3. AGING MANAGEMENT REVIEW

Rochester Gas and Electric Corporation (RG&E) fully utilized the Generic Aging Lessons Learned (GALL) process in preparing its license renewal application (LRA). The purpose of GALL is to provide the staff with a summary of staff-approved aging management programs (AMPs) for the aging of most structures and components that are subject to an aging management review (AMR). If an applicant commits to implementing these staff-approved AMPs, the time, effort, and resources used to review an applicant's LRA will be reduced, thereby improving the efficiency and effectiveness of the license renewal review process.

The GALL Report is a compilation of existing programs and activities used by commercial nuclear power plants that were reviewed and evaluated by the staff for managing the aging effects of structures and components within the scope of license renewal which are subject to an AMR. The GALL Report summarizes the aging management evaluations, programs, and activities credited for managing aging for most of the structures and components used throughout the industry, and serves as a reference for both applicants and staff reviewers to quickly identify those AMPs and activities that the staff has determined will provide adequate aging management during the period of extended operation.

The GALL report identifies (1) systems, structures, and components, (2) component materials, (3) the environments to which the components are exposed, (4) the aging effects associated with the materials and environments, (5) the AMPs that are credited with managing the aging effects, and (6) recommendations for further applicant evaluations of aging effects and their management for certain specific component types.

In order to determine whether the GALL process would improve the efficiency of the license renewal review, the staff conducted a demonstration project to exercise the GALL process and determine the format and content of a safety evaluation based on the GALL review process. The Standard Review Plan for License Renewal (SRP-LR) was prepared based on both the GALL model and the lessons learned from the demonstration project.

During its review of the RG&E LRA, the staff performed an AMR inspection (Inspection Report 50-244/2003-008) from July 21–25, 2003, and from August 4–8, 2003. The purpose of the inspection was to examine activities that support the LRA and consisted of a selected examination of procedures, representative records, and interviews with the applicant regarding proposed aging management activities. The team also reviewed the proposed implementation of all AMPs credited in the LRA for managing aging. The results of the inspection have not yet been issued.

The staff also performed an AMP audit on June 24 and 25, 2003. The audit team reviewed those AMPs credited in the LRA for managing aging that the applicant claimed consistent with GALL. The audit team evaluated each of the 10 attributes of the applicant's AMP, which the applicant claimed was consistent with the attributes of the associated AMP described in the GALL report. Those AMPs that were not claimed to be consistent with the GALL Report, and those attributes that were deviations from the attributes described in the GALL Report AMPs, were provided to the NRC staff for review. The audit team identified that the Fire Protection Program attributes for parameters monitored/inspected and detection of aging effects were not consistent with GALL as stated in the LRA. In addition, inconsistencies were identified in the

Fire Water System Program attributes for detection of aging effects and parameters monitored/inspected. The team concluded that, with the exception of the Fire Protection Program and the Fire Water System Program, the applicant's AMPs were consistent with the GALL Report AMPs with differences/exceptions as stated in the LRA/RAIs.

During the AMP audit, the staff also performed a separate audit of some specific issues such as reviewing the plant spaces (buildings/areas) identified in LRA Section 2.4.3 against information contained in the Ginna UFSAR. The AMP review and audit of specific issues can be found in the staff's AMP audit report, dated September 8, 2003, and are addressed in this SER.

As a result of the staff's review of the RG&E application for license renewal, including the additional information and clarifications submitted subsequently, the staff identified two proposed license conditions. The first license condition requires the applicant to include the updated final safety analysis report (UFSAR) Supplement in the next UFSAR update required by 10 CFR 50.71(e) following issuance of the renewed license. The second license condition requires that the future activities identified in the UFSAR Supplement be completed prior to the period of extended operation.

3.0.1 The GALL Format for the LRA

The Ginna Nuclear Power Plant LRA closely follows the standard LRA format, as agreed between the Nuclear Energy Institute (NEI) and the staff (see letters dated August 9, 1999, and September 22, 1999). This format has been used by previous applicants and will continue to be used by future applicants. However, there are several important changes within the format that reflect the GALL process. First, the tables in LRA Section 2 that identify the structures and components that are subject to an AMR now include a third column that links plant-specific structures and components in the Section 2 tables to generic GALL component groups in Section 3 (discussed in detail below). Second, the tables in LRA Section 3 are different from the Section 3 tables used in previous LRAs. There are no system-specific tables in Section 3 of the Ginna LRA. The individual components within a system have been included in a series of system group tables. For example, there are 20 auxiliary systems at Ginna. Each system has several components. In previous LRAs, each system had a separate table that listed the components in the system. With the Ginna LRA, there are no system tables. Instead all the components in the 20 auxiliary systems are included in any one of two auxiliary system tables. LRA Table 3.4-1 consists of auxiliary system components evaluated in the GALL Report, and LRA Table 3.4-2 consists of auxiliary systems components not evaluated in the GALL Report. Similarly, the LRA tables for the other system groups (3.2 — reactor coolant systems, 3.3 - engineered safety features systems, 3.5 steam and power conversion systems, 3.6 - structures and component supports, and 3.7 — electrical and instrumentation and controls systems) have 3.x-1 LRA tables for components evaluated in the GALL Report and 3.x-2 LRA tables for components not evaluated in the GALL Report.

The 3.x-1 tables provide information regarding AMPs that are consistent with the GALL Report. The first four columns of Table 3.x-1 are derived from Tables 3.1-1 through 3.1-6 of the SRP-LR. Included in this table is a discussion column. The discussion column provides a conclusion indicating if the aging management evaluation results are consistent with GALL, along with any clarifications or explanations required to support the conclusion, if the conclusion is different than those of the GALL Report. For a determination to be made that a table line item is

"Consistent with GALL," several criteria must be met. First, the plant-specific component is reviewed against the GALL to ensure that the component, materials of construction, and internal or external service environments are comparable to those described in a particular GALL item. Second, for those that are comparable, the results of the plant aging management review/aging effect evaluation are compared to the aging effects/mechanisms in the GALL. Finally, the programs credited in the GALL for managing those aging effects are compared to the programs described in the plant evaluation. If, using good engineering judgment, it could be reasonably concluded that the plant evaluation is in agreement with the GALL evaluation, a line item was considered consistent with GALL or NUREG-1801. There are cases where components, and component material/environment combinations, and aging effects are common between a NUREG-1801 line item and the plant evaluation, but the AMP selections differ. In those cases the discussion column indicates the plant AMP selection, but no conclusion will be made that the line item is consistent with the GALL.

The 3.x-2 tables provide information regarding AMPs that are different from or not addressed in the GALL Report. A plant component is considered not addressed by the NUREG if the component type is not evaluated in the GALL or has a different material of construction or operating environment than evaluated in the GALL.

The 3.x-2 tables are different from the 3.x-1 tables. The 3.x-2 tables include the component types, materials, environments, aging effects requiring management, the programs and activities for managing aging, and a discussion column. Because these structures and components were not evaluated in GALL, the staff performed a review, similar to those done for past applications.

3.0.2 The Staff's Review Process

The staff's review of the Ginna LRA was performed in three phases. In Phase 1, the staff reviewed the applicant's AMP descriptions to compare those AMPs for which the applicant claimed consistency with those reviewed and approved in the GALL Report. For those AMPs for which the applicant claimed consistency with the GALL AMPs, and for which GALL recommended no further evaluation, the staff conducted an audit to confirm that the applicant's AMPs were consistent with the GALL AMPs. For those AMPs that were not consistent with GALL, or were not addressed in GALL, the staff's review determined whether the AMPs were adequate to manage the aging effects for which they were credited.

Several Ginna AMPs were described by the applicant as being consistent with GALL, but with some deviation from GALL. By letter dated March 21, 2003, the staff issued RAI 3.0-1, requesting the applicant to define the AMP deviations contained in the LRA. By letter dated May 23, 2003, the applicant addressed this RAI by defining the following two types of AMP deviations.

(1) Exceptions to GALL—"those that do not agree with, or do not implement, recommendations in GALL program elements"

(2) Enhancements to GALL—"those that augment the GALL program element recommendations"

For each AMP that had one or more of these deviations, the staff reviewed each deviation to determine (1) whether the deviation is acceptable and (2) whether the AMP, as modified, would adequately manage the aging effect(s) for which it is credited.

For those AMPs that are not evaluated in GALL, the staff evaluated the AMP against the 10 program elements found in Branch Technical Position RLSB-1 in Section A-1 of the SRP-LR Appendix A.

The staff also reviewed the UFSAR Supplement for each AMP to determine whether it provided an adequate summary description of the program or activity, as required by 10 CFR 54.21(d).

The AMRs and associated AMPs in the GALL Report fall into two broad categories—those AMRs and associated AMPs that GALL concludes are adequate to manage aging of the components referenced in GALL, and those AMRs and associated AMPs for which GALL concludes that aging management is adequate, but further evaluation must be done for certain aspects of the aging management process. In Phase 2, the staff compared the applicant's AMR results and associated AMPs to the AMR results and associated AMPs in GALL, to determine whether the applicant's AMRs and associated AMPs were consistent with those reviewed and approved in the GALL Report. For those AMRs and associated AMPs for which GALL recommended further evaluation, the staff reviewed the applicant's evaluation to determine whether it addressed the additional issues recommended in the GALL Report. Finally, for AMRs and associated AMPs that were not consistent with GALL, the staff's review determined whether the AMRs and associated AMPs were adequate to manage the aging effects for which they were credited.

Once the staff determined that the applicant's AMRs and associated AMPs were adequate to manage aging, it performed Phase 3 of its review by reviewing plant-specific structures and components to determine whether the applicant 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) for the period of extended operation, as required by 10 CFR 54.21(a)(3). Specifically, this review involved a component-by-component review to determine whether the applicant properly applied the GALL program to the aging management of components within the scope of license renewal and subject to an AMR (i.e., the staff evaluated whether the applicant had properly identified the aging effects, and the AMPs credited for managing the aging effects, for each RG&E structure and component within the scope of license renewal and subject to an AMR). For structures and components evaluated in GALL, the staff reviewed the adequacy of aging management against the GALL criteria. For structures and components not evaluated in GALL, the staff reviewed the adequacy of aging management against the 10 criteria in Appendix A of the SRP-LR. Some RG&E structures and components were not evaluated in GALL, but the applicant determined that the GALL AMR results could be applied to these structures and components and provided justification to support this determination. In these cases, the staff reviewed the adequacy of aging management against the GALL criteria to determine whether the GALL AMPs were adequate to manage the aging effects for which they were credited.

3.0.3 Aging Management Programs

Table 3.0.3-1 presents the common AMPs, the associated GALL program, the system groups that credit the program for management of component aging, and the safety evaluation report (SER) section that contains the staff's review of the program. Table 3.0.3-1 also lists programs that were described in the license renewal application that the applicant stated are not included as one of Ginna's aging management programs.

