP containment concrete specifications specified testing of aggregate for potential reactivity in accordance with ASTM C227 and C295. As discussed in section 3.5.2.2.2(2a) of this Report, the aggregate was tested in accordance with ASTM C227 and C295. Based on the criteria of ISG-03 and the aggregate tests which demonstrated the lack of reactive aggregate, project team agrees that evaluation of inaccessible areas is not needed for PBNP.

On the basis of its review, the project team finds that based on the testing of aggregate for potential reactivity performed during construction, the applicant is consistent with the GALL Report, Chapter II, Containment Structures, Item A1.-d, as updated by ISG-03, and has demonstrated that cracking due to reaction with aggregates will be adequately managed.

(5) Corrosion of embedded steel - SRP-LR Section 3.5.2.2.1.1 states that cracking, spalling, loss of bond, and loss of material due to corrosion of embedded steel could occur in inaccessible areas of PWR concrete and steel containments. The GALL Report, as updated by ISG-03, 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.

The GALL Report, Chapter II, Containment Structures, Item A1.1.-e, states that for below-grade exterior reinforced concrete (basemat, embedded walls), a plant-specific aging management program is required only if the below-grade environment is aggressive (pH less than 5.5, chlorides are greater than 500 ppm, or sulfates are greater than1500 ppm). Examination of representative samples of below-grade concrete, when excavated for any reason, is to be included as part a plant-specific program. ISG-03 also states that a plant-specific aging management program is required for inaccessible areas if the below-grade environment is found to be aggressive.

In LRA Section 3.5.2.2.1.1, the applicant stated that the below grade/lake-water environment is not aggressive. Also, the applicant stated that its structure monitoring program requires periodic monitoring of ground/lake water to confirm chemistry remains nonaggressive.

On the basis of its review, the project team finds that based on the nonaggressive below-grade/lake-water environment and the periodic confirmatory water monitoring, the applicant is consistent with GALL Report, Chapter II, Containment Structures,

Item A1.-e, as updated by ISG-03, and has demonstrated that cracking, spalling, loss of bond, and loss of material due to corrosion of embedded steel will be adequately managed.

The project team reviewed the results of the applicant's AMR for inaccessible concrete areas. On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving management of aging of inaccessible concrete areas for the containment, as recommended in the GALL Report and ISG-3. 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 for the period of extended operation, as required by 10 CFR 54.21(a)(3). Subsequent to the audit, the project team requested in RAI 3.5-13 that the applicant proved additional clarification on how it explicitly satisfies all parameters of ISG-03. The applicant verbally explained how it satisfies ISG-03 and agreed to proved a table with detailing additional locations in its program which demonstrate how it satisfied ISG-03. <Confirmatory Item 3.5-13>

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.

The project team reviewed LRA Section 3.5.2.2.1.2 against the criteria in SRP-LR Section 3.5.2.2.1.2.

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. SRP-LR Section 3.5.2.2.1.2 also states that reduction of foundation strength due to erosion of porous concrete subfoundations could occur in all types of PWR containments.

The GALL Report recommends no further evaluation if these activities are included in the scope of the applicant's structures monitoring program.

In LRA Section 3.5.2.2.1.2, the applicant stated that all structures at PBNP are founded on either spread footings, basemats, or basemats with steel foundation piles that are driven to refusal. Settlement monitoring and structural inspections indicate no visible evidence of uneven or excessive settlement since construction of the station. The applicant also stated that its structures monitoring program monitors for cracks and distortions. In addition, in LRA Section 3.5.2.2.1.2, the applicant stated that PBNP structure foundations were constructed of normal concrete and not the porous type, and that the foundations are not subject to flowing water. The applicant also stated that its structures monitoring program monitors for settlement and cracking.

The project team reviewed the applicant's structures monitoring program and its evaluation is documented in Section 7.1.15 of this Report. On the basis of its review, the project team finds that based on the foundation designs used at PBNP and based on the absence of porous concrete in subfoundations, the applicant satisfies the specific criteria in the GALL Report and has demonstrated that cracking, distortion, and increase in component stress level due to settlement and reduction of foundation strength due to erosion of porous concrete subfoundations will be adequately managed.

On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving management of 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 for the 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 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.

The project team reviewed LRA Section 3.5.2.2.1.3 against the criteria in SRP-LR Section 3.5.2.2.1.3.

In LRA Section 3.5.2.2.1.3, the applicant addressed 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 of 66°C (150°F) and local area temperature of 93°C (200°F).

The applicant stated, in the LRA, that for plant areas of concern, temperatures are normally maintained below the specified limits. During the audit, the applicant provided information. The applicant stated that, by design, containment concrete should not be exposed to temperatures above FSAR specified limits; however, the applicant stated that four Unit 2 containment penetrations associated with the main steam and feedwater systems concrete expose to temperatures above the specified limits. This Unit 2 nonconforming condition is captured and addressed by the PBNP corrective action program. Currently, the status of these penetrations is operable but degraded. As part of the plant's existing corrective action process, the affected penetrations will be inspected and restored to original design conditions during the next Unit 2 refueling outage which is planned for Spring 2005.

The applicant stated that it has included susceptible components within the scope of PBNP AMP B2.1.20, "Structures Monitoring Program," and PBNP AMP B2.1.2, "ASME Section XI, Subsections IWE and IWL Inservice Inspection Program," to monitor for loss of material, cracks, and changes in material properties.

The project team reviewed the applicant's structures monitoring program and ASME Section XI, Subsections IWE and IWL inservice inspection program and its evaluation is documented in Section 7.1.15 and Section 7.1.2 of this report, respectively. The project team finds that based on the design of the hot penetration areas, in combination with the resolution of PBNP corrective action associated with concrete that operated at an elevated temperature and continuing monitoring the structures monitoring program and ASME Section XI, Subsections IWE and IWL inservice inspection program, any reduction of strength and modulus of elasticity due to elevated temperatures in PWR concrete will be adequately managed.

On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving reduction of strength and modulus of concrete structures due to elevated temperature for the 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 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.

The project team reviewed LRA Section 3.5.2.2.1.4 against the criteria in SRP-LR Section 3.5.2.2.1.4.

In LRA Section 3.5.2.2.1.4, the applicant addressed loss of material due to corrosion in inaccessible areas of the steel containment shell or the steel liner plate for the containment.

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, Chapter II, Containment Structures, Item A1.2-a states that for inaccessible areas (embedded containment steel shell or liner), loss of material is not significant if the following conditions are 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 concrete is monitored to ensure that it is free of penetrating cracks that provide a path for water seepage to the surface of the containment shell or liner; (3) the moisture barrier, at the junction where the shell or liner becomes embedded, is subject to aging management activities in accordance with 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. If any of the above conditions cannot be satisfied, then a plant-specific aging management program for corrosion is required.

The applicant stated, in the LRA, that plant operating experience has shown that borated water spills in containment have impacted the containment liner and accordingly, the liner plate has been selected to receive augmented inspections, category E-C, in accordance with ASME Section XI, Subsections IWE. In addition, the boric acid corrosion program is also credited with assessing and managing loss of material in the containment liner.

The NRR/DE staff reviewed the applicant's boric acid corrosion program which will be documented in Section 3.0 of the SER. On the basis of its review, the project team finds, predicated on the NRR/DE staff acceptance of the boric acid corrosion AMP, that based on the augmented inspections identified above, loss of material due to corrosion in inaccessible areas of the steel liner plate for the containment will be adequately managed.

On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving loss of material due to corrosion in inaccessible areas of the steel containment shell or the steel liner plate for the 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 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.

PBNP LRA Section 3.5.2.2.1.5 is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4 of the PBNP SER and is reviewed by the NRR DE staff. Therefore, the project team did not review this item.

7.2.5.2.1.6 Cumulative Fatigue Damage.

PBNP LRA Section 3.5.2.2.1.5 is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4 of the PBNP SER and is reviewed by the NRR DE staff. Therefore, the project team did not review this item.

7.2.5.2.1.7 Cracking Due to Cyclic Loading and Stress Corrosion Cracking (SCC).

The project team reviewed LRA Section 3.5.2.2.1.7 against the criteria in SRP-LR Section 3.5.2.2.1.7.

In LRA Section 3.5.2.2.1.7, the applicant addressed cracking due to cyclic loading and SCC.

SRP-LR Section 3.5.2.2.1.7 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 because visual (VT-3) examinations may be unable to detect this aging effect.

The applicant stated, in the LRA, that liner penetrations have had a fatigue review and cracking due to cyclic loading and is addressed as a TLAA in LRA Section 4.3.11. Additionally, the applicant stated that carbon steel components within penetrations are not susceptible to SCC and that stainless steel components require both a high temperature (temperature greater than140°F) and exposure to an aggressive chemical environment (e.g., exposure to chlorides). The bellows at PBNP are not exposed to aggressive chemical environments.

During the audit, the applicant was asked to address the difference between the applicant's position and the GALL Report recommendation of enhanced inspection methods. The project team noted that TLAA does not detect and manage cracking due to cyclic loading. Therefore, PBNP was requested to provide further clarification for crediting Item 3.5.1-01/II.A3.1-b to manage cracking due to cyclic loading. This is RAI 3.5.12 The applicant pointed out that GALL only requires either a TLAA or an inspection. Staff acknowledges the GALL position and awaits the RAI response.<Confirmatory issue RAI 3.5-12>

The project team reviewed and concurred with the applicant that carbon steel components within penetrations are not susceptible to SCC. Also, cracking due to cyclic loading of the liner plate and penetrations is a TLAA which is evaluated and addressed in Section 4.6 of this Report.

On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving management of cracking due to cyclic loading and stress corrosion cracking for the 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 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 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.

The project team reviewed LRA Section 3.5.2.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.2.1.

In LRA Section 3.5.2.2.2.1, the applicant addressed aging of Class 1 structures not covered by the structures monitoring program.

SRP-LR Section 3.5.2.2.2.1 states that the GALL Report recommends further evaluation of certain structure/aging effect combinations if they are not covered by the structures monitoring program. This is described in GALL Report Chapter III and 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 subfoundations 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; 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 Structures Monitoring Program.

Also, technical details of the aging management issue are presented in SRP-LR Subsection 3.5.2.2.1.2 for structure/aging effect combinations Items (5) and (6) and SRP-LR Subsection 3.5.2.2.1.3 for Item (8), above.

In LRA Subsection 3.5.2.2.2.1, the applicant stated that its PBNP AMP B2.1.20, “Structures Monitoring Program” identifies that an aging mechanism is present and active. The applicant stated that the structures monitoring program also provides confirmation and verification of the absence of all types of aging effects. The applicant further stated that aging effects may be absent if the materials of construction, design specifications, and operational environment preclude an aging mechanism but, it is prudent to periodically assess the condition of SSCs regardless of the likelihood that a particular aging mechanism is applicable. The project team reviewed the applicant’s structures monitoring program and its evaluation is documented in Section 7.1.15 of this report. Additional discussion of specific structure/aging effect combinations follows.

(1) Freeze-thaw - SRP-LR Section 3.5.2.2.1.2 does not address freeze-thaw as an aging mechanism for concrete containments because no further evaluation is recommended in the GALL Report. However, ISG-03 clarifies the project team position that further evaluation is appropriate if the applicant’s facility is subject to moderate to severe

weathering conditions unless the concrete meets certain specifications and subsequent inspections have confirmed that the aging mechanism has not caused degradation of the concrete.

PBNP is located in a region considered to be severe weathering conditions. In the LRA, the applicant states that the contract specified air contents are within the range specified by ACI 318-63, and the contract specified water-to-cement ratio meets the recommendations of ACI 318-63. Therefore, loss of material and cracking of concrete due to freeze-thaw are not probable aging effects at PBNP and have not been observed to date.

The project team interviewed the applicant's technical project team and confirmed that the concrete at PBNP was allowed to properly cure. In addition, it was confirmed that a loss of material from freeze-thaw has not been observed, either through the applicant's ASME Section XI, Subsections IWE and IWL inservice inspection program or the structures monitoring program.

On the basis that concrete that satisfies the requirements of ACI 318-63 will meet the requirements of the Gall Report as clarified by ISG-03, and on the basis of the lack of freeze-thaw effects to date, the project team finds that loss of material and cracking due to freeze-thaw will be adequately managed.