Table 3.0.3-1

Common Aging Management Programs

Applicant's AMP (LRA section)	Associated GALL AMP	LRA System Groups that Credit the AMP for Aging Management	Staff Evaluation (SER Section)
Water Chemistry Control (B2.1.37)	XI.M2	3.1 - RCS 3.2 - ESF 3.3 - Auxiliary 3.4 - Steam and Power Conversion 3.5 - Structures	3.0.3.1
ASME Section XI, Subsection IWB, IWC and IWD Inservice Inspection (B2.1.2)	XI.M1	3.1 - RCS 3.2 - ESF 3.3 - Auxiliary 3.5 - Structures	3.0.3.2
Bolting Integrity (B2.1.5)	XI.M18	3.1 - RCS 3.2 - ESF 3.3 - Auxiliary 3.4 - Steam and Power Conversion 3.5 - Structures	3.0.3.3
Boric Acid Corrosion (B2.1.6)	XI.M10	3.1 - RCS 3.2 - ESF 3.3 - Auxiliary 3.4 - Steam and Power Conversion 3.5 - Structures 3.6 - Electrical	3.0.3.4
Closed-Cycle (Component) Cooling Water System (B.2.1.9)	XI.M21	3.2 - ESF 3.3 - Auxiliary	3.0.3.5
Flow-Accelerated Corrosion (B2.1.15)	XI.M17	3.3 - Auxiliary 3.5 - Steam and Power Conversion	3.0.3.6

One-Time Inspection (B2.1.21)	XI.M32	3.1 - RCS 3.2 - ESF 3.3 - Auxiliary 3.4 - Steam and Power Conversion 3.6 - Electrical	3.0.3.7
Periodic Surveillance and Preventive Maintenance (B2.1.23)	Plant Specific	3.1 - RCS 3.2 - ESF 3.3 - Auxiliary 3.4 - Steam and Power Conversion 3.5 - Structures	3.0.3.8
Selective Leaching of Materials (B2.1.29)	XI.M33	3.2 - ESF 3.3 - Auxiliary	3.0.3.9
Structures Monitoring (B2.1.32)	XI.S5, SI.S6, SI.S7	3.3 - Auxiliary 3.5 - Structures	3.0.3.10
System Monitoring (B2.1.33)	Plant Specific	3.1 - RCS 3.2 - ESF 3.3 - Auxiliary 3.4 - Steam and Power Conversion 3.5 - Structures	3.0.3.11
Thermal Aging and Neutron Embrittlement of Austenitic Stainless Steel (B2.1.35)	XI.M13	Not Applicable	3.0.3.12.1
Buried Pipe and Tank Surveillance (B2.1.8)	XI.M28	Not Applicable	3.0.3.12.2
Compressed Air Monitoring (B2.1.10)	XI.M24	Not Applicable	3.0.3.12.3
Inaccessible Medium Voltage Cables not Subject to EQ (B2.1.17)	XI.E3	Not Applicable	3.0.3.12.4
Loose Parts Monitoring (B2.1.19)	XI.M14	Not Applicable	3.0.3.12.5
Neutron Noise Monitoring (B2.1.20)	XI.M15	Not Applicable	3.0.3.12.6
Protective Coatings Monitoring and Maintenance (B2.1.24)	XI.S8	Not Applicable	3.0.3.12.7

Table 3.0.3-2 presents the system-specific AMPs, the associated GALL program, the system groups that credit the program for management of component aging, and the SER section that contains the staff's review of the program.

Table 3.0.3-2

System-Specific Management Programs

Applicant's AMP (LRA section)	Associated GALL AMP	LRA System Groups that Credit the AMP for Aging Management	Staff Evaluation (SER Section)
Reactor Head Closure Studs (B2.1.25)	XI.M3	3.1 - RCS	3.1.2.3.1
Reactor Vessel Head Penetration Inspection Program (B2.1.26)	XI.M11	3.1 - RCS	3.1.2.3.2
Reactor Vessel Internals (B2.1.27)	XI.M16	3.1 - RCS	3.1.2.3.3
Reactor Vessel Surveillance (B1.1.28)	XI.M31	3.1 - RCS	3.1.2.3.4
Steam Generator Integrity (B2.1.31)	XI.M19	3.1 - RCS	3.1.2.3.5
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (B2.1.34)	XI.M12	3.1 - RCS	3.1.2.3.6
Thimble Tube Inspection (B2.1.36)	Plant Specific	3.1 - RCS	3.1.2.3.7
Fatigue Monitoring (B3.2)	X.M1	3.1 - RCS	3.1.2.3.8
Buried Piping and Tank Inspection (B2.1.7)	XI.M34	3.3 - Auxiliary	3.3.2.3.1
Fire Protection (B2.1.13)	XI.M26	3.3 - Auxiliary	3.3.2.3.2
Fire Water System (B2.1.14)	XI.M27	3.3 - Auxiliary	3.3.2.3.3
Fuel Oil Chemistry (B2.1.16)	XI.M30	3.3 - Auxiliary	3.3.2.3.4

Heavy and Light Load (Related to Refueling) Handling Systems (B2.1.18)	XI.M23	3.3 - Auxiliary	3.3.2.3.5
Open-Cycle Cooling (Service) Water (B2.1.22)	XI.M20	3.3 - Auxiliary	3.3.2.3.6
Spent Fuel Pool Neutron Absorbing Monitoring (B2.1.30)	XI.M22	3.3 - Auxiliary	3.3.2.3.7
Aboveground Carbon Steel Tanks (B2.1.1)	XI.M29	3.3 - Auxiliary	3.3.2.3.8
ASME Section XI, Subsections IWE and IWL Inservice Inspection) (B2.1.3)	XI.S1, XI.S2, XI.S4	3.5 - Structures	3.5.2.3.1
ASME Section XI, Subsection IWF, Inservice Inspection (B2.1.4)	XI.S3	3.5 - Structures	3.5.2.3.2
Concrete Containment Tendon Prestress (B3.3)	X.S1	3.5 - Structures	3.5.2.3.3
Electrical Cables and Connections not Subject to EQ (B2.1.11)	XI.E1	3.6 - Electrical	3.6.2.3.1
Electric Cables not Subject to EQ used in Instrumentation Circuits (B2.1.12)	XI.E2	3.6 - Electrical	3.6.2.3.2
Environmental Qualification (B3.1)	X.E1	3.6 - Electrical	3.6.2.3.3

3.0.3.1 Water Chemistry Control Program

3.0.3.1.1 Summary of Technical Information in the Application

The applicant’s Water Chemistry Control Program is discussed in LRA Section B2.1.37, “Water Chemistry Control." In LRA B2.1.37, Water Chemistry Control,” the applicant described its AMP to manage aging effects in the systems carrying the primary and secondary water. The LRA stated that this AMP is consistent with GALL AMP XI.M2, “Water Chemistry,” including the need for verification of the program by performing a one-time inspection of the selected components in the low-flow or stagnant portions of a system. The components exposed to a

high velocity flow are not included in the one-time inspection because the dominant corrosion mechanism in these components is flow accelerated corrosion which is addressed in the flow accelerated corrosion program. The one-time inspection of the components at susceptible locations will provide verification of the effectiveness of the water chemistry control program. This inspection is covered within the scope of the LRA Section B2.1.21, “One-Time Inspection.”

Aging effects managed by the program include loss of material due to general corrosion, pitting, and crevice corrosion, MIC, SCC, and fouling due to corrosion product buildup. The applicant states that the effectiveness of Water Chemistry Control Program will be verified by a One-Time Inspection Program of selected susceptible components in low-flow or stagnant portions of the system.

In the LRA, the applicant concluded that the Water Chemistry Control Program ensures that aging effects caused by primary and secondary water chemistries will be adequately managed.

3.0.3.1.2 Staff Evaluation

During the audit, the staff confirmed the applicant’s claim of consistency of the AMP with the GALL Program. It also determined that the applicant properly applied the GALL Program to its facility and the AMP remains, therefore, adequate to manage the aging effect for which it is credited. Furthermore, the staff reviewed the UFSAR Supplement and found that it provides an adequate description of the revised program.

3.0.3.1.3 Conclusions

On the basis of its review and audit of the applicant’s program, the staff finds that this program is consistent with the GALL Program. Therefore, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of structures and components (SCs) subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.0.3.2 ASME Section XI, Subsection IWB, IWC, and IWD Inservice Inspection Program

3.0.3.2.1 Summary of Technical Information in the Application

The applicant’s American Society of Mechanical Engineers (ASME) Section XI, Inservice Inspection (ISI) Program is discussed in LRA Section B2.1.2, “ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program.” The LRA stated that the program is consistent with GALL AMP XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD ,” with no deviations.

This AMP is credited with managing aging effects in Class 1, 2, and 3 components and their integral attachments in the reactor coolant systems (RCS), engineered safety features (ESF) systems, auxiliary systems, and steam and power conversion systems(SPCS).

According to 10 CFR 50.55a, light-water cooled power plants are required to meet the ISI requirements of ASME Boiler and Pressure Vessel Code, Section XI, for Class 1, 2, and 3 pressure-retaining components and their integral attachments. The applicant's program performs inspection, repair, and replacement of these components in accordance with Subsections IWB, IWC, and IWD, respectively, of the 1995 Edition of the code and the 1996 Addenda. The applicant's program also 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.

The LRA stated that the ASME Section XI Inservice Inspection Program meets the requirements outlined in Subsections IWB, IWC, and IWD, and has been effective in managing the effects of aging in Class 1, 2, and 3 components and their integral attachments.

The applicant also stated that Ginna has maintained an Inservice Inspection Program in accordance with 10 CFR 50.55a and its plant technical specification requirements. The fourth 10-year interval of the Ginna Inservice Inspection Program began on January 1, 2000, and was developed and prepared to meet the requirements of ASME Section XI, 1995 Edition and 1996 Addenda.

The applicant performed a review of industry operating experience of incidents of primary pressure boundary degradation that were revealed by ISI's and reported through NRC generic communications. The applicant grouped the incidents into the following categories.

- Boric Acid corrosion due to leakage at bolted closures and leakage caused by cracking of primary pressure boundary Alloy 600 components such as reactor vessel head control rod drive mechanism (CRDM) nozzles

- Cracking due to SCC in safety injection piping, instrument nozzles in safety injection accumulators, and safety related stainless steel piping systems containing stagnant borated water

- Crack initiation and growth due to thermal and mechanical loading in high-pressure injection and safety injection lines

- Degradation of steam generator tubing due to primary water stress corrosion cracking (PWSCC), outside diameter stress corrosion cracking (ODSCC), intergranular attack (IGA), wastage and pitting and denting and cracking of steam generator shell welds

The applicant reviewed Ginna's plant specific operating experiences and credits the Inservice Inspection Program examinations with discovering the following conditions;

- Bolting degradation detected by visual VT-1 examinations and boric acid leakage by VT-2 leakage examinations

- PWSCC, ODSCC, IGA, and denting of Alloy 600 steam generator tubing by eddy current examinations

- Shallow thermal fatigue cracks in steam generator feedwater nozzle-to-pipe weld

- Original manufacturing flaw indications in the primary inlet nozzle-to-reactor vessel weld (N2B) and pressurizer lower head-to-shell girth weld. The applicant stated the indications were evaluated by fracture mechanics and determined to be acceptable.

The LRA stated that the Inservice Inspection Program at Ginna is continually upgraded to account for industry experience and research, and is subjected to periodic NRC inspections and self assessments. The applicant concluded that the Inservice Inspection Program at Ginna has provided an effective means of assuring the pressure integrity of Class 1, 2, and 3 systems at Ginna.

In its LRA, the applicant concluded that the ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program is consistent with the GALL Report and that continued implementation of the Inservice Inspection Program ensures that aging effects will be managed such that the intended functions of Class 1, 2, and 3 pressure-retaining components and their integral attachments will be maintained during the license renewal period.

3.0.3.2.2 Staff Evaluation

The staff confirmed the applicant's claim that the ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program is consistent with GALL during the AMP audit. In addition, for Ginna, the staff determined whether the applicant properly applied the GALL program to its facility. The staff also reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable.

3.0.3.2.3 Conclusion

On the basis of its review and audit of the applicant's program, the staff finds that this program is consistent with the GALL Report. Therefore, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.0.3.3 Bolting Integrity Program

3.0.3.3.1 Summary of Technical Information in the Application

The applicant's Bolting Integrity Program is discussed in LRA Section X1.M3, "Reactor Head Closure Studs," and B2.1.5, "Bolting Integrity." The applicant states that the program is consistent with GALL Program XI.M18, "Bolting Integrity," with no deviations. The applicant also states that its Bolting Integrity Program credits activities performed under the direction of other AMPS for managing specific aging effects. These programs include the following:

- ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection (1995 Edition with 1996 Addenda)
- ASME Section XI, Subsection IWF Inservice Inspection
- Periodic Surveillance and Preventive Maintenance
- Boric Acid Corrosion
- Systems Monitoring
- Structures Monitoring

This AMP is credited with managing aging of all bolting on mechanical and structural components within the scope of license renewal. The program consists of periodic inspections of pressure-retaining bolting as delineated in NUREG-1339, and other industry recommendations such as in EPRI NP-5679 (with exceptions noted in NUREG-1339) for safety-related bolting, and EPRI TR-104213 for pressure-retaining and structural bolting. The program provides for periodic inspection of closure bolting for indication of loss of preload, cracking, and loss of material.

The applicant's plant-specific operating experience has revealed bolting degradation resulting from boric acid leakage in borated systems, failure of American Society of Testing and Materials (ASTM) A-90 high-strength reactor coolant pump (RCP) leg-support anchor bolts due to stress-corrosion cracking (SCC), and linear indications in machine reduced-section shank of five steam generator man-way bolts attributed to fatigue. The applicant's review of industry operating experience has also indicated incidents of loss of pressure boundary integrity due to leakage of boric acid at bolted joints, SCC of high-strength bolts, and cracking due to fatigue.

3.0.3.3.2 Staff Evaluation

The staff confirmed the applicant's claim that the Bolting Integrity Program is consistent with GALL during the AMP audit. In addition, for Ginna, the staff determined whether the applicant properly applied the GALL program to its facility. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program.

3.0.3.3.3 Conclusions

On the basis of its review and audit of the applicant's program, the staff finds that this program is consistent with the GALL program. Therefore, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP

and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.0.3.4 Boric Acid Corrosion Program

3.0.3.4.1 Summary of Technical Information In the Application

The applicant's Boric Acid Corrosion Control (BAC) Program is discussed in LRA Section B2.1.6 "Boric Acid Corrosion Control Program." The applicant states that the program will be consistent with GALL Program XI.M10, "Boric Acid Corrosion". The applicant also stated that the program will be enhanced to address non RCS systems and components subject to boric acid leakage, including cable connectors, cable trays, and other susceptible structures, systems, and components (SSCs).

This AMP is credited with managing the aging of carbon steel and low-alloy steel structures or components or electrical components on which borated water may leak in the RCS, engineered safety features (ESF), auxiliary, steam and power conversion systems (SPCS), structures and component supports, and electrical systems.

The applicant's program was developed and implemented to meet generic letter (GL) 88-05 "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants," and to monitor the condition of the RCS pressure boundary components for boric acid leakage. The program identifies carbon steel components within the RCS that are susceptible to corrosion from boric acid leakage and provides for visual inspection of adjacent components. The program will be enhanced to account for boric acid corrosion of non-RCS components including cable connectors, cable trays and other susceptible SSCs.

Ginna has experienced RHR heat exchanger stud, and RHR and CVCS body-to-bonnet bolting degradation as a result of boric acid corrosion caused by boric acid leakage at bolted joints. Degradation was detected by visual examination and the bolting was replaced. The applicant performed reactor vessel head penetration inspections as identified in NRC Bulletin 2002-01 and found no evidence of leakage.

3.0.3.4.2 Staff Evaluation

Since the applicant indicated the program did not meet the GALL Boric Acid Program when the LRA was submitted, the staff requested additional information in a letter dated March 21, 2003, regarding the applicant's program. The applicant responded to these RAIs in a letter dated May 13, 2003, and indicated the program had been revised and was consistent with the GALL. The staff confirmed the applicant's claim of consistency during the AMP audit that was performed for Ginna on June 23-25, 2003. In addition, the staff determined whether the applicant properly applied the GALL program to the facility.

RAI B2.1.6-1 requested information identifying when the AMP would be consistent with the GALL and what changes would be made to the applicant's Boric Acid Corrosion Control Program for it to be consistent with GALL Section XI.M10. The applicant indicated that as of March 2003 the program had been revised and was now consistent with GALL. The applicant indicated that the primary changes necessary for consistency with GALL resulted in an expansion of the program scope beyond RCS components to include carbon and low-alloy steel components that could be subjected to boric acid leaks. The program originally had been limited to the scope recommended by GL 88-05. Changes also included ensuring boric acid leaks are entered into the corrective action program and, if necessary, technical evaluations are performed for affected components in accordance with the guidance in the EPRI Boric Acid Corrosion Guidebook and GL 88-05.

The staff found the applicant's RAI response acceptable because the applicant has revised the Boric Acid Corrosion Program for consistency with GALL prior to the period of extended operation.

In light of the events at Davis-Besse regarding reactor pressure vessel head degradation, the staff requested additional information regarding the applicant's operating experience and program changes. In RAI B2.1.6-2, the staff requested the applicant address the changes that were made to its boric acid corrosion prevention program in response to the Davis-Besse reactor vessel head boric acid corrosion event. The applicant responded to this RAI in a letter dated May 13, 2003. The applicant indicated information provided to licensees in NRC Bulletins 2002-01, "Reactor Pressure Vessel Head Degradation and RCS Pressure Boundary Integrity," and 2002-02, "Reactor Pressure Vessel Head Penetration Nozzle Inspection Programs," were direct contributors to the applicant's new Boric Acid Corrosion Monitoring Program procedure. Specific changes to the Boric Acid Corrosion Monitoring Program resulting from the Davis-Besse operating experience include the identification of RCS locations containing Alloy 600 and Inconel 82/182 weld materials. Moreover, the control rod penetrations are specifically called out for inspection. Additionally, during leak evaluations any identified boric acid residue will be evaluated to ensure it does not contain rust-like coloring and, when a leak is identified in containment or in an area with enclosed ventilation units, the ventilation units will be evaluated for evidence of boron precipitation.

The staff found the applicant's RAI response acceptable since the applicant expanded the Boric Acid Corrosion Program scope to become consistent with GALL and incorporated lessons learned from Davis-Besse and recent staff generic communications, (i.e., identifying locations where leakage could lead to corrosion damage, examination of ventilation units for boron precipitation, and engineering evaluations of potentially affected components). This additional operating experience supports the staff's determination that the program will provide reasonable assurance that age related degradation will be managed during the period of extended operation.

The staff confirmed the applicant's claim that the Boric Acid corrosion Control Program is consistent with GALL during the AMP audit. In addition, for Ginna, the staff determined whether the applicant properly applied the GALL program to its facility. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program.

3.0.3.4.3 Conclusions

On the basis of its review and audit of the applicant's program, the staff finds that this program is consistent with the GALL program. Therefore, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.0.3.5 Closed-Cycle (Component) Cooling Water System Program

3.0.3.5.1 Summary of Technical Information in the Application

The applicant's Closed-Cycle (Component) Cooling Water System AMP is discussed in LRA Section B2.1.9, "Closed-Cycle (Component) Cooling Water." The applicant does not conclude whether the program is or is not consistent with the equivalent GALL Program, XI.M21, Closed-Cycle Cooling Water System. The applicant acknowledges that there are differences from the GALL program, but states that the differences were evaluated and were determined to be minor in terms of assuring proper functionality of system components.

The AMP is credited with managing the aging effects of loss of material due to general corrosion, pitting, and crevice corrosion in ESF and SPCS and loss of material due to general pitting, and crevice corrosion, and microbiologically influenced corrosion (MIC) in the auxiliary systems.

The applicant's program includes preventive measures, such as maintenance of system corrosion inhibitor concentration in accordance with EPRI TR 107396 limits to minimize corrosion and surveillance testing and inspection to monitor the effects of corrosion. Differences do exist between the applicant's program and that outlined in the GALL. In the applicant's program, the only parameters monitored are pH, corrosion inhibitor concentration and radioactivity. According to the applicant, plant operating experience indicates there is no value added by monitoring additional parameters. Cooler and heat exchanger temperatures and differential pressures are not monitored, but temperature and pressure are monitored at other locations throughout the system to assure proper functionality. Corrosion coupons are not used in the system based on operating experience which does not show a need. Finally, the applicant does not perform MIC testing in the system because the use of chromated water also acts as an effective biocide as well as a corrosion inhibitor.

On the bases of the above discussion, the applicant indicates that their program is capable of assuring proper functionality of system components.

3.0.3.5.2 Staff Evaluation

The applicant's LRA did not clearly indicate if this program was intended to be consistent with the GALL program, therefore, the staff, in a letter dated March 21, 2003, asked F-RAI B.2.1.9-1. The RAI focused on requesting the licensee to discuss if the program was consistent with the GALL, or if not consistent with GALL provide a description of the program relative to the 10 elements of an AMP. The applicant responded to the RAI in a letter dated May 13, 2003, and indicated that the Close Cycle Cooling Water Program is consistent with the GALL Program XI.21, with exceptions. The staff confirmed the applicant's claim of consistency during the AMP audit that was performed June 23-25, 2003. Furthermore, the staff reviewed the program and the deviations with their justification to determine whether the AMP, with the deviations, remains adequate to manage the aging effects for which it is credited. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the revised program.

RAI B.2.1.9-1 requested the applicant address a subset of RAIs if the applicant concluded the program was consistent with GALL.

The staff requested that the applicant discuss how the program ensures aging effects are identified prior to a loss of function and how the program ensures that heat transfer capabilities are maintained. In response to this portion of RAI B.2.1.9-1, the applicant indicated the Closed-Cycle (Component) Cooling Water System Surveillance Program employs various methods to ensure that components will continue to perform their intended function. Periodic maintenance activities performed under the Periodic Surveillance and Preventive Maintenance (PSPM) Program provide opportunities for visual inspections of the internal (wetted) and external surfaces of components in the system. Thermal performance testing of selected heat exchangers is used to verify that these components are capable of performing the heat removal function. Monitoring of the CCW chemistry and maintaining parameters within the specified limits ensures that the system is maintained free of corrosion and biofouling.
The applicant stated that plant-specific operating experience indicates that the CCW system performance has been satisfactory. No evidence of corrosion product build-up or corrosion-induced degradation in CCW piping or components has ever been identified at Ginna Station. Destructive metallurgical examination of a leaking pipe-to-elbow weld performed in 1991 revealed no evidence of corrosion or degradation of the internal surfaces of the pipe and elbow exposed to the CCW environment. The leak was determined to be the result of a large slag inclusion in the weld which was an original fabrication defect. Further confirmation of the effectiveness of CCW chemistry control was obtained during remote visual inspection of the internal surfaces of the carbon steel heat exchanger shell, tubesheet, and tube supports, as well as piping connections during retubing of both CCW heat exchangers in 1999. All surfaces were clean and in excellent condition.