(2a) Leaching of calcium hydroxide - SRP-LR Section 3.5.2.2.2.1 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-03, recommends further evaluation of plant-specific programs to manage the aging effects for inaccessible areas exposed to flowing water, unless the requirements of ACI 201.2R are met.

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.

The applicant stated, in the LRA, that the original specifications met the intent of ACI 201.2R, and that a change in material properties due to leaching of calcium hydroxide is not a probable aging effect at PBNP and has not been observed to date. The applicant has used concrete per ACI 318-63 to construct these components. The differences between the ACI 318 concrete and ACI 201 standard are concrete rated at 3500 psi, some concrete cured to a time that was sightly shorter, use of type 1 versus type 2 concrete and tested its aggregate per alternate ASTM C 295 and C 227. The lower strength and shorter cure time were consistent with the plant design criteria and effect abrasion resistance primarily. Type 1 concrete is a higher quality concrete that type 2. The alternate aggregate ASTM test standards are accepted by the GALL Report as an acceptable alternative.

The project team reviewed the information provided in the LRA and held discussion with the applicant. The project team considers these differences and concludes that the ACI concrete possesses comparable aging resistance properties and will perform as well as concrete fabricated to the later ACI 201-2R guidance. The project team finds that based on the concrete specifications for Class 1 structures, the applicant is consistent with the

GALL Report as updated by ISG-03, and has demonstrated that cracking, spalling, and increases in porosity and permeability due to leaching of calcium hydroxide will be adequately managed.

(2b) Aggressive chemical attack - SRP-LR Section 3.5.2.2.2.1 states that cracking, spalling, and increases in porosity and permeability due to aggressive chemical attack could occur in inaccessible areas of Class 1 structures. 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-03 cannot be satisfied.

The GALL Report as updated by ISG-03 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.

The applicant stated, in the LRA, that concrete degradation in air due to aggressive rainwater is insignificant and the below grade environment is not aggressive. The structures monitoring program requires periodic monitoring of ground/lake water to confirm chemistry remains nonaggressive. Concrete degradation due to aggressive chemical attack has not been observed to date at PBNP.

The project team finds that based on the nonaggressive below-grade/lake-water environment, the applicant is consistent with the GALL Report, as updated by ISG-03, and has demonstrated that cracking, spalling, and increases in porosity and permeability due to aggressive chemical attack will be adequately managed.

(3) Reaction with aggregates - SRP-LR Section 3.5.2.2.2.1 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-03 clarifies the project team position that further evaluation is appropriate if investigations, tests, or examinations have demonstrated that the aggregates are reactive.

The applicant stated, In the LRA, that during construction, the aggregates were tested for potential reactivity in accordance with ASTM C227 and ASTM C295. Consequently, cracking and expansion due to reaction with aggregates are not probable aging effects at PBNP and have not been observed to date.

The project team finds that the testing of aggregate for potential reactivity performed during construction is consistent with GALL Report, as updated by ISG-03, and has demonstrated that cracking due to reaction with aggregates will be adequately managed.

(4) Corrosion of embedded steel - SRP-LR Section 3.5.2.2.2.1 states that loss of material due to corrosion of embedded steel could occur in inaccessible areas of Class 1 structures. The GALL Report as updated by ISG-03 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.

The GALL Report states that a plant-specific program is required only if the below-grade environment is aggressive.

The applicant, in the LRA, that since the embedded steel is not exposed to an

environment which is considered aggressive, loss of material, cracking, and loss of bond due to corrosion of embedded steel are not probable aging effects at Point Beach and have not been observed to date.

The project team finds that based on the nonaggressive below-grade/lake-water environment, the applicant is consistent with the GALL Report, as updated by ISG-03, and has demonstrated that cracking, spalling, loss of bond, and loss of material due to corrosion of embedded steel will be adequately managed.

(5) Settlement - SRP-LR Section 3.5.2.2.2.1 refers to Section 3.5.2.2.1.2 for discussion of settlement. 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 Class 1 structures. Some plants may rely on a dewatering system to lower the site ground water level. If the plant's CLB credits a dewatering system, the GALL Report recommends verification of the continued functionality of the dewatering 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 structures monitoring program.

In LRA Section 3.5.2.2.2.1, the applicant stated that all structures at PBNP are founded on either spread footings, basemats, or basemats with steel foundation piles that are driven to refusal. Settlement monitoring and structural inspection indicate no visible evidence of uneven or excessive settlement since construction of the station. Cracking, distortion, and an increase in component stress levels due to settlement are not probable aging effects at Point Beach and have not been observed to date. Additionally, according to LRA Table 3.5.0-1, Item (13), there is no permanent dewatering system at PBNP.

The project team finds that based on the foundation designs used at PBNP, the applicant satisfies the specific criteria in the GALL Report and has demonstrated that cracking, distortion, and increase in component stress level due to settlement will be adequately managed.

(6) Erosion of porous concrete subfoundation - SRP-LR Section 3.5.2.2.2.1 refers to LRA Section 3.5.2.2.1.2 for discussion of erosion of porous concrete subfoundation. SRP-LR Section 3.5.2.2.1.2 states that reduction of foundation strength due to erosion of porous concrete subfoundations could occur in all types of Class 1 structures. Some plants may rely on a dewatering system to lower the site ground water level. If the plant's CLB credits a dewatering system, the GALL Report recommends verification of the continued functionality of the dewatering 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 structures monitoring program.

SRP-LR Section 3.5.2.2.1.2 states that reduction of foundation strength due to erosion of porous concrete subfoundations could occur in all types of PWR containments. LRA Section 3.5.2.2.1.2 states that PBNP structure foundations were constructed of normal concrete and not the porous type, and that the foundations are not subject to flowing water. The structures monitoring program monitors for settlement and cracking.

The project team finds that based on the foundation designs used at PBNP and based on the absence of porous concrete in subfoundations, the applicant satisfies the specific criteria in the GALL Report and has demonstrated that cracking, distortion, and increase

in component stress level due to settlement and reduction of foundation strength due to erosion of porous concrete subfoundations will be adequately managed.

(7) Corrosion of structural steel components - SRP-LR Section 3.5.2.2.2.1 states that corrosion of structural steel components could occur and that further evaluation is necessary only for structure/aging effect combinations not covered by the structures monitoring program.

The project team reviewed the AMR results involving management of aging effects resulting from corrosion of structural steel components and confirmed that the structures monitoring program addresses each of the affected SSCs. The project team reviewed the applicant's structures monitoring program and its evaluation is documented in evaluated in Section 7.1.15 of this Report. On the basis of its review, the project team finds that the applicant has appropriately evaluated AMR results involving this aging effect and that corrosion of structural steel components is adequately managed by the structures monitoring program.

(8) Elevated temperatures - SRP-LR Section 3.5.2.2.2.1 refers to SRP-LR Section 3.5.2.2.1.3 for discussion of elevated temperatures. 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 Class 1 structures. The GALL Report calls for a plant-specific aging management program and recommends further evaluation if any portion of the concrete components exceeds specified temperature limits, i.e., general area temperature 66°C (150°F) and local area temperature 93°C (200°F).

The applicant stated, in the LRA, that for plant areas of concern, temperatures are normally maintained below the specified limits; therefore, loss of material, cracking, change in material properties due to elevated temperatures are not probable aging effects at PBNP and have not been observed to date. However, in RAI 3.5-3, it stated that the concrete temperatures in Unit 2 around the main steam and feed water lines were found to be about 380°F for an unknown period of time. Such sustained temperatures not only affect the concrete compressive strength and its elastic modulus, but they also accentuate the concrete creep and relaxation of prestressing tendons located in the vicinity of high temperature areas. The net effect could be lower tendon forces in these areas. In the August 26, 2003 response letter, the applicant stated that it had, in 2003, initiated corrective actions to address this issue. In its RAI response, the applicant stated that the penetrations will be restored to their original design condition during the Unit 2 Spring 2005 refueling outages. This inspection will confirm weather or not there are any adverse conditions. If adverse conditions are identified, corrective actions will be taken.

The project team reviewed the applicant's structures monitoring system and its evaluation is documented in Section 7.1.15 of this report. The project team also reviewed the AMR results and RAI 3.5-3 involving management of aging effects resulting from elevated temperature. The project team finds that the applicant has appropriately evaluated AMR results involving reduction of strength and modulus due to elevated temperature, as recommended in the GALL Report, and that it is adequately managed by the structures monitoring program.

(9) Aging effects for stainless steel liners for tanks

The applicant stated, in the LRA, that no tanks with stainless steel liners are included in the structural AMRs. Tanks subject to an AMR are evaluated with their respective mechanical systems.

On the basis of its review, the project team concurred that no tanks with stainless steel liners are included in the structural AMRs.

The project team reviewed the results of the applicant's AMR for accessible interior and exterior concrete and steel components of Class 1 structures (except Group 6). On the basis of its audit, the project team finds that the applicant appropriately evaluated AMR results involving management of aging of accessible interior and exterior concrete and steel components of Class 1 structures (except Group 6, water-control structures. 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 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.

The project team reviewed the LRA Section 3.5.2.2.2.2 against the criteria in SRP-LR Section 3.5.2.2.2.2.

In LRA Section 3.5.2.2.2.2, the applicant addressed aging 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 an aggressive below-grade environment exists.

The applicant stated, in the LRA, that the below-grade environment is not aggressive. The applicant use the structures monitoring program to examine below-grade concrete when it is exposed by excavation and monitor the ground/lake water to confirm that the chemistry remains nonaggressive. Inspections of accessible concrete have not revealed degradation from aggressive chemical attack or corrosion of embedded steel.

The project team reviewed the applicant's structures monitoring program and its evaluation is documented in Section 7.1.15 of this report. The project team concurred with the applicant that the below-grade environment is not aggressive and that excavated concrete has been and will continue to be monitored. The project team finds that increases in porosity and permeability, loss of material (spalling, scaling) and cracking due to aggressive chemical attack and cracking, spalling, loss of bond, and loss of material due to corrosion of embedded steel are adequately managed for concrete in inaccessible areas.

On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving management of aging of accessible interior and exterior concrete and steel components of Class 1 structures (except Group 6). 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 for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.5.2.3 Component Supports

The project team reviewed the LRA Section 3.5.2.2.3 against the criteria in SRP-LR Section 3.5.2.2.3, which addresses several areas discussed below.

7.2.5.2.3.1 Aging of Supports Not Covered by Structures Monitoring Program.

The project team reviewed the LRA Section 3.5.2.2.3.1 against the criteria in SRP-LR Section 3.5.2.2.3.1.

In LRA Section 3.5.2.2.3.1, the applicant addressed aging of component supports that are not managed by the structures 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 stated, in the LRA, that for Groups B1-B5, these component supports are included in the structures monitoring program. Component supports in Group B1 are managed using the ASME Section XI, Subsection IWF inoperative inspection program. The applicant further stated that its structures monitoring program includes baseplates, grout, and expansion anchors for Group B1 supports, but these items are inspected at the same time as the ASME Section XI IWF ISI inspections.

(1) Reduction in concrete anchor capacity due to surrounding concrete for Groups B1 through B5 supports.

    The applicant stated that its concrete anchors and surrounding concrete are included in the structures monitoring program (Groups B1 through B5).

(2) Loss of material due to environmental corrosion, for Groups B2-B5 supports.

    The applicant stated that loss of material due to corrosion of steel support components is an aging effect requiring management. The applicant stated that this aging effect is managed by the PBNP AMP B.2.1.20, “Structures Monitoring Program.”

(3) Reduction/loss of isolation function due to degradation of vibration isolation elements for Group B4 supports

    The applicant stated that PBNP AMP B.2.1.20, “Structures Monitoring Program,” identifies and evaluates the degradation of vibration isolation elements.

The project team reviewed the applicant’s structures monitoring program and ASME Section XI,

Subsection IWF inservice inspection program and its evaluation is documented in Section 7.1.15 and Section 7.1.3 of this report.

On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving management of aging of supports not covered by structures monitoring program for the component supports, 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 for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.5.2.3.2 Cumulative Fatigue Damage Due to Cyclic Loading.

PBNP LRA Section 3.5.2.2.3.2 is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4 of the PBNP SER and is reviewed by the NRR DE staff. Therefore, the project team did not review this item.

7.2.5.2.4 Quality Assurance for Aging Management of Non-Safety-Related Components.

PBNP LRA Section 3.5.2.2.8 is reviewed by NRR DIPM staff and addressed in Section 3 of the PBNP SER related to the PBNP LRA. Therefore, the project team did not review this item.

Conclusion. On the basis of its review, for component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the project team determines that (1) those attributes or features for which the applicant claimed consistency with the GALL Report were indeed consistent and (2) the applicant adequately addressed the issues that were further evaluated. 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).

7.2.5.3 AMR Results That Are Not Consistent With or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In Tables 3.5.2-1 through 3.5.2-14 of the LRA, the project team reviewed additional details of the results of the AMRs for material, environment, aging effect requiring management, and AMP combinations that are not consistent with the GALL Report or are not addressed in the GALL Report.

In Tables 3.5.2-1 through 3.5.2-14, the applicant indicated, via Notes F through J, that neither the identified component nor the material and environment combination is evaluated in the GALL Report and provided information concerning how the aging effect requiring management will be managed.

Project Team Evaluation. For component type, material and environment combination that are not evaluated in the GALL Report, the project team reviewed the applicant's evaluation to determine whether the applicant had demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained during the period of extended operation.

The project team evaluation is discussed below.

7.2.5.3.1 Containments, Structures, and Component Supports Components That Have No Aging Effects

In LRA Table 3.5.2-1 to Table 3.5.2-14, the applicant identified line items where no aging effects were identified as a result of the aging review process. Specifically, instances in which the applicant stated that no aging effects were identified occurred when components fabricated from structural stainless steel, carbon steel, glass, grout or fiber reinforced cement that were exposed to air, or were buried concrete (reinforced) . Neither air or buried concrete (reinforced), is identified in the GALL Report as an environment for these components and materials. No aging effects are considered to be applicable to buried reinforced concrete or structural stainless steel, carbon steel, glass, grout or fiber reinforced cement that were exposed to air environments.

On the basis of its review of current industry research and operating experience, the project team finds that dry air on metal will not result in aging that will be of concern during the period of extended operation. There is not aging effect/mechanism on structural stainless steel, carbon steel, glass, grout or fiber reinforced cement in air environment. Therefore, the project team concludes that there are no applicable aging effects requiring management for structural stainless steel, carbon steel, glass, grout or fiber reinforced cement in air environment. The project team also finds that no applicable aging effects for buried reinforced concrete or structural stainless steel, carbon steel, glass, grout or fiber reinforced cement that were exposed to air environments.

7.2.5.3.2 Containment Unit ½ Building Structure - Summary of Aging Management Evaluation

The project team reviewed Table 3.5.2-1 of the LRA, which summarized the results of AMR evaluations for the containment Unit 1&2 building structure component groups.

The applicant proposed to manage loss of material due to boric acid wastage of structural steel-carbon material for component types of structural carbon steel/indoor -all: containment liner and keyway channels, penetrations -electrical, penetrations - mechanical, including bolting exposed to indoor -no air conditioning (external) environment using PBNP AMP B2.1.6, “Boric Acid Corrosion Program.”

The NRR/DE staff reviewed the applicant’s boric acid corrosion program and its evaluation is documented in Section 3.0 of the SER. Predicated on the NRR/DE acceptance fo the boric acids corrosion AMP, the applicant’s plant specific and industry operating experience, the project team finds that loss of material due to boric acid wastage for components in the containment Unit 1&2 building structure are effectively managed using the boric acid corrosion program. On this basis, the project team finds that management of loss of material due to boric acid wastage in the containment Unit 1&2 building structure is acceptable.

The applicant proposed to manage loss of material due to wear of structural copper alloy (Zn less than 15%) material for component type of structural copper alloy/indoor - all: airlock bushings exposed to indoor - no air conditioning (external) environment using PBNP AMP B2.1.2, “ASME Section XI, Subsection IWE and IWL Inservice Inspection Program.”

The project team reviewed the applicant’s ASME Section XI, Subsection IWE and IWL inservice inspection program and its evaluation is documented in Section 7.1.2 of this Report. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material due to wear for components in the containment Unit 1&2 building

structure are effectively managed using the ASME Section XI, Subsection IWE and IWL inservice inspection program. On this basis, the project team finds that management of loss of material due to wear in the containment Unit 1&2 building structure is acceptable.

The applicant also proposed to manage loss of material due to MIC and loss of material due to pitting corrosion of structural steel -stainless material for component type of structural stainless steel/borated water - all: refueling cavity liner, sandbox covers including bolting; plates, bars, strips, and rods associated with the RC; fuel transfer tube including bolting exposed to treated water borated, temperature less than 140/F using PBNP AMP B2.1.24, “Water Chemistry Control Program.”

The project team reviewed the applicant’s water chemistry control program and its evaluation is documented in Section 7.1.17 of this report. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material due to MIC and pitting corrosion for components in the containment Unit 1&2 building structure are effectively managed using the water chemistry control program. On this basis, the project team finds that management of loss of material due to MIC and pitting corrosion in the containment Unit 1&2 building structure is acceptable.

In LRA Table 3.5.1, Item 3.5.1-33, the applicant stated that the Bolting Integrity Program includes the use of Inservice Inspections to evaluate and monitor crack initiation and growth due to SSC, if present, in high strength low-alloy steel bolts used in NSSS component support.
In LRA Tables 3.5.2-1 through 3.5.2-14, the applicant does not address Group B1.1, high strength low-alloy bolts. In LRA Section B2.1.4, the applicant indicated that high strength component support bolting is used in pinned connections associated with steam, reactor coolant pumps and reactor vessel supports and is loaded only in shear with no preload stress.
No preload stress indicates that PBNP NSSS components bolting were installed with snug-tight only, without using any torque or turn-of nuts method during installation. The staff requests the applicant to provide justification for the statement of no preload stress for NSSS components bolting. The applicant is requested to clarify if there are any Group B1.1, high strength low-alloy bolts, not used for pinned connection only. To address these questions RAI 3.5-14 was issued. The applicant has agreed that PBNP has these high strength bolts which are torques and agreed to amend its LRA to identify and mange these bolts. The applicant also identified a similar RAI B2.1.4-3 which addressed the same issue. The project team reviewed this RAI and concurred that it acceptable addressed the question. <Confirmatory Item B2.1.4-3>

7.2.5.3.3 Control Building Structure - Summary of Aging Management Evaluation

The project team reviewed Table 3.5.2-2 of the LRA, which summarized the results of AMR evaluations for the control building structure component groups.

The applicant proposed to manage loss of material due to general corrosion and loss of material due to wear of structural steel - carbon material for component type of doors/indoor -all: all doors throughout the building exposed to indoor -no air conditioning (external) environment the using PBNP AMR B2.1.20 , “Structures Monitoring Program,” and PBNP AMR B2.1.10, “Fire Protection Program.” The project team reviewed the applicant’s structures monitoring program and fire protection program and its evaluation is documented in Section 7.1.15 and Section 7.1.8 of this report, respectively. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material due to general corrosion and loss of material due to wear for components in the control building structure are

effectively managed using the structures monitoring program and fire protection program. On this basis, the project team finds that management of loss of material due to general corrosion and loss of material due to wear in the control building structure is acceptable.

The applicant proposed to manage change in material properties due to elevated temperature, cracking due to elevated temperature, and cracking due to ultraviolet radiation and ozone of elastomer materials for component type of elastomers/indoor - all: rubber flap-DGR louver; rubber sill, sweep -flood doors; gasket and seals -control room door exposed to indoor -no air conditioning (external) environment using the PBNP AMP B2.1.10 ,"Fire Protection Program."

The project team reviewed the applicant's fire protection program and its evaluation is documented in Section 7.1.8 of this Report. The project team finds that elastomers experience changes in material properties and cracking gradually. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that change in material properties due to elevated temperature, cracking due to elevated temperature, and cracking due to ultraviolet radiation and ozone for components in the control building structure are effectively managed using the fire protection program. On this basis, the project team finds that management of change in material properties due to elevated temperature, cracking due to elevated temperature, and cracking due to ultraviolet radiation and ozone in the control building structure is acceptable.

The applicant proposed to manage change in material properties due to rot and mildew and loss of material due to rot and mildew of wood material for component type of wood/outdoor - all: missile shield -integral part of the diesel generator air intake exposed to outdoor (external) using PBNP AMP B2.1.20, "Structures Monitoring Program."

The project team reviewed the applicant's structures monitoring program and its evaluation is documented in Section 7.1.15 of this report. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that changes in material properties due to rot and mildew, and loss of material due to rot and mildew for components in the control building structure are effectively managed using the structures monitoring program. On this basis, the project team finds that management of changes in material properties due to rot and mildew, and loss of material due to rot and mildew in the control building structure is acceptable.

7.2.5.3.4 Circulating Water Pumphouse Structure - Summary of Aging Management Evaluation

The project team reviewed Table 3.5.2-3 of the LRA, which summarized the results of AMR evaluations for the circulating water pumphouse structure component groups.

The applicant proposed to manage loss of material due to abrasion and cavitation of concrete (reinforced) material for component type of concrete/ raw water - all: forebay structure and pump bays exposed to raw water (submerged) environment using PBNP AMP B2.1.20, "Structures Monitoring Program."

The project team reviewed the applicant's structures monitoring program and its evaluation is documented in Section 7.1.15 of this report. The project team finds that limited loss of material due to abrasion and cavitation can occur in a raw water submerged external environment. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material due to abrasion and cavitation for components in the circulating water pumphouse structure are effectively managed using the structures monitoring

program. On this basis, the project team finds that management of loss of material due to abrasion and cavitation in the circulating water pumphouse structure is acceptable.

The applicant proposed to manage loss of material due to general corrosion of structural steel - carbon material for component type of doors/indoor -all: all doors throughout the building exposed to indoor -no air conditioning (external) environment using PBNP AMR B2.1.10, “Fire Protection Program.”

The project team reviewed the applicant’s fire protection program and its evaluation is documented in Section 7.1.8 of this report. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material due to general corrosion for components in the circulating water pumphouse structure are effectively managed using the fire protection program. On this basis, the project team finds that management of loss of material due to general corrosion in the circulating water pumphouse structure is acceptable.

The applicant proposed to manage loss of material due to general corrosion of structural steel - carbon material for component type of structural carbon steel/ indoor - all: framing - columns, beams and structural carbon steel fasteners/ indoor - all: structural steel framing exposed to indoor - no air conditioning (external) environment using PBNP AMP B2.1.20, “Structures Monitoring Program.”

The project team reviewed the applicant’s structures monitoring program and its evaluation is documented in Section 7.1.15 of this report. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material due to general corrosion for components in the circulating water pumphouse structure are effectively managed using the structures monitoring program. On this basis, the project team finds that management of loss of material due to general corrosion in the circulating water pumphouse structure is acceptable.

7.2.5.3.5 Diesel Generator Building Structure - Summary of Aging Management Evaluation

The project team reviewed Table 3.5.2-4 of the LRA, which summarized the results of AMR evaluations for the diesel generator building structure component groups.

The applicant proposed to manage loss of material due to general corrosion of structural steel - carbon material for component type of doors/indoor -all: all doors throughout the building exposed to outdoor (external) and indoor -no air conditioning (external) environment using PBNP AMR B2.1.10, “Fire Protection Program.”

The project team reviewed the applicant’s fire protection program and its evaluation is documented in Section 7.1.8 of this report. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material due to general corrosion for components in the diesel generator building structure are effectively managed using the fire protection program. On this basis, the project team finds that management of loss of material due to general corrosion in the diesel generator building structure is acceptable.

7.2.5.3.6 Facade Unit ½ Structure - Summary of Aging Management Evaluation - LRA Table 3.5.2-5

The project team reviewed Table 3.5.2-5 of the LRA, which summarized the results of AMR evaluations for the facade Unit ½ structure component groups.

In Table 3.5.2-5 of the LRA, the applicant stated that the AMRs for the facade Unit ½ structure components are consistent with the GALL Report.

7.2.5.3.7 Primary Auxiliary Building Structure - Summary of Aging Management Evaluation

The project team reviewed Table 3.5.2-6 of the LRA, which summarized the results of AMR evaluations for the primary auxiliary building structure component groups.

The applicant proposed to manage loss of material due to general corrosion and loss of material due to wear of structural steel - carbon material for component type of doors/indoor -all: all doors throughout the building exposed to indoor -no air conditioning (external) environment the using PBNP AMR B2.1.20 , "Structures Monitoring Program," and PBNP AMR B2.1.10, "Fire Protection Program." The project team reviewed the applicant's structures monitoring program and fire protection program and its evaluation is documented in Section 7.1.15 and Section 7.1.8 of this report, respectively.