The staff reviewed the applicant's response and found it is acceptable based on the combined use of the PSPM Program to provide opportunities for visual inspection of internal surfaces, thermal performance testing to ascertain heat transfer capability, and water chemistry to mitigate corrosion and limit fouling. The applicant also described operating experience indicating corrosion issues have been absent thus supporting acceptability of this response and providing objective evidence that the program will manage aging.

The staff noted the applicant samples for pH, chromates, and radioactivity, and requested further discussion supporting why the applicant does not sample for corrosion products, calcium, potassium, refrigerant chemicals, chlorides, or sulfates. In response to this portion of

RAI B.2.1.9-1, the applicant indicated that demineralized water is used as makeup water for this system. Therefore calcium and other mineral deposits, chlorides, and sulfates are not an issue in the system. Chromate is added as potassium dichromate, therefore, sampling for potassium is not necessary. No components with refrigerant chemicals are serviced by the CCW system.

The staff reviewed the applicant's response and finds that the use of demineralized water alleviates the need to sample chemistry parameters other than pH, chromates, and radioactivity in the closed-cycle cooling water system.

The staff requested that the applicant discuss how the effectiveness of chemistry control in stagnant and low flow areas is determined for the closed-cycle cooling water system. In response to this portion of RAI B.2.1.9-1, the applicant indicated that it uses plant operating experience with relief valves located on stagnant system tail pieces. The relief valves are periodically removed, tested, and inspected by the Periodic Surveillance and Preventive Maintenance Program. No evidence of degradation has been identified at these locations.

The staff finds that using relief valves to indicate the performance of chemistry control in stagnant and low flow areas is acceptable based on the provided operating experience that no evidence of degradation has been identified at these locations. The operating experience provides objective evidence that the program will adequately manage aging.

The staff noted the operating experience discussion indicated that due to condensation, external corrosion had affected the surface of some CCW system piping and requested the applicant to discuss how much of the system was affected, how long the system had been in operation, the extent of the ultrasonic testing which noted no significant wall thinning, and how any wall loss was attributed to internal or external corrosion. In response to this portion of RAI B.2.1.9-1, the applicant indicated the pipe had been in service since original construction and experienced only minor surface rusting. UT scans performed over several inches of pipe length and around the pipe circumferences were taken to determine the maximum and minimum wall thickness. The applicant indicated that all thickness readings were acceptable and corrective action included insulating approximately 2000 feet of the piping.

The staff finds the applicant's response providing additional information relative to the operating experience with surface corrosion of portions of the closed-cycle cooling water system acceptable based on the applicant's further explanation that the corrosion was limited to minor surface rusting. The additional operating experience provides objective evidence that the program will adequately manage aging during the period of extended operation.

3.0.3.5.3 Conclusion

On the basis of its review and audit of the applicant's program, the staff finds that this program is consistent with the GALL program. Therefore, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d)

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.0.3.6 Flow-Accelerated Corrosion

3.0.3.6.1 Summary of Technical Information in the Application

The applicant's Flow-Accelerated Corrosion Program is discussed in LRA Section B2.1.15, "Flow-Accelerated Corrosion." The applicant states that the program is consistent with GALL Program XI.M17, "Flow-Accelerated Corrosion," with no deviations.

This AMP is credited with managing flow-accelerated corrosion (FAC) of components made from carbon or low-alloy steel and exposed to single-phase fluid in feedwater and condensate systems, and to two-phase fluid in extraction steam lines, moisture separation reheater, and feedwater heater drain lines.

The applicant states that the plant has a comprehensive program that addresses FAC control measures in accordance with the EPRI guidelines in Nuclear Safety Analysis Center (NSAC) 20L-R2, "Recommendation for an Effective Flow-Accelerated Corrosion Program." The program includes use of the CHECWORKS computer code for predicting wear rates caused by FAC, and the procedures for the subsequent inspections and repair or replacement of the damage components.

3.0.3.6.2 Staff Evaluation

The staff confirmed the applicant's claim that the Flow-Accelerated Corrosion Program is consistent with GALL during the AMP audit. In addition, for Ginna, the staff determined whether the applicant properly applied the GALL program to its facility. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program.

3.0.3.6.3 Conclusions

On the basis of its review and audit of the applicant's program, the staff finds that this program is consistent with the GALL program. Therefore, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.0.3.7 One-Time Inspection Program

3.0.3.7.1 Summary of Technical Information in the Application

The applicant's One-Time Inspection program is described in Section B2.1.21 of the LRA. The LRA states that the program will be consistent with GALL Program XI.M32, "One-Time Inspection." The LRA states that the program will be used to verify that unacceptable degradation is not occurring, and that in this way it will validate the effectiveness of an existing AMP (usually the Chemistry Control Program) or confirming that there is no need to manage potential age-related degradation for the period of extended operation. The LRA lists four items in the scope of this program as follows:

(1) Verification of the effectiveness of the Water Chemistry Control Program for managing the effects of aging in stagnant or low flow portions of piping, or occluded areas of components, exposed to treated water environments

(2) Managing cracking due to SCC or cyclic loading due to thermal fatigue in small bore Class 1 piping < 4 inches normal pipe size (NPS) that is directly connected to the reactor coolant system

(3) Managing loss of material due to galvanic corrosion on the internal surfaces of piping and components in treated water systems at locations where galvanic couples are present

(4) Managing loss of material and/or loss of structural integrity due to selective leaching on the internal surfaces of piping and components made of gray cast iron, bronze, or brass exposed to treated water or raw water environments

The LRA states that the program elements will include (a) determination of appropriate inspection sample size based on materials of construction, environment, plausible aging effects, and operating experience, (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 LRA further states that the inspection sample will include locations where the most severe aging effect(s) would be expected to occur, and that inspection methods will include visual (or remote visual), surface or volumetric examination, or other established nondestructive examination (NDE) techniques. The LRA states that the One-Time Inspection Program is a new program, and that the scope and techniques that will be employed are consistent with industry practice.

3.0.3.7.2 Staff Evaluation

GALL recommends use of this program to verify the effectiveness of other AMPs and to verify that aging effects are not occurring. The staff confirmed the applicant's claim of consistency during the AMP audit. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program. Furthermore, the staff reviewed the applicant's evaluation to determine whether it addressed the additional issues recommended in the GALL Report and confirmed that the AMP would adequately address these issues. Finally,

for Ginna, the staff determined whether the applicant properly applied the GALL Report program to its facility.

The staff reviewed the tables in Sections 2 and 3 of the LRA to confirm that the structures and components that credit the One-Time Inspection Program are generally commensurate with the GALL Report. In addition to the four items mentioned above, the staff identified numerous components where the One-Time Inspection Program is used to confirm the absence of significant aging effects. The staff considers these items to be consistent with the GALL program.

The staff also identified that the One-Time Inspection Program is credited for material/environment combinations where it was not clear from the LRA whether aging could be expected, such that periodic inspections would be more appropriate than a one-time inspection. The staff asked the applicant to justify why a one-time inspection is appropriate for (1) change in material properties of Neoprene, (2) loss of material of cast iron and carbon steel in raw water, treated water (where the One-Time Inspection Program is the only AMP), and drainage water, and (3) loss of heat transfer of cast iron in raw water. In its May 13, May 23, and July 30, 2003, responses to the staff's RAIs, the applicant provided the following justification.

(a) For change in material properties of Neoprene, the applicant stated that a one-time inspection is used for internal environments of oil, fuel oil, raw water, and treated water where the temperature remains below 95°F and the exposure to ionizing radiation remains below 10E6 rads. The applicant stated that below these threshold values, changes in material properties are not expected, and that plant experience reveals no evidence of age-related degradation of Neoprene exposed to these environments. Since the environment is not expected to cause significant degradation of Neoprene, the staff finds it acceptable to use a one-time inspection.

(b) For loss of material of cast iron in raw and treated water, the applicant stated that plant experience shows that gray cast iron exhibits good resistence to fresh (raw) waters such as Lake Ontario water, that the behavior in drainage water is expected to be the same as in raw water, and that the behavior in treated water is expected to be at least as good as in raw water. Based on the plant operating experience, the staff finds this acceptable.

(c) For loss of material of carbon/low-alloy steel in treated water, the applicant clarified that the One-Time Inspection Program is used for piping, valves, and the reactor make-up water storage tank in the treated water system to verify the effectiveness of the Water Chemistry Program. The applicant also described its operating experience with these components, and the operating experience supports the applicant's conclusion that aging is either not occurring or is occurring very slowly. Based on the operating experience, the staff finds it acceptable to use the One-Time Inspection Program to verify the effectiveness of the Water Chemistry Program in preventing loss of material for these components.

(d) For loss of material of carbon steel in raw water, the applicant clarified that, instead of the One-Time Inspection Program, periodic inspections would be performed under the Periodic Surveillance and Preventative Maintenance Program. The staff considers the use of the Periodic Surveillance and Preventative Maintenance program (evaluated in

Section 3.0.3.8) to be appropriate for this material/environment combination; therefore, the staff finds this acceptable.

(e) For loss of heat transfer of cast iron in raw water, the applicant clarified that the concern was reduction of flow to cast iron outboard bearing oil coolers for the auxiliary feedwater pumps, caused by loss of material, and that plant experience shows that the gray cast iron exhibits good resistence to loss of material in Lake Ontario water. Based on the plant operating experience, the staff finds this acceptable.

The staff also asked for justification for using a one-time ultrasonic inspection, in combination with periodic visual examination of the internal surfaces, for the buried fuel oil storage tanks. In its response dated May 23, 2003, the applicant described the tank construction and examination history, and also clarified that instead of a one-time inspection, the ultrasonic examination would be performed periodically under the Periodic Surveillance and Preventative Maintenance Program. The staff finds that performing an ultrasonic examination on a periodic basis (under the Periodic Surveillance and Preventative Maintenance Program evaluated in Section 3.0.3.8 of this SER) will adequately monitor for degradation of the external surface of the buried fuel oil storage tanks; therefore, the staff finds this acceptable.

The staff also asked for justification for using a one-time inspection for loss of material of a buried carbon steel pipe in the hydrogen detectors and recombiner system. In its response dated May 23, 2003, the applicant stated that the pipe was originally exposed and was apparently covered with engineered backfill during a plant modification. The applicant stated that the aging management would consist of excavating the pipe to perform the one-time inspection, and subsequently including the pipe in the Systems Monitoring Program. Since the Systems Monitoring Program (evaluated in Section 3.0.3.11 of this SER) is effective in managing external corrosion for this material/environment combination, the staff finds this acceptable.