On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material due to general corrosion and loss of material due to wear for components in the primary auxiliary building structure are effectively managed using the structures monitoring program and fire protection program. On this basis, the project team finds that management of loss of material due to general corrosion and loss of material due to wear in the primary auxiliary building structure is acceptable.

The applicant proposed to manage change in material properties due to elevated temperature, cracking due to elevated temperature, and cracking due to ultraviolet radiation and ozone of elastomer materials for component type of elastomers/indoor - all: rubber sill, sweep -flood doors exposed to indoor -no air conditioning (external) environment using the PBNP AMP B2.1.10 ,"Fire Protection Program."

The project team reviewed the applicant's fire protection program and its evaluation is documented in Section 7.1.8 of this report. The project team finds that elastomers experience changes in material properties and cracking gradually. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that change in material properties due to elevated temperature, cracking due to elevated temperature, and cracking due to ultraviolet radiation and ozone for components in the primary auxiliary building structure are effectively managed using the fire protection program. On this basis, the project team finds that management of change in material properties due to elevated temperature, cracking due to elevated temperature, and cracking due to ultraviolet radiation and ozone in the primary auxiliary building structure is acceptable.

The applicant proposed to manage loss of material due to boric acid wastage of structural steel-carbon material for component types of structural carbon steel fasteners/indoor -all: structural steel framing and structural carbon steel/indoor- all: crane support girders, framing - columns, beams; roof trusses; platforms, and stairs exposed to indoor -no air conditioning (external) environment using PBNP AMP B2.1.6, "Boric Acid Corrosion Program."

The NRR/DE reviewed the applicant's boric acid corrosion program and its evaluation is documented in Section 3.0 of the SER. Predicated on NRR/DE accepting the boric acid

corrosion AMP, review of the applicant's plant specific and industry operating experience, the project team finds that loss of material due to boric acid wastage for components in the primary auxiliary building structure are effectively managed using the boric acid corrosion program. On this basis, the project team finds that management of loss of material due to boric acid wastage in the primary auxiliary building structure is acceptable.

The applicant proposed to manage loss of material due to crevice corrosion, loss of material due to MIC, and loss of material due to pitting corrosion of structural steel - stainless material for component type of structural stainless steel/borated water - all: spent fuel pool (SFP), SFP canal, SFP gates; and structural stainless steel/borated water - all: spent fuel storage racks exposed to treated water - borated , temperature less than 140/F (externa) environment using PBNP AMP B2.1.24, "Water Chemistry Control Program."

The project team reviewed the applicant's water chemistry control program and its evaluation is documented in Section 7.1.17 of this report. The project team finds that use of only the water chemistry control program for loss of materials in treated borated water, temperature less than 140/F of structural steel - stainless material is consistent with the GALL Report Table 2, Items III.A5.2-b and VII.A2.1-c. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material due to crevice corrosion, loss of material due to MIC, and loss of material due to pitting corrosion for components in the primary auxiliary building structure are effectively managed using the boric acid corrosion program. On this basis, the project team finds that management of loss of material due to boric acid wastage in the primary auxiliary building structure is acceptable.

7.2.5.3.8 Turbine Building Unit ½ Structure- Summary of Aging Management Evaluation

The project team reviewed Table 3.5.2-7 of the LRA, which summarized the results of AMR evaluations for the turbine building Unit ½ structure component groups.

In Table 3.5.2-7 of the LRA, the applicant stated that the AMRs for the turbine building Unit ½ structure components are consistent with the GALL Report.

7.2.5.3.9 Yard Structures - Summary of Aging Management Evaluation

The project team reviewed Table 3.5.2-8 of the LRA, which summarized the results of AMR evaluations for the yard structures component groups.

The applicant proposed to manage loss of material due to surface runoff and erosion of earth material for component type of earth berm/outdoor - all: berm around the fuel oil storage tanks exposed to outdoor (external) environment using PBNP AMP B2.1.20, "Structures Monitoring Program."

The project team reviewed the applicant's structures monitoring program and its evaluation is documented in Section 7.1.15 of this report. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material due to surface runoff and erosion for components in the yard structures are effectively managed using the structures monitoring program. On this basis, the project team finds that management of loss of material due to boric acid wastage in the yard structures is acceptable.

The applicant proposed to manage loss of material due to general corrosion and loss of material due to selective leaching of structural cast iron material for component type of structural cast

iron/outdoor -all: manhole frames and covers exposed to outdoor (external) environment using PBNP AMP B2.1.20, “Structures Monitoring Program.”

The project team reviewed the applicant’s structures monitoring program and its evaluation is documented in Section 7.1.15 of this report. The project team finds that loss of material due to general corrosion and loss of material due to selective leaching in manhole covers and frames can gradually occur in outdoor environments but it is not expected to be significant. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material due to general corrosion and loss of material due to selective leaching for components in the yard structures are effectively managed using the structures monitoring program. On this basis, the project team finds that management of loss of material due to general corrosion and loss of material due to selective leaching in the yard structures is acceptable.

7.2.5.3.10 Cranes, Hoists, and Lifting Devices - Summary of Aging Management Evaluation

The project team reviewed Table 3.5.2-9 of the LRA, which summarized the results of AMR evaluations for the cranes, hoists, and lifting devices component groups.

The applicant proposed to manage loss of material due to general corrosion of structural steel - carbon for component type of structural carbon steel/indoor- all: bridge and trolley framing; crane rails, monorails, lifting rigs exposed to an indoor -no air conditioning (external) environment using PBNP AMP B2.1.20, “Structures Monitoring Program.”

The project team reviewed the applicant’s structures monitoring program and its evaluation is documented in Section 7.1.15 of this report. The project team finds that loss of material due to general corrosion are minimal in indoor environments. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material due to general corrosion for components in the cranes, hoists, and lifting devices are effectively managed using the structures monitoring program. On this basis, the project team finds that management of loss of material due to general corrosion in the cranes, hoists, and lifting devices is acceptable.

The applicant proposed to manage loss of material due to crevice corrosion, loss of material due to MIC, and loss of material due to pitting corrosion of structural steel -stainless material for component type of structural stainless steel/borated water - all: RV internals lifting rig exposed to treated water -borated, temperature less than 140/F environment using PBNP AMP B2.1.20, “Structures Monitoring Program.”

The project team reviewed the applicant’s structures monitoring program and its evaluation is documented in Section 7.1.15 of this report. The project team finds that the effects of loss of material of structural steel-stainless material in treated borated water environments is minimal or non-existent. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material due to crevice corrosion, loss of material due to MIC, and loss of material due to pitting corrosion for components in the cranes, hoists, and lifting devices are effectively managed using the structures monitoring program. On this basis, the project team finds that management of loss of material due to crevice corrosion, loss of material due to MIC, and loss of material due to pitting corrosion in the cranes, hoists, and lifting devices is acceptable.

7.2.5.3.11 Component Supports Commodity Group - Summary of Aging Management

Evaluation

The project team reviewed Table 3.5.2-10 of the LRA, which summarized the results of AMR evaluations for the component supports commodity group component groups.

The applicant proposed to manage loss of material due to general corrosion of structural steel - carbon material for component type of structural carbon steel fasteners/indoor-All ASME equipment, ASME pipe supports and restraints; structural carbon steel/indoor -all: ASME pipe supports and restraints, ASME equipment supports exposed to indoor -no air conditioning (external) environment using PBNP AMP B2.1.20, “Structures Monitoring Program.”

The project team reviewed the applicant’s structures monitoring program and its evaluation is documented in Section 7.1.15 of this report. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that loss of material due to general corrosion for components in the component supports commodity group are effectively managed using the structures monitoring program. On this basis, the project team finds that management of loss of material due to general corrosion in the component supports commodity group is acceptable.

7.2.5.3.12 Fire Barrier Commodity Group - Summary of Aging Management Evaluation

The project team reviewed Table 3.5.2-11 of the LRA, which summarized the results of AMR evaluations for the fire barrier commodity group component groups.

The applicant proposed to manage cracking/delamination due to movement, cracking/delamination due to shrinkage, cracking/delamination due to vibration, loss of material due to abrasion, separation due to movement, separation due to shrinkage, and separation due to vibration of calcium silicate board, ceramic fiber, ceramic fiber board, ceramic fiber mat, silicone based materials material for component types of calcium silicate board/ indoor - all: cable trays - fire stop; penetration seals, ceramic fiber- board/indoor - all: cable trays - fire stop; penetration seals, ceramic fiber- board/ indoor - all: penetration seals, ceramic fiber- mat/ indoor - all: cable trays - fire stop, and silicone based material/ indoor - all: sprayed on mastic; cable trays - fire stop; penetration seals; structural fireproofing exposed to indoor -no air conditioning (external) using PBNP AMP B2.1.10, “Fire Protection Program.”

The project team reviewed the applicant’s fire protection system and its evaluation is documented in Section 7.1.8 of this report. On the basis of its review of the applicant’s plant specific and industry operating experience, the project team finds that cracking/delamination due to movement, cracking/delamination due to shrinkage, cracking/delamination due to vibration, loss of material due to abrasion, separation due to movement, separation due to shrinkage, and separation due to vibration for components in the fire barrier commodity group are effectively managed using the fire protection program. On this basis, the project team finds that management of cracking/delamination due to movement, cracking/delamination due to shrinkage, cracking/delamination due to vibration, loss of material due to abrasion, separation due to movement, separation due to shrinkage, and separation due to vibration in the fire barrier commodity group is acceptable.

The applicant proposed to manage loss of material due to general corrosion of structural steel-carbon material for component of structural carbon steel/indoor - all: fire damper frames and cable tray covers exposed to indoor -no air conditioning (external) environment using the PBNP AMP B2.1.10, “Fire Protection Program.”

The project team reviewed the applicant's fire protection system and its evaluation is documented in Section 7.1.8 of this report. On the basis of its review of the applicant's plant specific and industry operating experience, the project team finds that loss of material due to general corrosion for components in the fire barrier commodity group are effectively managed using the fire protection program. On this basis, the project team finds that management of loss of material due to general corrosion in the fire barrier commodity group is acceptable.

7.2.5.3.13 13.8 KV Switchgear Building Structure- Summary of Aging Management Evaluation

The project team reviewed Table 3.5.2-12 of the LRA, which summarized the results of AMR evaluations for the 13.8 KV switchgear building structure component groups.

In Table 3.5.2-12 of the LRA, the applicant stated that the AMRs for the 13.8 KV switchgear building structure components are consistent with the GALL Report.

7.2.5.3.14 Fuel Oil Pumphouse Structure- Summary of Aging Management Evaluation

The project team reviewed Table 3.5.2-13 of the LRA, which summarized the results of AMR evaluations for the fuel oil pumphouse structure component groups.

In Table 3.5.2-13 of the LRA, the applicant stated that the AMRs for the fuel oil pumphouse structure components are consistent with the GALL Report.

7.2.5.3.15 Gas Turbine Building Structure- Summary of Aging Management Evaluation

The project team reviewed Table 3.5.2-14 of the LRA, which summarized the results of AMR evaluations for the gas turbine building structure component groups.

In Table 3.5.2-14 of the LRA, the applicant stated that the AMRs for the gas turbine building structure components are consistent with the GALL Report.

All AMRs in Tables 3.5.2-1 through 3.5.2-14 were evaluated. The project team finds them to be acceptable.

Conclusion. On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving material, environment, aging effect requiring management, and AMP combinations that are not evaluated 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 for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.5.3 Conclusion

On the basis of its review, the project team concludes that the applicant has demonstrated that the aging effects associated with the containments, structures, and component supports components will be adequately managed so that the intended functions will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The project team also reviewed the applicable FSAR supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging of the steam and power conversion systems as required by 10 CFR 54.21(d).

7.2.6 Aging Management of Electrical and Instrumentation and Controls

This section documents the project team's review of the applicant's AMR results for the electrical and instrumentation and controls components and component groups associated with the following system:

- electrical commodity groups

7.2.6.1 Summary of Technical Information in the Application

In LRA Section 3.6, the applicant provided AMR results for the electrical and instrumentation and control components and component groups.

In Table 3.6.1, "Summary of Aging Management Evaluations in Chapter IV of NUREG-1801 for Electrical and Instrumentation and Control," of the LRA, the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the electrical and instrumentation and control components and component groups that are relied on for license renewal. In Section 3.6.2.2 of the LRA, the applicant provided information concerning Table 3.6.1 components for which further evaluation is recommended by the GALL Report.

The applicant's AMRs incorporated applicable operating experience in the determination of aging effects requiring management (AERMs). These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

7.2.6.2 Project Team Evaluation

The project team reviewed LRA Section 3.6 to determine if the applicant provided sufficient information to demonstrate that the effects of aging for the electrical and instrumentation and controls components that are within the scope of license renewal and subject to an AMR will be adequately managed so that the intended functions will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Also, the project team performed an onsite audit of AMRs to confirm the applicant's claim that certain identified AMRs were consistent with the GALL Report. The project team did not repeat its review of the matters described in the GALL Report. However, the project team did verify that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL AMRs. The project team's evaluations of the AMPs are documented in Section 7.1 of this Report. The project team's audit evaluation are documented in its PBNP audit and review report and are summarized in Section 7.2.6.2.1 of this report.

The project team also performed an onsite audit of those selected AMRs that were consistent with the GALL Report and for which further evaluation is recommended. The project team confirmed that the applicant's further evaluations were consistent with the acceptance criteria in Section 3.6.2.2 of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," dated July 2001. The project team's audit evaluation are documented in its PBNP audit and review report and are summarized in Section 7.2.6.2.2 of this report.

The project team performed an onsite audit and conducted a technical review of the remaining AMRs that were not consistent with or not address in the GALL Report. The audit and technical review included evaluating whether all plausible aging effects were identified and the aging effects listed were appropriate for the combination of materials and environments specified. The project team's audit evaluation is documented in its PBNP audit and review report and summarized in Section 7.2.6.2.3 of this report.

Finally, the project team reviewed the AMP summary descriptions in the FSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the electrical and instrumentation and controls components.

7.2.6.2.1 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Not Recommended

Summary of Technical Information in the Application. In Section 3.6.2.1 of the LRA, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects related electrical commodity groups :

- boric acid corrosion program
- cable condition monitoring program
- environmental qualification program

Project Team Evaluation. In Table 3.6.2-1 of the LRA, the applicant provided a summary of AMRs for electrical commodity groups and identified which AMRs it considered to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report does not recommend further evaluation, the project team performed an audit and review to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant provided a note for each AMR line item. The notes described how the information in the tables aligns with the information in the GALL Report. The project team audited those AMRs with Notes A through E, which indicated the AMR was consistent with the GALL Report.

Note A indicated that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the AMP identified in the GALL Report. The project team audited these line items to verify consistency with the GALL Report and the validity of the AMR for the site-specific conditions.

Note B indicated 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 audited these line items to verify consistency with the GALL Report. The project team verified that the identified exceptions to the GALL AMPs had been reviewed and accepted by the project team. The project team also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

Note C indicated 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 is consistent with the AMP identified by the GALL Report. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report. However, the applicant identified a different component in the GALL Report that had the same material, environment, aging effect, and AMP as the component that was under review. The project team audited these line items to verify consistency with the GALL Report. The project team also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicated 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 audited these line items to verify consistency with the GALL Report. The project team verified whether the AMR line item of the different component was applicable to the component under review. The project team verified whether the identified exceptions to the GALL AMPs had been reviewed and accepted by the project team. The project team also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

Note E indicated that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited. The project team audited these line items to verify consistency with the GALL Report. The project team also determined whether the identified AMP would manage the aging effect consistent with the AMP identified by the GALL Report and whether the AMR was valid for the site-specific conditions.

The project team conducted an audit and review of the information provided in the LRA, as documented in its PBNP audit and review report. The project team did not repeat its review of the matters described in the GALL Report. However, the project team did verify that the material presented in the LRA was applicable and that the applicant had identified the appropriate GALL Report AMRs.

The project team reviewed the 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 review, the project team determined that for AMRs not requiring further evaluation, as identified in LRA Table 3.6.1 (Table 1), the applicant’s references to the GALL Report are acceptable and no further project team review is required.

Conclusion. The project team has evaluated the applicant's claim of consistency with the GALL Report. The project team also has reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the project team finds that the AMR results which the applicant claimed to be consistent with the GALL Report, are consistent with the AMRs in the GALL Report. Therefore, the project team finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.6.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In Section 3.6.2.2 of the LRA, the applicant provided further evaluation of aging management as recommended by the GALL Report for electrical commodity groups. The applicant provided information concerning how it will manage the following aging effects:

- electrical equipment subject to environmental qualification

Project Team Evaluation. For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the project team audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues that were further evaluated. In addition, the project team reviewed the applicant's further evaluations against the criteria contained in Section 3.6.3.2 of the SRP-LR.. The project team's evaluation of is discuss below.

7.2.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

PBNP LRA Section 3.6.2.2.1 is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section 4 of the PBNP SER and is reviewed by the NRR DE staff. Therefore, the project team did not review this item.

7.2.6.2.3 AMR Results That Are Not Consistent With or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In Table 3.6.2-1 of the LRA, the project team reviewed additional details of the results of the AMRs for material, environment, aging effect requiring management, and AMP combinations that are not consistent with the GALL Report or are not addressed in the GALL Report.

In Table 3.6.2-1, the applicant indicated, via Notes F through J, that neither the identified component nor the material and environment combination is evaluated in the GALL Report and provided information concerning how the aging effect requiring management will be managed.

Project Team Evaluation. For component type, material and environment combination that are not evaluated in the GALL Report, the project team reviewed the applicant's evaluation to determine whether the applicant had demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained during the period of extended operation.

The project team evaluation is discussed below.

7.2.6.2.3.1 Electrical Commodity Groups - Summary of Aging Management Evaluation - LRA Table 3.6.2-1

The project team reviewed Table 3.6.2-1 of the LRA, which summarized the results of AMR evaluations for the electrical commodity groups component groups.

In LRA Table 3.6.2-1, the applicant identified line items where no aging effects were identified

as a result of the aging review process. Specifically, instances in which the applicant stated that no aging effects were identified when components fabricated from fiberglass, bronze, Noryl, stainless steel, porcelain, silicone, steel, aluminum, copper, exposed to indoor air or fabricated from porcelain or cement exposed to outdoor air. Neither material or environment combination is identified in the GALL Report as an environment for these components and materials. No aging effects are considered to be applicable to the subject material and environmental conditions.

On the basis of its review of current industry research and operating experience, the project team finds that dry air on fiberglass, bronze, Noryl, stainless steel, porcelain, silicone, steel, aluminum, copper, exposed to indoor air or on porcelain or cement exposed to outdoor air will not result in aging that will be of concern during the period of extended operation. Therefore, the project team concludes that there are no applicable aging effects requiring management for these materials exposed to air.

All AMRs in Tables 3.6.2-1 were evaluated. The project team finds them to be acceptable.

Conclusion. On the basis of its review, the project team finds that the applicant appropriately evaluated AMR results involving material, environment, aging effect requiring management, and AMP combinations that are not evaluated 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 for the period of extended operation, as required by 10 CFR 54.21(a)(3).

7.2.6.3 Conclusion

On the basis of its review, the project team concludes that the applicant has demonstrated that the aging effects associated with the electrical and instrumentation and controls components will be adequately managed so that the intended functions will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The project team also reviewed the applicable FSAR supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging of the steam and power conversion systems as required by 10 CFR 54.21(d).

Attachment 1

Abbreviations

ACI	American Concrete Institute
ADAMS	Agencywide Documents Access and Management System
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
CAP	Corrective Action Program
CASS	cast austenitic stainless steel
CC	component cooling
CE	Combustion Engineering
CFR	Code of Federal Regulations
CHAMPS	Computerized History and Maintenance Planning System
CLB	current licensing basis
DE	Division of Engineering
DIPM	Division of Inspection Program Management
ECT	eddy current testing
EDG	emergency diesel generator
EPRI	Electric Power Research Institute
ESF	engineered safety feature
EQ	environmental qualification
F	Fahrenheit
FAC	flow-accelerated corrosion
FAI	Follow-Up Action Item (program)
FSAR	Final Safety Analysis Report
GALL	Generic Aging Lessons Learned
GL	Generic Letter
HX	heat exchanger
I&C	instrumentation and control
IASCC	irradiation-assisted stress corrosion cracking
IGA	intergranular attack
IGSCC	intergranular stress corrosion cracking
IN	Information Notice
ISG	Interim Staff Guidance
ISI	inservice inspection

LER	Licensee Event Report
LRA	License Renewal Application
MIC	microbiologically influenced corrosion
MRP	material reliability program
MRV	maximum required value
NDE	nondestructive examination
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NMC	Nuclear Management Company, LLC
NPS	nominal pipe size
NRC	U.S. Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
NUREG	Nuclear Regulatory Commission technical report
OE	operating experience
ppm	parts per million
PBNP	Point Beach Nuclear Plant
PBNP 1 & 2	Point Beach Units 1 and 2
PLL	predicted lower limit
PSPM	periodic surveillance and preventive maintenance
PWR	pressurized water reactor
PWSCC	primary water stress corrosion cracking
QA	quality assurance
RAI	request for additional information
RCP	reactor coolant pump
RCS	reactor coolant system
RG	Regulatory Guide
RI-ISI	risk-informed inservice inspection
RLEP B	License Renewal and Environmental Impacts Program, Section B
RLSB	License Renewal and Standardization Branch
RVI	reactor vessel internals
SCC	stress corrosion cracking
SC	structures and components
SER	Safety Evaluation Report
SFP	spent fuel pool
SG	steam generator
SRP-LR	Standard Review Plan-License Renewal
SSCs	structures, systems, and components
SW	service water
TLAA	time-limited aging analysis
TRM	Technical Requirements Manual

UFSAR	Updated Final Safety Analysis Report
UT	ultrasonic testing
VAC	volts alternating current
VT	visual testing

Attachment 2

Project Team and Applicant Personnel

Point Beach Nuclear Plant Units 1 & 2 LRA Audit and Review Project Team

Kurt Cozens	NRC, Team Leader
Mark Lintz	NRC, Backup Team Leader
Tom Taylor	PNNL, Project Manager
Steve Gosselin	PNNL
Kent Faris	PNNL
Don Jarrel	PNNL
Peter Penn	PNNL
Brian Tucker	PNNL

Project Team Support

Steve West	NRC/NRR/DRIP/RLEP-B
Michael Morgan	NRC/NRR/DRIP/RLEP-A
Debbie Guha	NRC/NRR/DRIP/RLEP-B
Andrea Currie	PNNL
Jean Cheyney	PNNL
Rose Urbina	PNNL
Barbara Wilson	PNNL
Nancy Maguire-Moffitt	PNNL
Jim Nickolaus	PNNL

Applicant Personnel Contacted

James Knorr
Bill Herrman
Todd Mielke
Mark Ortmayer
John Thorgersen
Brad Fromm
Bill Roman
Steve Schellin

Personnel Who Attended the Public Exit Meeting on July 15, 2004

Wendy Parks	WE Energies
John Thorgerson	NMC/PBNP – LR Project
Kim Duescher	NMC/PBNP – LR Project
Jim Knorr	NMC/PBNP – LR Project
Todd Mielke	NMC/PBNP – LR Project
Bill Herrman	NMC/PBNP – LR Project
Doug Johnson	NMC/PBNP – LR Project

Personnel Who Attended the Public Exit Meeting on July 15, 2004 (contd)

W. B. Fromm	NMC/PBNP – LR Project
James McCarthy	NMC/PBNP – LR Project
Steve Scheller	NMC/PBNP – LR Project
Mark Lintz	NRC/NRR/DRIP/RLEP-B
Brenda Scherwinski	NMC/PBNP – LR Project
Ben Cole	NMC/PBNP – LR Project
Kurt Cozens	NRC/NRR/DRIP/RLEP-B
Steve West	NRC/NRR/DRIP/RLEP-B
Michael Morgan	NRC/NRR/DRIP/RLEP-A
Alvin Chiu	NRC/NRR/DRIP/RLEP-A
Brian Moy	NRC/NRR/DRIP/RLEP-A
Laura Kozak	NRC B Region III

Attachment 3

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.		