The GALL Report recommends, and the applicant credits, the use of this program to verify the effectiveness of the applicant's Water Chemistry Program (B2.1.37, which is evaluated in Section 3.0.3.1 of this SER), for several systems in the RCS, ESF, auxiliary systems, and SPCS groups. The LRA indicates that the One-Time Inspection Program will include stagnant or low flow portions of piping, or occluded areas of components, exposed to treated water environments. The LRA further states that the program will include (a) determination of appropriate inspection sample size based on materials of construction, environment, plausible aging effects, and operating experience, (b) identification of inspection locations, (c) selection of examination technique, with acceptance criteria, and (d) inspection of locations where the most severe aging effect(s) would be expected to occur. These program attributes satisfy the recommendations in the SRP-LR for verifying the effectiveness of a chemistry program; therefore, the staff finds this acceptable.

GALL also recommends the use of this program, in conjunction with the Water Chemistry Program, to verify that cracking is not occurring in small-bore, RCS and connected systems piping, where the ASME Code does not require volumetric examination during ISI. The LRA states that the One-Time Inspection Program will be used to manage cracking due to SCC or cyclic loading due to thermal fatigue in small-bore Class 1 piping (<4 inches NPS) that is directly connected to the RCS. The LRA also states that volumetric examinations will be performed, since cracking is expected to originate at the internal surface of the pipe. These

program attributes satisfy the recommendations in the SRP-LR for small-bore RCS and connected systems piping; therefore, the staff finds this acceptable.

The staff has reviewed the UFSAR Supplement for this program in LRA Section A2.1.15, "One-Time Inspection." In RAI B2.1.21-3, the staff noted that, while the UFSAR description is generally consistent with the program description in the LRA, the UFSAR description did not contain a level of detail commensurate with the SRP-LR. In its May 23 and July 30, 2003, responses to the staff's RAIs, the applicant augmented the UFSAR Supplement to provide additional detail related to program attributes and how the program is used to satisfy the further evaluations recommended in the GALL. The staff finds that the augmented description of the program is commensurate with the SRP-LR and is acceptable.

3.0.3.7.3 Conclusions

On the basis of its review and audit of the applicant's program, the staff finds that this program is consistent with the GALL program. Therefore, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.0.3.8 Periodic Surveillance and Preventive Maintenance Program

3.0.3.8.1 Summary of Technical Information in the Application

The applicant described its Periodic Surveillance and Preventive Maintenance Program in Section B.2.1.23 of the LRA. The LRA states that the program is credited for managing aging effects such as loss of material, crack initiation, fouling buildup, and loss of seal for structures and components within the scope of license renewal. The program is also used to verify the effectiveness of other AMPs. The LRA states that the program provides for visual inspection and examination of surfaces of selected equipment items and components, including fasteners, for evidence of defects and age-related degradation such as corrosion, wear, cracking, fouling, etc., on a specified frequency based on operational experience. The LRA states that the program also utilizes leak inspection of piping and components, and replacement or refurbishment of components on a specified frequency. For operating experience, the LRA states that the Periodic Surveillance and Preventive Maintenance Program has been in place since Ginna began operation, that a significant number of corrective actions have been initiated to correct conditions identified by this program, and that this program has proven effective in maintaining the material condition of plant structures and components.

3.0.3.8.2 Staff Evaluation

The Periodic Surveillance and Preventive Maintenance Program is not based on a GALL Report program; therefore, the staff reviewed the program using the guidance in Branch Technical Position RLSB-1 in Appendix A of the SRP-LR. The staff's evaluation focused on management of aging effects through incorporation of the following 10 elements from RLSB-1—program scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria, corrective actions, confirmation process, administrative controls, and operating experience. The applicant indicated that the corrective actions, confirmation process, and administrative controls for license renewal are in accordance with the site-controlled Quality Assurance Program. The staff's evaluation of the applicant's Quality Assurance Program is provided separately in Section 3.0.4 of this SER, and the evaluation of the remaining seven elements is provided below. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program.

The staff notes that "repetitive tasks" in the Periodic Surveillance and Preventive Maintenance Program are used to initiate aging management activities that are performed as part of other AMPs. Those activities are evaluated with the appropriate AMPs and are not discussed in this section of the SER.

<u>Program Scope</u>. The LRA states that the Periodic Surveillance and Preventive Maintenance provides for visual inspections and surface examinations of certain piping, equipment, and components in all plant systems within the scope of license renewal. The LRA also states that the program provides for replacement or refurbishment of certain components on a specified frequency.

The staff noticed that the Periodic Surveillance and Preventive Maintenance is widely used throughout the RCS, emergency core cooling system (ECCS), auxiliary systems, and SPCS to manage loss of material, cracking, change in material properties, and loss of heat transfer, primarily for internal environments. Several items, such as the inspection of the buried fuel oil storage tanks and the inspection of carbon steel items in raw water, were added to the scope of this program in the applicant's responses to staff RAIs.

In its response to the staff's RAI, by letter dated May 23, 2003, the applicant clarified that the Periodic Surveillance and Preventive Maintenance is used for verification of the effectiveness of the Water Chemistry Control Program, and that the inspections performed under the Periodic Surveillance and Preventive Maintenance Program are comparable to those performed under the One-Time Inspection Program. The applicant selected the PSPM as the inspection initiating activity when opportunities for inspection due to routine maintenance were identified. Where no such inspection opportunity was presented, the One-Time Inspection Program was credited. In the June 13, 2003, letter, the applicant also stated that if a component in scope of license renewal was already included in the Periodic Surveillance and Preventive Maintenance Program, the Periodic Surveillance and Preventive Maintenance Program was credited for aging management. If an established Periodic Surveillance and Preventive Maintenance activity required enhancement to satisfy the aging management requirements, a tracking mechanism was put in place to revise the implementing procedures to include all necessary inspections for all applicable aging effects for each Periodic Surveillance and Preventive Maintenance activity.

The staff finds that the applicant's description of the scope of this program adequately covers the items which credit this program; therefore, the staff finds the scope acceptable.

Preventive Actions. The LRA states that the inspection and testing activities of the Periodic Surveillance and Preventive Maintenance Program are primarily monitoring activities, but the periodic replacement or refurbishment of components may be considered preventive in nature. The staff agrees with this assessment, and does not identify the need for further preventative actions; therefore, the staff finds this acceptable.

Parameters Monitored or Inspected. The LRA states that the Periodic Surveillance and Preventive Maintenance provides for visual inspection and examination of surfaces, including interior surfaces, of selected equipment items and components, including fasteners, for evidence of defects and age-related degradation, such as loss of material due to corrosion and wear, cracking, fouling buildup, and leakage, on a specified frequency based on operational experience. The LRA also states that equipment or system operating parameters, such as, pressure, flow, and temperature, are monitored by performance tests to detect performance degradation that may be indicative of aging effects. The LRA further states that the current guidelines in operations, maintenance, and surveillance test procedures and plant work orders will be enhanced to provide explicit guidance on detection of applicable aging effects and assessment of degradation. The staff finds that monitoring or inspecting the above parameters is appropriate for managing the aging effects that are covered by this program; therefore, the staff finds the parameters monitored or inspected acceptable.

Detection of Aging Effects. The LRA states that aging effects, such as loss of material due to corrosion and wear, cracking, loss of seal, etc., are detected by visual inspection of surfaces for evidence of leakage, material thinning, accumulation of corrosion products, and debris. The LRA also states that plant procedures will be enhanced to provide explicit guidance on detection of applicable aging effects and assessment of degradation.

The staff noted apparent inconsistencies in the LRA regarding the types of inspections that would be performed under the Periodic Surveillance and Preventive Maintenance Program; therefore, the staff asked for clarification (RAI B2.23-4). By letter dated May 23, 2003, the applicant stated that the Periodic Surveillance and Preventive Maintenance Program provides for visual, surface, and/or volumetric inspections, and surface and/or volumetric examinations are used to supplement visual inspections as deemed necessary by engineering evaluation. The applicant further stated that heat exchangers and coolers are inspected using volumetric techniques such as eddy current testing of tubing, that polymeric seals and gaskets in certain ventilation system components are periodically inspected for evidence of age-related degradation, and that leak inspections of piping and components in selected portions of systems are also performed on a specified frequency. The staff finds the above clarification acceptable. Additional information on the detection of aging effects is provided in the applicant’s RAI responses discussed below.

The LRA states that inspection for leakage may be utilized for managing aging effects in selected piping and components. It is the staff’s position that actual leakage is indicative of piping or component failure, therefore, the AMP should be aimed at detecting and preventing loss of material so that corrective actions can be taken prior to the occurrence of leakage. In RAI B2.1.23-2, the staff asked the applicant to identify the specific circumstances where leakage inspection is proposed to be utilized for aging management. In its response dated May 13, 2003, the applicant provided the following response.

"RG&E acknowledges that actual leakage is indicative of some type of degradation. However, In-Service Inspection (ISI) regulations require that leak inspections be performed. The PSPM program implements surveillance activities including ASME Section XI required leakage examinations for borated water systems and other leakage examinations inside and outside of containment. Thus the program must contain reference to leakage inspections even though those inspections may not be directly credited with managing the effects of aging of the SSC being inspected. Moreover, the leak inspections initiated by the PSPM program are an important element of the Boric Acid Corrosion program. The identification of leaks and the evaluation of the consequences of those leaks are the condition where leakage monitoring is an important technique utilized for component aging management. It is important to note that PSPM initiated leakage inspections are just one of several methods used for detecting and monitoring the affects of aging. Other techniques include visual examinations, supplemental surface and volumetric examinations deemed necessary by engineering evaluation, volumetric (eddy current) examinations of heat exchanger tubing, and other periodic volumetric examinations including radiography and ultrasonic testing to verify wall thickness as required by the Open-Cycle Cooling Water System program."

The staff considers the applicant's use of leakage detection to be reasonable and appropriate. The staff also notes that leakage detection is not used as the only aging management for components, but is combined with other inspection techniques as detailed in the applicant's response discussed above; therefore, the staff finds this acceptable.

The LRA states that cracking and material thinning will be detected by performing visual inspections and surface examinations. Since cracking and thinning on the interior surfaces (for example, interior surfaces of pipe walls), cannot be detected by such methods, the staff requested the applicant to indicate the methods which will be employed to detect such defects (RAI B2.1.23-1). In its response dated May 13, 2003, the applicant stated, in part, the following.

"The Periodic Surveillance and Preventive Maintenance program manages aging effects for SSCs within the scope of license renewal. Aging effects such as loss of material due to various corrosion mechanisms and wear are detected by visual examinations of surfaces for evidence of general or localized material thinning, presence of corrosion products, deposit accumulation, etc. Supplemental inspections using other NDE techniques such as surface (e.g., dye penetrant or magnetic particle) and volumetric (e.g., ultrasonic or radiographic) examinations are performed as necessary based on engineering evaluation. Change in material properties of polymeric seals and gaskets is detected by visual examination for evidence of cracking and crazing, evaluation of resilience and indentation recovery, evidence of swelling, tackiness, etc. Degradation of heat exchanger tubing is detected by eddy current testing, which provides the capability of detecting both ID and OD initiated tube-wall degradation such as thinning due to general, pitting and under-deposit (crevice) corrosion, MIC, fretting wear, fouling and cracking."

The staff finds the applicant's response acceptable because the applicant relies on other NDE techniques beside visual inspection for detecting cracking and thinning on interior surfaces.

In its May 23, 2003, response to the staff's RAI related to the One-Time Inspection Program, the applicant stated that a periodic ultrasonic examination would be performed under the Periodic Surveillance and Preventive Maintenance to monitor for loss of material of the buried fuel oil storage tanks. The staff finds that a periodic ultrasonic examination can effectively detect loss of material on the internal and external surfaces of the tanks; therefore, the staff finds this acceptable.