Attachment 4

Audit and Review Unresolved Issues and Confirmatory Items

Unresolved issues that could not be resolved at the time this audit and review report was issued are identified below. The unresolved issues are listed in Table 1 to this Attachment.

In addition, resolution of some issues have been discussed with the applicant and a tentatively acceptable verbal response received. Formal response to these tentative answers is needed, at which time the NRC will confirm the acceptability of the applicant's responses. These tentatively accepted issues are listed in Table 2.

An RAI has been issued to the applicant for each of the identified unresolved and confirmatory issues. The applicant's response to each RAI will be assessed by the NRC staff and the staff's disposition of the unresolved issue will be documented in the PBNP final SER related to the PBNP LRA.

Table 1, Unresolved Issues

Unresolved Issue #	Description	RAI #
B2.1	Use as ASME Code relief requests as basis for AMP these exceptions.	B2.1
3.3-7	LRA Table 3.3.2-2 (Page 3-221), the applicant proposed to manage cracking due to IGA/IGSCC of stainless steel in heat exchanges exposed to primary treated water with T>480^{o}F (internal) using only the Water Chemistry Control Program. That the applicant was requested to provide clarification why an inspection was not performed to verify the effectiveness of the water chemistry program.	3.3-7

Table 2, Confirmatory Items

Confirmatory Item	Description
Table 3.1.1-1	Aging management of thermal aging of CASS using LBB is in appropriate. The GALL Report identifies acceptable methods as flaw tolerance or enhanced volumetric inspection. The applicant has agreed to use the flaw tolerance method.
3.1.1-2.	The feedwater delivery to the steam generators at PBNP is through feed rings to J-tubes. The LRA stated that the feed rings and J-tubes perform no license renewal intended function. The project team verified through discussions with the applicant's technical project team that the J-tubes perform no license renewal function and that the applicant does not have any components for which this aging effect needs to be managed. Staff questioned the applicant in to provide a better justification. The applicant has agreed to put the feed rings and J-tubes into the scope of license renewal and mange the aging effect of cracking and erosion. This is confirmatory item RAI 3.1.1-2. Based on the conformity item this staff finds this acceptable.
3.5-12	The Fatigue TLAA does not detect and manage cracking due to cyclic loading. Therefore, PBNP was requested to provide further clarification for crediting Item 3.5.1-01/II.A3.1-b to manage cracking due to cyclic loading. The applicant pointed out that GALL only requires either a TLAA or an inspection. Staff acknowledges the GALL position and awaits the RAI response.
3.5-13	Subsequent to the audit, the project team requested that the applicant proved additional clarification on how it explicitly satisfies all parameters of ISG-03. The applicant verbally explained how it satisfies ISG-03 and agreed to proved a table with detailing additional locations in its program which demonstrate how it satisfied ISG-03.
3.5-14	The presence and aging management of SSC in high strength bolting and the presence of torqued high strength bolting. The applicant has verbally agreed that PBNP has these high strength bolts which are torques and agreed to amend its LRA to identify and manage these bolts. The applicant also identified a similar RAI B2.1.4-3 which addressed the same issue. The project team reviewed this RAI and concurred that it acceptable addressed the question.

B2.1.11-1	In the PBNP LRA AMP B2.1.11 it states that if the minimum measured thickness is less than 70% of pipe nominal wall thickness, the sample size must be expanded. RAI B2.1.11-1 was issued to obtain additional information concerning the methodology of determining minimum all and how the applicant will be making its determination. The applicant clarified that it uses ASME guidance to determine minimum wall and how it determines when to expand its sample. The staff found this explanation satisfactory.

Attachment 5

Documentation Reviewed

The following is a list of documents examined by the project team during the audit and review of the Point Beach Nuclear Plant aging management programs. The list includes applicant documents, documents prepared by others for the applicant, and documents from the open literature and public domain.

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.

Source documents generic to the overall PBNP audit and review—that is, those documents not specific to a particular aging management program—included

- Title 10 of the *Code of Federal Regulations*, Part 54 (10 CFR Part 54), "Requirements for Renewal of Operating Licenses for Nuclear Power Plants"

- NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants* (SRP-LR), dated July 2001

- NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, dated July 2001

- "Audit and Review Plan for Plant Aging Management Reviews and Programs - Point Beach Nuclear Plant Units 1 and 2," Docket No. 50-266 and Docket No. 50-301 (ML041550860)

- Letter dated February 25, 2004, from Gary D. Middlesworth (NMC) to the NRC, "Application for Renewed Operating License" (ML040580023)

- Letter dated July 12, 2004, from Dennis L. Koel (NMC) to Document Control Desk (NRC), "Clarifications to Point Beach Nuclear Plant License Renewal Application Information As a Result of Aging Management Program and Aging Management Review Audits of April and June 2004" (ML041960159).

Source documents specific to the reviews of individual aging management programs are tabulated by AMP on the following pages.

Applicant's Aging Management Program	GALL Aging Management Program	LRA AMP Basis Document and Other Documents Reviewed
ASME, Section XI, IWB, IWC & IWD (B2.1.1)	XI.M1, XI.M3	L. Raghavan (NRC) to Alfred Cayia (NMC), "Evaluation of Relief Request No. 8 Use of Code Case –624, "Successive Inspections" (TAC Nos. MB5405 and MB5406)," dated March 21,2003 (ML02254109) L. Raghavan (NRC) to Alfred Cayia (NMC) "Issuance of Relief Request No. 10 Alternative to Examine All Three Vessels of the Regenerative Heat Exchanger (TAC Nos. MB5401 and MB5402)", dated February 27,2003 (ML030210126) Beth Wetzel (NRC) to Mark Reddeman (NMC) "Relief Requests RR 1-24 (Unit 1) and RR-2-30 (Unit 2) RE: Use of ASME Code, Section XI, 1998 Edition with Addenda through 2000 (TAC Nos. MB2230 and MB2231)", dated November 6, 2001 (ML012750370) RC Docket Nos. 50-266 and 50-301, Letter from NRC to PBNP, July 2, 2003 "Point Beach Nuclear Power Plant, Units 1 & 2 - Evaluation of Risk Informed Inservice Inspection Program (TAC Nos. MB5553 and MB5554) (ML030210167) L. Raghavan (NRC) to Alfred Cayia (NMC) "Relief Request 5 regarding Visual Examination of insulated Bolting on Borated Systems (TAC Nos. MB5411 and MB5412)", dated October 8, 2002 (ML022530006) L. Raghavan (NRC) to Alfred Cayia (NMC) "Relief Request 6 regarding Evaluation of Leakage with Bolting in Place (TAC Nos. MB5409 and MB5410)", dated October 8, 2002 (ML022530023) L. Raghavan (NRC) to Alfred Cayia (NMC) "Relief Request No. 7 Use of code Case –616 Alternative Visual Examination and Method on Bolted Connections (TAC Nos. MB5407 and MB5408)", dated March 6,2003 (ML022530134) L. Raghavan (NRC) to Alfred Cayia (NMC) "Relief Request No. 9 Associated with the 10-year Interval Inservice Inspection Program (TAC Nos. MB5403 and MB5404)", dated March 21,2003 (ML030620328) L. Raghavan (NRC) to Alfred Cayia (NMC) "Evaluation of Relief Request No. 11 Associated with Emergency Diesel System VT-2 examinations for the Fourth 10-year Interval (TAC Nos. MB5399 and MB5400)", dated March 21, 2003 (ML022540109) License Renewal Basis Document LR-AMP-017-IWBCD, Revision 2 Dated 03/26/2004

Applicant's Aging Management Program	GALL Aging Management Program	LRA AMP Basis Document and Other Documents Reviewed
ASME, Section XI, IWE and IWL (B2.1.2)	XI.S1 XI.S2 XI.S4	ASME Section XI, Subsections IWE & IWL Inservice Inspection Program Basis Document for License Renewal, LR-AMP-028-IWEL, Revision 2 Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Containment Inservice Inspection Program, Docket Nos. 50-266 and 50-301, Relief Request LRR-2 (ML011220349) PBNP Final Safety Analysis Report (FSAR), Volume 3, Chapter 5, Section 5.6.1.4 "Post Tensioning System", dated June 2002 Letter from D. E. Cole (NMC) to Document Control Desk (NRC), dated November 2, 2000, "ASME Section XI, Subsection IWE/IWL Containment Inspection Relief Requests, Point Beach Nuclear Plant, Units 1 and 2" (ML003767196) Letter from Claudia M. Craig (NRC) to Mark Reddemann (NMC), dated May 2, 2001, "Safety Evaluation for Proposed Alternative to ASME Code, Section XI, Containment Inspection Program for the Point Beach Nuclear Plant, Units 1 and 2" (ML011220349) Letter from Claudia M. Craig (NRC) to Mark Reddemann (NMC), dated September 14, 2001, "Point Beach Nuclear Plant, Unit 1 and 2 - Safety Evaluation For Relief Requests for the Containment Inspection Program" (ML012390329) Letter from Thomas J. Webb to NRC, dated April 10, 2001, "ASME Section XI Relief Request LRR-2 Point Beach Nuclear Plant, Units 1 and 2" (ML011070389) Letter from Mark P. Findlay to Document Control Desk (NRC), dated June 29, 1999, "Dockets 50-266 AND 50-301 Reselection of Control Tendons in the Point Beach Nuclear Plant, Units 1 and 2" NRC Information Notice 85-10: Posttensioned Containment Tendon Anchor Head Failure, dated February 6, 1985 (ML031180645)

Applicant's Aging Management Program	GALL Aging Management Program	LRA AMP Basis Document and Other Documents Reviewed
		NRC Information Notice 97-10, Liner Plate Corrosion in Concrete Containments, dated March 13, 1997 (ML031050365) NRC Information Notice 99-10: Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments, dated April 13, 1999 (ML031040458) ACI (American Concrete Institute) 201.1R-68, "Guide for Making a Condition Survey of Concrete in Service" ACI (American Concrete Institute) 201.1R-77, "Guide for Making a Condition Survey of Concrete in Service"
ASME, Section XI, IWF (B2.1.3)	XI.S3	ASME, Section XI, IWF License Renewal Basis Document LR-AMP-027-IWF, Revision 2, 4/14/2004 Beth Wetzel (NRC) to Mark Reddeman (NMC) "Relief Requests RR 1-24 (Unit 1) and RR-2-30 (Unit 2) RE: Use of ASME Code, Section XI, 1998 Edition with Addenda through 2000 (TAC Nos. MB2230 and MB2231)", dated November 6, 2001 (ML012750370) L. Raghavan (NRC) to Alfred Cayia (NMC), "Evaluation of Relief Request No. 8 Use of Code Case –624, "Successive Inspections" (TAC Nos. MB5405 and MB5406)", dated March 21,2003 (ML02254109)

Applicant's Aging Management Program	GALL Aging Management Program	LRA AMP Basis Document and Other Documents Reviewed
Bolting Integrity Program (B2.1.4)	XI.M18	Evaluated by NRC Office of Nuclear Reactor Regulation, Division of Engineering
Boraflex Monitoring Program (B2.1.5)	XI.M22	IN 87-43, "Gaps in Neutron-Absorbing Material in High-Density Spent Fuel Storage Racks", September 1987 IN 93-70, "Degradation of Boraflex Neutron Absorber Coupons", October 1993 IN 95-38, "Degradation of Boraflex Neutron Absorber in Spent Fuel Storage Racks", September 1995 GL 96-04, "Boraflex Degradation in Spent Fuel Pool Storage Racks" Point Beach Nuclear Plant, Units 1 and 2, Dockets 50-266 and 50-301, January 1996 NRC-36555 "Safety Evaluation by the Office of Nuclear Reactor Regulation Related to the Proposed Boraflex Monitoring Program, Point Beach Nuclear Plant, Unit 1 and 2 Dockets 50-266 and 50-301" 2/21/1990 EPRI TR-10861 "A Synopsis of the Technology Developed to Address the Boraflex Degradation Issue" Final Report, Nov 1997.
Boric Acid Corrosion Program (B2.1.6)	XI.M10	Evaluated by NRC Office of Nuclear Reactor Regulation, Division of Engineering
Buried Services Monitoring Program (B2.1.7)	XI.M34	Buried Services Monitoring Program Basis Document for License Renewal, LR-AMP-018-BSMON, Revision 2, 4/14/2004