The staff finds that the above methods for detecting aging are consistent with industry practices and are capable of identifying the applicable aging effects; therefore, the staff finds this acceptable.

Monitoring and Trending. The LRA states that the Periodic Surveillance and Preventive Maintenance provides for monitoring and trending of material condition and equipment performance, that Periodic Surveillance and Preventive Maintenance activity intervals are established to provide timely detection of degradation, and that Periodic Surveillance and Preventive Maintenance intervals are based on service environment as well as industry and plant-specific operating experience and manufacturers recommendations. The LRA also states that operations and maintenance procedures specify activities to monitor for early detection of degradation, such as coatings failures, corrosion, cracking, leakage and physical condition, mechanical damage, and loose or missing hardware, that data are documented, trended and evaluated to identify and correct deficiencies; and that intervals may be adjusted as necessary based on inspection results and industry experience.

In its May 23, 2003, response to the staff’s RAIs, the applicant further stated that if a component in scope of license renewal was already included in the Periodic Surveillance and Preventive Maintenance Program due to industry or plant specific operating experience, the Periodic Surveillance and Preventive Maintenance Program was credited for aging management. The periodicity of many surveillance and preventive maintenance activities that were credited for license renewal was initially driven by considerations other than aging. A tracking mechanism was put in place to revise specific instructions in appropriate implementing procedures to include inspections for aging effects for each Periodic Surveillance and Preventive Maintenance Program activity. Periodic Surveillance and Preventive Maintenance Program activity intervals are established to provide timely detection of degradation and take into consideration known aging effects/mechanisms for material/service environment combinations, as well as industry and plant-specific operating experience and manufacturer's recommendations. The results of periodic surveillance inspections and preventive maintenance activities performed on selected equipment items are documented, evaluated, and trended. Based on the results of these aging management activities, inspection frequencies may be adjusted.

As examples, the applicant stated that an internal inspection of a check valve in the CCW system (which has a chemistry-controlled environment such that the effects of aging typically occur slowly) is more likely to be driven by seat/disc/hinge pin wear than by erosion or corrosion of the valve body. For components exposed to raw water environments, the periodicity of inspections is determined by trending data based on wall thickness measurements, corrosion product accumulation, fouling/biofouling build-up, etc. For heat exchangers, inspection frequencies are established by trending of tube wall degradation data. The applicant concluded that these trending evaluations have been effective in establishing frequencies which ensure that the effects of aging are managed such that intended functions of SSCs are maintained and will be maintained during the period of extended operation.

For equipment that is subject to periodic replacement or refurbishment, the LRA was not clear how the applicant verified that the equipment can perform its intended function at the time it is replaced or refurbished. The staff asked about inspections of this equipment and the basis for the replacement or refurbishment period. In its response dated June 13, 2003, the applicant indicated that inspections are performed on the equipment after it is removed from service, and

the inspection results are used in establishing replacement frequencies, such that the equipment can perform its intended function at the time of replacement or refurbishment. The staff finds that it is appropriate to use the inspection results to set the frequency of replacement/refurbishment; therefore, the staff finds this acceptable.

The applicant stated that the data from the Periodic Surveillance and Preventive Maintenance Program activities will be monitored and trended, and the intervals will be adjusted to ensure the timely identification of aging degradation. Adjusting the intervals based on the data provides reasonable assurance that the appropriate intervals are selected; therefore, the staff finds this acceptable.

Acceptance Criteria. The LRA states that operations, maintenance, and surveillance procedures, and specific task instructions will be enhanced to include explicit instructions for detection of aging effects and definition of acceptance criteria. In the May 23, 2003, response to RAI B2.1.23-7, the applicant stated the following.

> Explicit guidance for detection of aging effects will be incorporated into all appropriate plant procedures that implement the Periodic Surveillance and Preventive Maintenance program for aging management purposes during the period of extended operation. This guidance will be developed using published technical reference and industry source material. Acceptance criteria for any degraded condition that is detected during inspections will be established by engineering evaluation of the degraded condition in accordance with the Ginna Station Corrective Action program. This evaluation will address the need for additional non-destructive inspections, changes inspection frequency, as well as design Code requirements and margins.

The acceptance criteria will be established by engineering evaluation and will include design Code requirements and margins; therefore, the staff finds this acceptable.

Operating Experience. The LRA states that Periodic Surveillance and Preventive Maintenance Program activities have been in place since Ginna began operation. The applicant's review of plant-specific operating experience reveals that significant numbers of corrective actions have been generated as a result; therefore, the applicant concludes that the Periodic Surveillance and Preventive Maintenance Program activities have proven to be effective in maintaining the material condition of the structures and components and detecting unsatisfactory or degraded conditions. The staff concurs with the applicant's assessment that the operating experience supports the conclusion that the Periodic Surveillance and Preventive Maintenance Program will provide effective aging management during the extended period of operation.

3.0.3.8.3 Conclusions

On the basis of its review of the applicant's program, the staff finds that the program adequately addresses the 10 program elements defined in Branch Technical Position RLSB-1 in Appendix A.1 of the SRP-LR, and that the program will adequately manage the aging effects for which it is credited so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 50.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of

SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.0.3.9 Selective Leaching of Materials

3.0.3.9.1 Summary of Technical Information in the Application

The applicant's Selective Leaching Program is discussed in LRA Section B2.1.29, "Selective Leaching of Materials Program." The applicant states that the program is consistent with GALL program XI.M33, "Selective Leaching of Materials," with the exception that the applicant will not be performing hardness testing as part of their inspection program. The applicant states that they will assess the feasibility of performing hardness tests and the value of hardness test data on a component-specific basis.

This AMP is credited with managing aging in selective materials in the ESF and auxiliary systems.

The applicant performed visual inspections under the Periodic Surveillance and Preventive Maintenance Program on those potentially susceptible components which have a routine preventive maintenance activity. One time inspections are performed on components that do not have a specified routine preventive maintenance activity. The Periodic Surveillance and Preventive Maintenance Program and the One-Time Inspection Program are discussed in detail in Sections B2.1.23 and B2.1.21, respectively, of the LRA. Any significant indications or relevant conditions of degradation discovered with these two programs will be evaluated in accordance with the Ginna Corrective Action Program. Corrective actions are implemented in accordance with Ginna "Quality Assurance Program for Station Operation" (ND-QAP). ND-QAP meets the requirements of 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." Provisions for timely evaluation and implementation of required corrective actions, including root cause determinations and prevention of recurrence, are also included as part of the Ginna corrective actions.

In its LRA, the applicant concluded that the Selective Leaching of Materials Program ensures that the selective leaching of materials will be adequately managed.

3.0.3.9.2 Staff Evaluation

As stated in LRA Section B2.1.29, the applicant has removed the hardness test measurement from its inspection program. The applicant stated that assessments will be made on the feasibility of performing hardness tests and the value of hardness test data on a component-specific basis. The staff submitted RAI B2.1.29-1 to the applicant requesting the following clarifications.

The Selective Leaching Program in GALL identifies hardness measurements in addition to visual inspections as a method for determining whether there is a degradation of material on select components due to selective leaching. Hardness test measurements are helpful in evaluating degradation of material in a component due to leaching, where visual inspections may be ineffective. The applicant identified that an assessment of the feasibility of performing hardness tests and the value of hardness data is made on a component specific basis.

Therefore, the staff requested that the applicant explain the deviation from hardness testing and describe how the applicant will determine if selective leaching is occurring without taking hardness measurements. Additionally, the staff requested that the applicant provide detailed information concerning the assessment of the need for a hardness evaluation, components that will be assessed, and how the hardness testing will be performed.

The applicant responded to RAI B2.1.29-1 by stating that hardness testing on components susceptible to selective leaching may be appropriate if the component configuration and geometry allows. Tubing and components with complex internal geometries do not provide adequate physical access to internal surfaces requiring examinations to allow accurate measurements to be made.

The applicant stated that gray cast iron at Ginna would be inspected for graphitic corrosion. This type of corrosion creates a soft spongy porous mass consisting of graphite flakes and corrosion products of iron. It is a dark porous mass, brown/black in color which is readily distinguishable visually from the surrounding sound gray iron material after the surface is properly cleaned and prepared by removing surface deposits and debris. The applicant stated that probing the surface of the gray cast iron with a sharp object readily identifies soft, spongy areas which have undergone graphitic corrosion. The applicant concluded that years of experience examining buried gray cast iron gas pipe at RG&E has confirmed that detection of graphitic corrosion may be effectively performed by these methods. The applicant stated that the components that will be examined for potential degradation due to selective leaching are the channel heads for the “A” and “B” EDG jacket water coolers and lube oil coolers. These coolers have been in service since plant startup and should represent the most severe service conditions for gray cast iron components exposed to raw water. The applicant stated that the channel heads will be cleaned, examined visually, and assessed for the feasibility of performing hardness prior to the end of the current license period. If it is determined that hardness tests can be performed, the tests will be made using an Equotip dynamic hardness tester.

The applicant also stated that admiralty brass tubes in the “A” and “B” CCW heat exchangers, and the “A” and “B” EDG jacket water coolers and lube oil coolers will be examined for susceptibility to selective leaching. The licensee stated that the tubing in these heat exchangers are inspected periodically by eddy current testing. The applicant stated that eddy current testing has been effective in detecting loss of material and changes in material permeability caused by the selective leaching process. Destructive metallurgical evaluations of admiralty brass tubes pulled from these units to characterize eddy current test indications have verified evidence of the selective leaching mechanism, such as pits. Therefore, the applicant concluded that the eddy current testing presently performed on these heat exchangers is adequate for detection of tube wall degradation due to selective leaching and no other NDEs, including hardness testing, are required.

The staff confirmed the applicant’s claim of consistency during the AMP audit which was conducted at Ginna on June 28 and 29, 2003. Furthermore, the staff reviewed the deviation and its justification to determine whether the AMP with the deviation, remains adequate to manage the selective leaching of materials for which it is credited, and also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the revised program. Based upon the review of information provided by the licensee, and the results of the staff AMP audit, the staff concludes that the applicant has properly applied the GALL AMP XI.M33 to its facility.

3.0.3.9.3 Conclusion

On the basis of its review and audit of the applicant's program, the staff finds that this program is consistent with the GALL program. Therefore, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.0.3.10 Structures Monitoring

3.0.3.10.1 Summary of Technical Information in the Application

The applicant described its Structures Monitoring Program in Section B2.1.32 of the LRA. The LRA states that this program is consistent with GALL Programs XI.S6, "Structures Monitoring Program," XI.S5, "Masonry Wall Program," and XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants." The applicant credits this program with aging management of civil structures and components within the scope of license renewal. The LRA also states that enhancements will be made to include additional structural components consistent with the scope of the three GALL Programs identified above.

Under "Operating Experience," the LRA states that the Structures Monitoring Program requirements have been developed and documented since 1995. However, plant inspections and maintenance of specific structures within the program have been ongoing since initial operation. The LRA further states that structures such as buildings, supports, intakes, canals, etc., including roofs, block/masonry walls, liners, steel, etc. have been maintained periodically to ensure their intended function and have been upgraded consistent with regulatory requirements and industry experience.