Applicant's Aging Management Program	GALL Aging Management Program	LRA AMP Basis Document and Other Documents Reviewed
Cable Conditioning Monitoring Program (B2.1.8)	XI.E1, XI.E2, XI.E3	Cable Condition Monitoring Program Basis Document for License Renewal LR-AMP-014-CCMON, Revision 2, 12/18/03. Gazdzinski R.F., W.M. Denny, and R. Butwin. September 1996. *Aging Management Guideline for Commercial Nuclear Power Plants - Electrical Cable and Terminations*. SAND-96-0344, Sandia National Laboratories, Albuquerque, New Mexico. Addendum/Corrections to Text in SAND-96-0344 Concerning Thermal Life of Polyvinyl Chloride Insulation, June 2002. Interim Staff Guidance (ISG)-5 on the Identification and Treatment of Electrical Fuse Holders for License Renewal (ML030690512) Final Determination -3/10/2003. PB Aging Management Review for Electric Commodities, Revision 0, 02/25/04 NUREG-1785, *Safety Evaluation Report - Related to the License Renewal of the H. B. Robinson Steam Electric Plant, Unit 2*, March 2004 NUREG-1787, *Safety Evaluation Report - Related to the License Renewal of the Virgil C. Summer Nuclear Station,* March 2004
Closed-Cycle Cooling Water Surveillance Program (B2.1.9)	XI.M21	LR-AMP-023-CCW, Closed Cycle Cooling Water Surveillance Program Basis document for License Renewal, Revision 2, 4/14/2004 NP3.2.2, Primary Water Chemistry Monitoring Program (Reference 9.4), section 4.9, CCW (All Status Modes), Page 19 CAMP 101, Daily Routine Sampling Schedule for Operationing, Refueling, or Shutdown Units (Ref 9.5)

Applicant's Aging Management Program	GALL Aging Management Program	LRA AMP Basis Document and Other Documents Reviewed
		EPRI TR 107396, Closed Cooling Water Chemistry Guideline, October 1997 LRPG 1-3 Operating Experience Data Collection, Revision 6, 10/20/2003 (Procedure) 1-PT-CC-1, Component Cooling Water System Pressure Test - Inside/Outside containment Unit 1, Revision 4, 9/04/2002 Pressure Test Program, Revision 8, 12/17/2001- EDMS: controlled reference records PC29, Monthly Gas Turbine and Auxiliary Diesel Load Test, Revision 36, 4/10/2003
Fire Protection Program (B2.1.10)	XI.M26, XI.M27	License Renewal Aging Management Program Basis Document LR-AMP-010-FP, Revision 1, 4/14/2004 Interim Staff Guidance (ISG-04): Aging Management of Fire Protection Systems for License Renewal, 12/03/2002 Proposed Interim Staff Guidance (ISG) on Identification and Treatment of Housing for Active Components for License Renewal, 4/08/2003 MI031010423 RMP 9011-1, Revision 4, Safe Shutdown Fire Door Inspections 01/14/2004 RMP 9011-2, Revision 2, Industrial Fire Door Inspections, 03/05/2003 RMP 9057, Revision 3, Fire Barrier Penetration Fire Seal Surveillance, 01/07/2004 RMP 58, Revision 6, Containment Fire Seal and Conduit Wrapping Inspection, Unit 1, 03/17/2004 RMP 59, Revision 6, Containment Fire Seal and conduit Wrapping Inspection, Unit 2, 07/09/2003
Flow-Accelerated Program (B2.1.11)	XI.M17	NP7.7.23, Flow Accelerated Corrosion Inspection Program Basis Document, Revision 1, 2/18/2004 LR-AMP-009-FAC Flow Accelerated Corrosion Program Basis Document for License Renewal, Revision 3, 4/14/2004
Fuel Oil Chemistry Control	XI.M30	LR-AMP-002-FOCHEM, Fuel Oil Chemistry Control Program Basis Documents for License

Applicant's Aging Management Program	GALL Aging Management Program	LRA AMP Basis Document and Other Documents Reviewed
Program (B2.1.12)		Renewal, Revision 2, 4/5/2004 Technical Requirements Manual, TRM 4.12, Diesel Fuel Oil, Revision 2, 9/5/2003 LR-AMP-024-OTINSP, One-Time Inspection Program Basis Document for License Renewal, Revision 2, 4/14/2004 TS-80, Sampling of Emergency Fuel Oil Tanks (Quarterly), Revision 15, 6/3/2002 LR-AMP-004-PSPM, Periodic Surveillance and Preventative Maintenance Program Basis Document for License Renewal, Revision 2, 4/14/2004 NP 5.3.1, Action Request Process, Revision 22, October 29, 2003 OI 92A, Fuel Oil Ordering, Receipt, Sampling and T-173 Fill Tank Draining, Revision 11, 2/5/2004 Point Beach Nuclear Plant Technical Requirements Manual, Revision 22, 4/16/2004 ASTM D6217-98, Designation 415/98- Standard test method for particulate contamination ASTM D2276-93, Designation 216/85 (87) - Creep properties of adhesives in shear by tension loading ASTM D2276-91, Designation 216/71 (79) - Fabrication of ring test specimens for glass resin composites ASTM D2276-87, Designation 216/71 (79) - Records: Particulate contaminant in Aviation Turbine Fuels ASTM D2709-88-Records: Water & Sediment in Distillate Fuels by centrifuge ASTM D2707-96- (Discontinued in 1989) Test method for hard rubber in tension ASTM D1796-97, Designation MPMS Chapter 10.6- Standard test method for water & sediment

Applicant's Aging Management Program	GALL Aging Management Program	LRA AMP Basis Document and Other Documents Reviewed
		in fuel oils ASTM D4057-88, Designation MPMS (Chapter 8.1) - Records: manual sampling of petroleum & petroleum products ASTM D4057-81, Designation MPMS (Chapter 8.1) - Records: manual sampling of petroleum & petroleum products ASTM D96-88 (Reapproved 1998), Designation MPMS Chapter 10.4 - Standard test methods for water & sediment in crude oil

Applicant's Aging Management Program	GALL Aging Management Program	LRA AMP Basis Document and Other Documents Reviewed
One-Time Inspection Program (B2.1.13)	XI.M32, XI.M33	LR-AMP-024-OTINSP, One-Time Inspection Program Basis Document for License Renewal, Revision 2, 4/14/2004 LPRG 1-3, Operating Experience Data Collection, Revision 6, 10/20/2003 LR-AMP-001-WCHEM, Water Chemistry Control Program Basis Document for License Renewal, Revision 2, 4/14/2004 LR-AMP-002-FOCHEM, Fuel Oil Chemistry Control Program Basis Document for License Renewal, Revision 2, 4/14/2004 LR-AMP-015-RVINT, Reactor Vessel Internals Program Basis Document for License Renewal, Revision 2, 4/14/2004 LR-AMP-023-CCCW, Closed Cycle Cooling Water System Surveillance Program Basis Document for License Renewal, Revision 2, 4/14/2004 LR-AMP-017-IWBCD, ASME Section XI, Subsection IWB, IWC and IWD Inservice Inspection Program Basis Document for License Renewal, Revision 2, 4/14/2004 LR-AMP-004-PSPM, Periodic Surveillance and Preventative Maintenance Program Basis Document for License Renewal NP 5.3.1, Action Request Process, Revision 22, October 29,2003 NRC Docket Nos. 50-266 and 50-301, Letter from NRC to PBNP, July 2, 2003 "Point Beach Nuclear Power Plant, Units 1 &2 - Evaluation of Risk Informed Inservice Inspection Program (TAC Nos. MB5553 and MB5554) (ML030210167)- EDMS: regulatory records SER 2003-0009
Open-Cycle Cooling (Service) Water Surveillance Program (B2.1.14)	XI.M20	LR-AMP-021-OCCW Open Cycle Cooling (Service) Water System Surveillance Program Basis Document for License Renewal, Revision 2, 4/14/2004 "Generic Letter 89-13 Program", Revision 3, ½9/2004
Periodic Surveillance and Preventive Maintenance Program (B2.1.15)	Plant-Specific	"License Renewal Aging Management Program Basis Document," LR-AMP-004-PSPM, Revision 2, April 14, 2004

Applicant's Aging Management Program	GALL Aging Management Program	LRA AMP Basis Document and Other Documents Reviewed
Reactor Coolant System Alloy 600 Program (B2.1.16)	XI.M11	Evaluated by NRC Office of Nuclear Reactor Regulation, Division of Engineering
Reactor Vessel Internals Program (B2.1.17)	XI.M13 XI.M16	"Reactor Vessel Internals Program Basis Document for License Renewal," LR-AMP-015-RVINT, April 14, 2004
Reactor Vessel Surveillance Program (B2.1.18)	XI.M31	Evaluated by NRC Office of Nuclear Reactor Regulation, Division of Engineering
Steam Generator Integrity Program (B2.1.19)	XI.M19	Evaluated by NRC Office of Nuclear Reactor Regulation, Division of Engineering
Structures Monitoring Program (B2.1.20)	XI.M23 XI.S5 XI.S6 XI.S7	NP 7.7.9 Facilities Monitoring Program, Revision 3, June 18, 2003 "Structures Monitoring Program Basis Document for License Renewal," LR-AMP-022-STRMON, Revision 2 PBNP Corrective Action Program, CAP 51854, Unit 2 Main Steam Line Containment Penetration Concrete Temperature Above FSAR Specified Allowable, November 15, 2003 EPRI TR-103842, Class 1 Structures License Renewal Industry Report, Revision 1, July 1994 American Concrete Institute Standard ACI 201.2R-77." Guide to Durable Concrete," 1977

Applicant's Aging Management Program	GALL Aging Management Program	LRA AMP Basis Document and Other Documents Reviewed
Systems Monitoring Program (B2.1.21)	XI.M29	NRC Information Notice 86-99, Degradation of Steel Containments, U.S. Nuclear Regulatory Commission, December 8, 1986 NRC Information Notice 86-99, Supplement 1, Degradation of Steel Containments, U.S. Nuclear Regulatory Commission, February 14, 1991 NRC Information Notice 89-79, Degraded Coatings and Corrosion of Steel Containment Vessel, U.S. Nuclear Regulatory Commission, December 1, 1989 NRC Information Notice 89-79, Supplement 1, Degraded Coatings and Corrosion of Steel Containment Vessel, U.S. Nuclear Regulatory Commission, June 29, 1990 Systems Monitoring Program Basis Document for License Renewal, LR-AMP-007-SYSMON, Revision 1, 12/08/03 Tank Internal Inspection Program Basis Document LR-AMP-019-TNKINT, Revision 2, 4/04/2004 Procedure: Sampling of Emergency Fuel Oil Tanks (TS 80 Revision15, 01/2002)- EDMS: procedures TS 80
Tank Internal Inspection Program (B2.1.22)	Plant-Specific	Evaluated by NRC Office of Nuclear Reactor Regulation, Division of Engineering
Thimble Tube Inspection Program (B2.1.23)	Plant-Specific	Evaluated by NRC Office of Nuclear Reactor Regulation, Division of Engineering

Applicant's Aging Management Program	GALL Aging Management Program	LRA AMP Basis Document and Other Documents Reviewed
Water Chemistry Control Program (B2.1.24)	XI.M2	LR-AMP-001-WCHEM. Water Chemistry Control Program Basis Document, Revision 2, 4/14/2004. NP 3.2.2 Primary Water Chemistry Monitoring Program Revision11 8/13/03 NP 3.2.3 Secondary Water Chemistry Monitoring Program Revision15 8/13/03 Point Beach Nuclear Power Plant Technical Requirements Manual - Secondary Water Chemistry - TRM 4.9 Revision1 January 17,2003 Point Beach Technical Specifications 5.5.9 Secondary Water Chemistry Program, (Unit 1 Amendment No. 201 and Unit 2 Amendment No. 206)
Environmental Qualification Program (B3.1)	X.S1	LR-AMP-012-EQ, Environmental Qualification Program Basis Document for License Renewal, Revision 2, 04/14/04. NUREG-1786, *Safety Evaluation Report - Related to the License Renewal of the R. E. Ginna Nuclear Power Plant*, May 2004 - Section 4.4, Environmental Qualification of Electrical Equipment (ML041400502 NRC Bulletin 1979-001B: Environmental Qualification of Class 1E Equipment, January 14, 1980 (ML031210320) Generic Issue 168: Environmental Qualification of Electrical Equipment (Revision 2) NUREG-0933 Section 3 issue 168
Fatigue Monitoring Program (B3.2)	X.M1	"Fatigue Monitoring Program Basis Document for License Renewal, LR-AMP-025-FATMON, Revision 2, 4/14/2004

Applicant's Aging Management Program	GALL Aging Management Program	LRA AMP Basis Document and Other Documents Reviewed
Pre-Stressed Concrete Containment Tendon Surveillance Program (B3.3)	X.E1	Pre-stressed Concrete Containment Tendon Surveillance Program Basis Document for License Renewal, LR-AMP-031-TENDON, Revision 2 PBNP Final Safety Analysis Report (FSAR), Volume 3, Chapter 5, Section 5.6.1.4, "Post Tensioning System", dated June 2002 Controlled Reference (Internal) ISI IWL Program, IWL Containment Inspection Program, Revision 1, October 25, 2002. PBNP Technical Specifications, Docket No. 50-266. Letter from Mark P. Findlay to NRC Document Control Desk, dated June 29, 1999, "DOCKETS 50-266 AND 50-301 RESELECTION OF CONTROL TENDONS IN THE POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2" Calculation Document Form (Internal), 2000-0056, "Tendon Prestress Acceptance Limits", Received December 5, 2000.

Attachment 6

List of Commitments
To Be Included in Appendix A of the Safety Evaluation Report

The following tables summarize those actions committed to by Nuclear Management Company, LLC, with respect to its license renewal application. Implementation of these commitments will afford Point Beach Nuclear Plant staff guidance in managing aging effects.

The commitments listed in Table A.6-1 are documented in a letter dated February 25, 2004, from Gary Van Middlesworth (NMC) to the NRC, "Application for Renewed Operating License" (ML040580023).

Table A.6-1. Nuclear Management Company Commitments Enclosed with PNBP License Renewal Application

	Commitment	FSAR Section	Due Date or Frequency	Source
1	A License Renewal flag for each component will be maintained as part of the equipment information database.	1.4	Prior to the period of extended operation	LRA (License Renewal Application) Section 1.0
2	RI ISI Program inspections of piping welds less than 4-inch NPS will include volumetric examinations for non-socket welds and surface examination for socket welds.	N/A	Continue as part of RI ISI	LRA (License Renewal Application) Section 2.1.1.3.8, 3.1 and Table 3.1.0-1
3	Chemical analyses of the soil, groundwater, and lake water will be performed to ensure the below-grade environment remains chemically non-aggressive.	N/A	Prior to the period of extended operation	LRA (License Renewal Application) Section 3.0.1.9
4	All concrete/grout at Point Beach that is within the scope of license renewal, will be managed for aging.	N/A	Prior to the period of extended operation	LRA (License Renewal Application) Section 3.0.1.9
5	Point Beach will continue to monitor and participate in industry initiatives with regard to baffle/former and barrel/ former bolt performance to support aging management for the Unit 1 bolting.	N/A	Prior to the period of extended operation	LRA (License Renewal Application) Section 3.1.2.2.3.3 and 3.1.2.2.8 and Table 3.1.0-2

	Commitment	FSAR Section	Due Date or Frequency	Source
6	PBNP will continue to participate in industry investigations of aging effects applicable to reactor vessel internals. Aging management activities or surveillance techniques resulting from these initiatives will be incorporated, as required, as enhancements to the Reactor Vessel Internals Program.	N/A	Prior to the period of extended operation	LRA (License Renewal Application) Section 3.1.2.2.6 and 3.1.2.2.9
7	PBNP will incorporate applicable results of industry initiatives related to void swelling in the Reactor Vessel Internals Program.	N/A	Prior to the period of extended operation	LRA (License Renewal Application) Section 3.1.2.2.6 and 3.1.2.2.9
8	Plant process control procedures (design control, repair/-replacement, and welding) will be revised to ensure that repair or replacement of Class 1 piping components within the scope of LBB analysis (welded connections or cast austenitic stainless steel) would require a new LBB analysis based on replacement process and/or material properties. Updated per July 12, 2004, letter, audit item 67.	N/A	Prior to the period of extended operation	LRA (License Renewal Application) Section Table 3.1.0-1
9	PBNP will implement the NRC approved industry activities resulting from the MRP, as appropriate, to manage any applicable aging effects identified through the EPRI MRP effort (RVI Related).	N/A	Prior to the period of extended operation	LRA (License Renewal Application) Section Table 3.1.0-2

10	The Periodic Surveillance and Preventive Maintenance Program will be used to replace the program designated bolting.	N/A	Prior to the period of extended operation	LRA (License Renewal Application) Tables 3.1.2-1 through 3.1.2-6, Tables 3.2.2-1 through 3.2.2-4, Tables 3.3.3.-1 through 3.3.3-16, Tables 3.4.2-1 through 3.4.2-1, and Tables 3.5.2-1 through 3.5.2-14
11	The integrity of the RPV will be directly validated with the testing of the capsule installed on Unit 2 in 2002, should extended operation be considered.	N/A	When fluence levels reach those anticipated for the end of the renewed license period	LRA (License Renewal Application) Section 4.1.2
12	Capsule A2 (Unit 1) will be removed at a target EOLE fluence of 3.7×10^{19} n/cm^2.	N/A	Removal at Fluence described	LRA Section 4.2
13	The upper shelf energy evaluation will be revised prior to entering into the extended period of operation.	N/A	Prior to the period of extended operation	LRA Section 4.2
14	Implement an enhanced ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program.	15.2.1 ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.1
15	Implement an enhanced ASME Section XI, Subsections IWE and IWL Inservice Inspection Program.	15.2.2 ASME Section XI, Subsections IWE & IWL Inservice Inspection Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.2

16	Implement an enhanced ASME Section XI, Subsections IWF Inservice Inspection Program.	15.2.3 Subsections IWF Inservice Inspection Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.3
17	Implement an enhanced Bolting Integrity Program.	15.2.4 Bolting Integrity Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.4
18	Implement an enhanced Boraflex Monitoring Program. Updated per July 12, 2004, letter, audit item 66.	15.2.5 Boraflex Monitoring Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.5
19	Implement an enhanced Boric Acid Corrosion Program.	15.2.6 Boric Acid Corrosion Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.6
20	Develop and implement a Buried Services Monitoring Program. Updated per July 12, 2004, letter, audit item 107.	15.2.7 Buried Services Monitoring Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.7
21	Develop and implement a Cable Condition Monitoring Program. Updated per July 12, 2004, letter, audit item 119.	15.2.8 Cable Condition Monitoring Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.8
22	Implement an enhanced Closed-Cycle Cooling Water System Surveillance Program.	15.2.9 Closed-Cycle Cooling Water System Surveillance Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.9

23	Implement an enhanced Fire Protection Program.	15.2.10 Fire Protection Program	Prior to the period of extended operation In case of the sprinkler heads, they will be inspected prior to exceeding their 50-year service life.	LRA Appendix A and Appendix B2.1.10
24	Implement and enhanced Flow Accelerated Corrosion Program.	15.2.11 Flow Accelerated Corrosion Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.11
25	Implement an enhanced Fuel Oil Chemistry Control Program.	15.2.12 Fuel Oil Chemistry Control Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.12
26	Develop and implement a One-Time Inspection Program. Updated per July 12, 2004, letter, audit item 147.	15.2.13 One-Time Inspection Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.13
27	Implement and enhanced Open-Cycle Cooling (Service) Water System Surveillance Program.	15.2.14 Open-Cycle Cooling (Service) Water System Surveillance Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.14

28	Implement an enhanced Periodic Surveillance and Preventive Maintenance Program. Updated per July 12, 2004, letter, audit item 134.	15.2.15 Periodic Surveillance and Preventive Maintenance Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.15
29	Develop and implement a Reactor Coolant System Alloy 600 Inspection Program.	15.2.16 Reactor Coolant System Alloy 600 Inspection Program	Completion will be consistent with the commit-ments made in the response to NRC Bulletin 2002-02 and the requirements of NRC Order EA-03-00 9	LRA Appendix A and Appendix B2.1.16
30	Implement an enhanced Reactor Vessel Internals Program. Updated per July 12, 2004, letter, audit item 85.	15.2.17 Reactor Vessel Internals Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.17
31	Implement an enhanced Reactor Vessel Surveillance Program.	15.2.18 Reactor Vessel Surveillance Program	Implement prior to the need to assess condition of surveillance capsule	LRA Appendix A and Appendix B2.1.18
32	Implement an enhanced Steam Generator Integrity Program.	15.2.19 Steam Generator Integrity Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.19
33	Implement an enhanced Structures Monitoring Program. Updated per July 12, 2004, letter, audit items 111 and 112.	15.2.20 Structures Monitoring Program	Prior to the period of extended operation	LRA Table 3.5.0-1 Line 8, and Appendix B2.1.20

34	Implement an enhanced Systems Monitoring Program.	15.2.21 Systems Monitoring Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.21
35	Develop and implement a Tank Internal Inspection Program.	15.2.22 Tank Internal Inspection Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.22
36	Implement an enhanced Thimble Tube Inspection Program.	15.2.23 Thimble Tube Inspection Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.23
37	Implement an enhanced Water Chemistry Control Program.	15.2.24 Water Chemistry Control Program	Prior to the period of extended operation	LRA Appendix A and Appendix B2.1.24
38	Implement an enhanced EQ Program	15.3.2 EQ Program	Prior to the period of extended operation	LRA Appendix A and Appendix B3.1
39	Implement an enhanced Fatigue Monitoring Program.	15.3.3 Fatigue Monitoring Program	Prior to the period of extended operation	LRA Appendix A, Table 3.1.0-2 Line 11 and Appendix B3.2
40	Implement an enhanced Pre-Stressed Concrete Containment Tendon Surveillance Program.	15.3.1 Pre-Stressed Concrete Containment Tendon Surveillance Program	Prior to the period of extended operation	LRA Appendix A and Appendix B3.3

Commitments made by Nuclear Management Company, LLC, in response to the project team site visits are documented in a letter dated July 12, 2004, from Dennis L. Koehl (NMC) to the Document Control Desk (NRC), “Clarifications to Point Beach Nuclear Plant License Renewal Application Information As a Result of Aging Management Program and Aging Management Review Audits of April and June 2004" (ML041960159). Those updated commitments are discussed in detail in the July 12 letter and summarized in Table A.6-2.

Table A.6-2. Nuclear Management Company Commitments in Response to AMP and AMR Audits

Audit Item No.	Commitment	Due Date or Frequency
66	Provide additional sub-criticality detail in the Boraflex Monitoring Program description in Appendix B of annual update to the LRA.	2005 LRA annual update
67	Add appropriate references to Section 4.4.3 and/or 4.4.4 in. Appendix B to the LRA to indicate where the reviewer can find the analysis that PBNP conducted for Cast Austenitic Stainless Steel.	2005 LRA annual update
85	A Reactor Vessel Internals Program will be submitted to the NRC for review and approval.	Two years prior to the period of extended operation
107	The Buried Services Monitoring Program, Parameters Monitored or Inspected section will include if there are any indications of selective leaching or if the condition is indeterminate, then a hardness test will be performed.	2005 LRA annual update
111	The Structures Monitoring Program, Scope of Program section will be revised to add more detail to specifically describe overhead crane locations in the program scope.	2005 LRA annual update
112	The steel edge supports and bracing for the masonry wall description will be added to the Structures Monitoring Program, Scope of Program.	2005 LRA annual update
119	Additional detail on recent cable testing and manufacturer's recommended testing will be added to the Cable Condition Monitoring Program Aging Management Program description in the LRA and/or the program basis document as appropriate. Add trending of test results to the Cable Condition Monitoring Program Aging Management Program description in the LRA and/or the program basis document as appropriate. The first Cable Condition Monitoring Program testing is to be completed prior to the period of extended operation.	2005 LRA annual update 2005 LRA annual update Prior to the period of extended operation
134	The Aging Management Review results in Section 3 the LRA will be revised to include loss of material being managed by the Periodic Surveillance and Preventive Maintenance Aging Management Program.	2005 LRA annual update
135 and 137	The Aging Management Review Results in Section 3 of the LRA will be revised to change note references as appropriate for copper alloys	2005 LRA annual update
136	A note correction deleting note F will be made in Table 3.3.2-1 1 of the LRA.	2005 LRA annual update
147	The recirculation line orifices in the RHR system will be added to the scope of the One-Time Inspection Program of the LRA.	2005 LRA annual update