In the LRA, the applicant concludes that the Structures Monitoring Program provides reasonable assurance that the aging effects will be managed such that the components within the scope of the program will continue to perform their intended functions consistent with the CLB for the period of extended operation. In LRA Section B2.1.32, "Structures Monitoring Program," the applicant described its program to manage the aging of civil structures and components within the scope of license renewal. The LRA states that this program is consistent with GALL program XI.S6, "Structures Monitoring Program , "XI.S5, "Masonry Wall Program," and XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants."

3.0.3.10.2 Staff Evaluation

The staff confirmed the applicant's claim that the Structures Monitoring Program is consistent with GALL during the AMP audit. In addition, for Ginna, the staff determined whether the applicant properly applied the GALL program to its facility. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program.

3.0.3.10.3 Conclusion

On the basis of its review and audit of the applicant's program, the staff finds that this program is consistent with the GALL program. Therefore, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.0.3.11 Systems Monitoring Program

3.0.3.11.1 Summary of Technical Information in the Application

The applicant described its Systems Monitoring Program in Section B2.1.33 of the LRA. The Systems Monitoring Program is credited for aging management of selected components in the various plant systems at Ginna. The Systems Monitoring Program is credited for managing aging effects such as loss of material, cracking, and fouling buildup 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, such as corrosion, cracking, degradation of coatings, sealants and caulking, deformation, and debris and corrosion product buildup. The program is based on scheduled system walkdowns, health reports, and performance monitoring and trending analysis. The program is credited for managing the aging of structures and components in the RCS, ESF, auxiliary systems, SPCS, and structures system groups.

The LRA states that the program is based on guidance developed to implement 10 CFR 50.65 (the Maintenance Rule). This guidance has been in place since the mid 1990s and has resulted in a significant number of corrective actions, demonstrating their effectiveness. This guidance will be enhanced to include (1) visual inspection acceptance criteria that considers the design margins, (2) additional guidance on the evaluation of protective coatings, and (3) additional systems/components, consistent with the scope of license renewal, to a future revision to the appropriate plant procedures.

3.0.3.11.2 Staff Evaluation

The Systems Monitoring Program is not based on a GALL Report program; therefore, the staff reviewed the program using the guidance in Branch Technical Position RLSB-1 in Appendix A of the SRP-LR. The staff's evaluation focused on management of aging effects through incorporation of the following 10 elements from RLSB-1—program scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria, corrective actions, confirmation process, administrative controls, and operating experience. The applicant indicated that the corrective actions, confirmation process, and administrative controls for license renewal are in accordance with the site-controlled Quality Assurance Program. The staff's evaluation of the applicant's Quality Assurance Program is provided separately in Section 3.0.4 of this SER, and the evaluation of the remaining seven elements is provided below. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program.

Program Scope. The LRA states that the program includes the external portions of systems, components, and equipment which are designated as maintenance rule systems and are within the scope of license renewal. The LRA states that the program covers corrosion, cracking, degradation of coatings, sealants and caulking, deformation, and debris and corrosion product buildup. The staff finds this acceptable because it is consistent with the AMR items that credit this program.

Preventive Actions. The LRA states that systems monitoring is primarily a condition monitoring program and, thus, there are no preventative actions. The staff concurs with this assessment and does not identify the need for any preventative actions associated with this program.

Parameters Monitored or Inspected. The LRA states that the surface conditions of system piping and components, including visible portions of insulated components, equipment, supports and closure bolting, are monitored through periodic visual examinations for evidence of leakage, corrosion, cracking, coating degradation, deformation, change in material properties of flexible connections and sealants, fouling, and corrosion product build-up. The staff finds that periodically monitoring these parameters will adequately detect the aging effects covered by this program. Therefore, the staff finds this acceptable.

Detection of Aging Effects. The LRA states that this program relies on visual inspections during walkdowns as the primary means for detection and quantification of aging effects. Accessible portions of the systems are walked down once per quarter, and the entire system is inspected once per operating cycle. The staff finds that visual inspections, conducted during routine system walkdowns, are capable of detecting the aging effects applicable to this program.

Monitoring and Trending. The LRA states that the data from inspections are documented, trended, and evaluated. The LRA also states that the frequency of inspections may be adjusted as necessary based on inspection results and industry experience. The staff finds that the overall monitoring and trending proposed by the applicant are acceptable because they will effectively manage the applicable aging effects.

Acceptance Criteria. The LRA states that the program administrative procedures will be enhanced to include visual inspection acceptance criteria, and that acceptance criteria for external corrosion will consider the design margin of the component being inspected. The staff notes that this program covers a wide variety of components, including metal expansion joints and pump bodies, that may have a wide range of design margin with respect to allowable

corrosion. The staff requested additional information related to the acceptance criteria for the visual inspections. In its response dated May 23, 2003, the applicant stated that the acceptance criteria will be established by an engineering evaluation which will address design code requirements and margins, as well as the need for additional non-destructive inspections. The staff finds that the use of engineering evaluations, using additional inspections and design requirements and margins, as applicable, is appropriate for evaluating the inspection results; therefore, the staff finds this acceptable.

Operating Experience. The LRA states that the systems monitoring inspection requirements have been in place since the mid 1990s in support of the Maintenance Rule, and have resulted in a significant number of corrective actions. The LRA also states that the program will be continually re-assessed and upgraded based on industry and plant-specific operating experience. The applicant concluded that the systems monitoring inspection requirements have proven to be effective in maintaining the material condition of plant systems. The staff finds that the applicant's operating experience supports the conclusion that the program will adequately manage the aging effects in the structures and components that credit this program.

3.0.3.11.3 Conclusion

On the basis of its review of the applicant's program, the staff finds that the Systems Monitoring program adequately addresses the 10 program elements identified in Appendix A of the SRP-LR, and that the program will adequately manage the aging effects for which it is credited so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 50.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

Aging management programs described in the LRA, that are not credited for managing or monitoring aging effects.

3.0.3.12 Existing and GALL Aging Management Programs not Credited for License Renewal

The following programs are described in the LRA, but no credit was taken for managing or monitoring aging effects during the extended period of operation.

3.0.3.12.1 Thermal Aging and Neutron Embrittlement of Austenitic Stainless Steel Program

In LRA Appendix B, Section B2.1.35, the applicant provided a brief summary of its Thermal Aging and Neutron Embrittlement of Austenitic Stainless Steel Program, which is an existing program at Ginna. However, the applicant did not credit this AMP for managing or monitoring aging effects for SSCs within the scope of license renewal and subject to an AMR. Therefore, the staff did not evaluate this program for license renewal.

3.0.3.12.2 Buried Piping and Tank Surveillance Program

3.0.3.12.2.1 Summary of Technical Information in the Application

The applicant describes its AMP for buried piping and tanks surveillance in Section B2.1.8 of the LRA. This program as described in NUREG-1801 (GALL), recommends the use of National Association of Corrosion Engineers (NACE) standards RP-0285-95 and RP-0169-96 for surveillance and mitigating the corrosion of the external surface of buried carbon steel piping and tanks. The applicant stated that it does not employ these standards or credit the surveillance and preventive measure referenced in these standards as aging management program. Instead, the applicant relies on the following 10 programs in maintaining the intended functions of buried carbon steel piping and tanks.

(1) ASME Section XI, Subsections IWB, IWC, IWD, Inservice Inspection
(2) Water Chemistry Control
(3) Open-Cycle Cooling (Service) Water System
(4) Fire Water System
(5) Fuel Oil Chemistry
(6) One-Time Inspection
(7) Buried Piping and Tanks Inspection
(8) Structures Monitoring Program
(9) Periodic Surveillance and Preventive Maintenance
(10) Systems Monitoring

3.0.3.12.2.2 Staff Evaluation

The applicant does not credit this program for aging management of the buried piping and tanks. This is acceptable because, in accordance with the guidance in the GALL Report, the applicant only needs to implement either the Buried Piping and Tanks Surveillance Program or the Buried Piping and Tanks Inspection Program for aging management of buried piping and tanks. Since the applicant has implemented the Buried Piping and Tanks Inspection Program (see Section 3.3.2.3.1), the staff agrees with the applicant that this program is not needed to manage the aging effects of buried piping and tanks.

3.0.3.12.2.3 Conclusion

Based on the fact that the applicant has implemented the Buried Piping and Tanks Inspection Program to manage the aging effects on buried piping and tanks, the staff concludes that the Buried Piping and Tanks Surveillance Program is not needed to manage the aging effects on buried piping and tanks.

3.0.3.12.3 Compressed Air Monitoring

In LRA Appendix B, Section B2.1.10, the applicant provided a brief summary of its Compressed Air Monitoring Program, which is an existing program at Ginna. However, the applicant did not credit this AMP for managing or monitoring aging effects for SSCs within the scope of license renewal and subject to an AMR. Therefore, the staff did not evaluate this program for license renewal.

3.0.3.12.4 Inaccessible Medium Voltage Cables Not Subject to Environmental Qualification

In LRA Appendix B, Section B2.1.17, the applicant provided a brief summary of its Inaccessible Medium Voltage Cables not Subject to Environmental Qualification Program, which is an existing program at Ginna. However, the applicant did not credit this AMP for managing or monitoring aging effects for SSCs within the scope of license renewal and subject to an AMR. Therefore, the staff did not evaluate this program for license renewal.

3.0.3.12.5 Loose Parts Monitoring

In LRA Appendix B, Section B2.1.19, the applicant provided a brief summary of its Loose Parts Monitoring Program, which is an existing program at Ginna. However, the applicant did not credit this AMP for managing or monitoring aging effects for SSCs within the scope of license renewal and subject to an AMR. Therefore, the staff did not evaluate this program for license renewal.

3.0.3.12.6 Neutron Noise Monitoring

In LRA Appendix B, Section B2.1.20, the applicant provided a brief summary of its Neutron Noise Monitoring Program, which is an existing program at Ginna. However, the applicant did not credit this AMP for managing or monitoring aging effects for SSCs within the scope of license renewal and subject to an AMR. Therefore, the staff did not evaluate this program for license renewal.

3.0.3.12.7 Protective Coatings Monitoring and Maintenance

In LRA Appendix B, Section B2.1.24, the applicant provided a brief summary of its Protective Coatings Monitoring and Maintenance Program, which is an existing program at Ginna. However, the applicant did not credit this AMP for managing or monitoring aging effects for SSCs within the scope of license renewal and subject to an AMR. Therefore, the staff did not review the program for consistency with the GALL Section XI.S8 or for adequacy as an AMP.

Although the applicant is not crediting the program as an AMP, the applicant did discuss the 10 elements of an AMP as they relate to their coatings program. It appeared to the staff that this was intended to demonstrate compliance with the resolution of generic safety issue GSI-191 (GSI 191 discusses the clogging of containment emergency sumps and is an open generic safety issue). In order to clarify the applicant's intent in this section of the LRA, the staff submitted RAI B2.1.24-1 requesting the applicant to clarify the intent of providing a discussion on the Protective Coatings Monitoring and Maintenance Program and resolution of GSI 191. The applicant reiterated that the Protective Coatings Monitoring and Maintenance Program is not credited as a license renewal AMP. Further, the applicant indicated that the program's intent and discussion were not intended to demonstrate compliance with the resolution of the GSI which will occur within the CLB.

3.0.3.13 Evaluation Findings

The staff has reviewed the common AMPs in Appendix B of the LRA. On the basis of its review, the staff concludes that the applicant has demonstrated that these AMPs will effectively manage aging in the structures and components for which these AMPs are credited so that

these components will perform their intended functions in accordance with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3). In addition, the staff has reviewed the UFSAR Supplements for these AMPs and concludes that the UFSAR Supplements provide an acceptable description of the programs and activities for managing the effects of aging of the components for which the AMPs are credited, as required by 10 CFR 54.21(d).

3.0.4 R.E. Ginna Quality Assurance Program Attributes Integral to Aging Management Programs

The NRC staff reviewed Appendix B of the LRA, "Aging Management Activities," in accordance with the requirements of 10 CFR 54.21(a)(3) and 10 CFR 54.21(d). A license renewal applicant is required to demonstrate that the effects of aging on structures and components that are subject to an AMR will be adequately managed to ensure that their intended functions will be maintained in a manner that is consistent with the CLB of the facility throughout the period of extended operation. To manage these effects, applicants have developed new or revised existing AMPs and applied those programs to the SSCs of interest. The staff has evaluated the adequacy of certain aspects of the applicant's programs to manage the effects of aging, in particular, the three quality assurance program attributes of corrective action, confirmation process, and administrative controls.

3.0.4.1 Summary of Technical Information in Application

Section 3.0, "Aging Management Review Results," of the LRA, provides an AMR summary for structures and components, or commodity groups, determined during the scoping and screening process to be subject to an AMR. Appendix B, Section B1.0, "Appendix B - Introduction," and Section B2.0, "AMP," of the LRA, provide the AMP descriptions for each program credited for managing aging effects based upon the AMR results provided in Section 3.2 through 3.7 of the LRA. The applicant stated that the existing Quality Assurance Program implements the requirements of 10 CFR 50, Appendix B, and is consistent with the summary in Appendix A.2 of NUREG-1800. The applicant further stated that the Quality Assurance Program includes the elements of corrective action, confirmation process, and administrative control, and would be applicable to safety-related and non-safety-related SSCs that were subject to an AMR during the period of extended operation. AMPs identified as existing or new in Appendix B, Sections B1.3 and B2.0, of the LRA, provide descriptions of the specific attributes of corrective action, confirmation process, and administrative control. A correlation of NUREG-1801 versus Ginna programs credited with aging management is provided in Appendix B, Table B2.0-1, of the LRA.

3.0.4.2 Staff Evaluation

Pursuant to 10 CFR 54.21(a)(3), a license renewal applicant is required to demonstrate that the effects of aging on structures and components subject to an AMR will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation. NUREG-1800, Branch Technical Position RLSB-1, "Aging Management Review - Generic," describes 10 attributes of an acceptable AMP. Three of these 10 attributes are associated with the quality assurance activities of corrective action, confirmation processes,

and administrative controls. Table A.1-1, "Elements of an AMP for License Renewal," of Branch Technical Position RLSB-1 provides the following description of these quality attributes:

- Corrective actions, including root cause determination and prevention of recurrence, should be timely.

- The confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective.

- Administrative controls should provide a formal review and approval process.

NUREG-1800, Branch Technical Position IQMB-1, "Quality Assurance For AMPs," noted that those aspects of the AMP that affect quality of safety-related SSCs are subject to the QA requirements of 10 CFR Part 50, Appendix B. Additionally, for non-safety-related structures and components subject to an AMR, the existing 10 CFR Part 50, Appendix B Quality Assurance Program may be used by the applicant to address the elements of corrective actions, the confirmation process, and administrative controls.

The staff has evaluated the adequacy of certain aspects of the applicant's programs to manage the effects of aging. The particular aspects reviewed by the staff in this section encompass three Quality Assurance Program attributes, namely corrective action, confirmation process, and administrative control. These three attributes of the Quality Assurance Program are used by all of the applicant's AMPs. During the staff's audit of the Ginna scoping and screening methodology, the staff reviewed the applicant's programs described in Appendix A, "Updated Final Safety Analysis Report (UFSAR) Supplement," and Appendix B, "Aging Management Activities," to assure that the aging management activities were consistent with the staff's guidance described in Section A.2, "Quality Assurance for AMP," and Branch Technical Position IQMB-1, regarding QA of the SRP-LR.

Based on the staff's evaluation, the descriptions and applicability of the AMPs and their associated attributes to all safety-related and non-safety-related structures and components provided in Appendix A and Appendix B of the LRA are consistent with the staff's position regarding Quality Assurance for aging management. However, the applicant did not sufficiently describe the use of the Quality Assurance Program and its associated attributes (corrective action, confirmation process, and document control) in the discussions provided for the existing AMPs consistent with those descriptions provided for new programs.

In a letter dated March 21, 2003, the staff submitted RAI 2.1-6 to the applicant which requested that the applicant revise or supplement the descriptions in Appendix A and B, of the LRA, to include a description of the Quality Assurance Program attributes, including references to pertinent implementing guidance as necessary, which are credited for existing programs. In a letter dated May 23, 2003, the applicant provided a response to the RAI which stated that the applicability of the Ginna Quality Assurance Program applies equally to existing programs as to new programs being developed for license renewal. The applicant also stated that the applicability of the Ginna Quality Assurance Program to the AMP attributes of corrective action, confirmation process, and administrative control can be made relative to all of the programs credited to manage aging effects for in-scope SSCs.

Corrective actions are implemented at Ginna in accordance with the requirements of 10 CFR 50, Appendix B, and ANSI N18.7-1976, as committed to in Chapter 17 of the Ginna UFSAR, as described in ND-QAP, "Quality Assurance Program." Provisions for timely evaluation of adverse conditions and implementation of any corrective actions required, including root cause determinations and prevention of recurrence where appropriate, are included in the corrective action program. Corrective actions are implemented through the initiation of an Action Report in accordance with Ginna procedure IP-CAP-1, "Abnormal Condition Tracking Initiation or Notification (Action) Report," and equipment deficiencies are corrected through the initiation of a Work Order in accordance with Ginna procedure A-1603.2, "Work Order Initiation."

The applicant stated that with respect to the confirmation process, it is part of the Corrective a Action Program and that aging management activities required by this program would also reveal any unsatisfactory condition due to ineffective corrective action. Ginna procedure IP-CAP-1 includes provisions for tracking, coordinating, monitoring, reviewing, verifying, validating, and approving corrective actions, to ensure that effective corrective actions are taken. Potentially adverse trends are also monitored through the Action Report process. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of an Action Report. Ginna procedure A-1603.6, "Post-Maintenance/Modification Testing," includes provisions for verifying the completion and effectiveness of corrective actions for equipment deficiencies. The procedure also provides guidance for the selection and documentation of post-maintenance or operability tests, provides guidelines to ensure equipment will perform its intended function prior to return to service, and provides guidelines to ensure the original equipment deficiency is corrected and a new deficiency has not been created.

For administrative control, the applicant stated that the implementing documents are subject to administrative controls, including a formal review and approval process, are implemented in accordance with the requirements of 10 CFR 50, Appendix B, and ANSI N18.7-1976, as committed to in Chapter 17 of the Ginna Station UFSAR, and that various procedures provide the required controls including a formal review and approval process for procedures and other forms of administrative control documents. Ginna procedures ND-PRO, "Procedures, Instructions and Guidelines," and IP-PRO-3, "Procedure Control," provide guidance on procedures and other administrative control documents. IP-PRO-3 provides guidance on procedure hierarchy and classification, content and format, and preparation, revision, review and approval of Nuclear Directives and all Nuclear Operating Group Procedures. Procedure IP-PRO-4, "Procedure Adherence Requirements," establishes procedure usage and adherence requirements. Procedure IP-RDM-3, "Ginna Records," delineates the system for review, submittal, receipt, processing, retrieval, and disposition of Ginna records to meet, as a minimum, the Quality Assurance Program for Station Operation.

Based on the information provided in the LRA, as supplemented by the applicant's response to the staff's RAI dated March 21, 2003, the staff has determined that for all AMPs credited for license renewal, the applicant has provided a sufficient description of the Quality Assurance Program attributes and activities for managing the effects of aging that is consistent with the staff's review guidance in NUREG-1800, Section A.2, "Quality Assurance Program for Aging Management Programs," and Branch Technical Position IQMB-1, regarding QA.

3.0.4.3 Conclusion

Based on the staff's review of the applicant's LRA descriptions and supplemental responses to the request for information regarding the AMP QA attributes credited for license renewal, and the results of the staff's audit of the scoping and screening methodology, the staff finds that the QA attributes described for all AMPs credited for license renewal are consistent with the requirements of 10 CFR 54.21(a)(3) and 10 CFR 54.21(d) and are, therefore, acceptable.

3.1 Reactor Coolant Systems

This section addresses the aging management of the components of the reactor coolant systems group. The systems that make up the reactor coolant systems group are described in the following SER Sections

- Reactor Coolant (2.3.1.1)
- Reactor Vessel (2.3.1.2)
- Reactor Vessel Internals (2.3.1.3)
- Pressurizer (2.3.1.4)
- Steam Generators (2.3.1.5)
- Reactor Coolant (Non-Class 1) (2.3.1.6)

As discussed in Section 3.0.1 of this SER, the components in each of these reactor systems are included in one of two LRA tables. LRA Table 3.2-1 consists of reactor system components that are evaluated in the GALL Report and LRA Table 3.2-2 consists of reactor system components that are not evaluated in the GALL Report.

3.1.1 Summary of Technical Information in the Application

In LRA Section 3.2, the applicant described its AMRs for the RCS at Ginna.

The description of the systems that comprise the reactor systems group can be found in LRA Section 2.3.1.

The passive, long-lived components in these systems that are subject to an AMR are identified in LRA Tables 2.3.1-1, 2.3.1-2, 2.3.1-3, 2.3.1-4, 2.3.1-5, and 2.3.1-6.

The applicant's AMRs included an 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 aging effects that require management. These reviews concluded that the aging effects requiring management based on Ginna operating experience were consistent with aging effects identified in GALL.

The applicant's review of industry operating experience included a review of operating experience through 2002. The results of this review concluded that aging effects requiring

management based on industry operating experience were consistent with aging effects identified in GALL.

The applicant's ongoing review of plant-specific and industry-wide operating experience is conducted in accordance with the Ginna Operating Experience Program.

3.1.2 Staff Evaluation

The staff reviewed LRA Section 3.2 to determine whether the applicant has provided sufficient information to demonstrate that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB throughout the period of extended operation, in accordance with the requirements of 10 CFR 54.21(a)(3), for the RCS components that are determined to be within the scope of license renewal and subject to an AMR.

The applicant referenced the GALL Report in its LRA. The staff has previously evaluated the adequacy of the aging management of reactor system components for license renewal as documented in the GALL Report. Thus, the staff did not repeat its review of the matters described in the GALL Report, except to ensure that the material presented in the LRA was applicable, and to verify that the applicant had identified the appropriate programs as described and evaluated in the GALL Report. The staff evaluated those aging management issues recommended for further evaluation in the GALL Report. The staff also reviewed aging management information submitted by the applicant that was different from that in the GALL Report or was not addressed in the GALL Report. Finally, the staff reviewed the UFSAR Supplement to ensure that it provided an adequate description of the programs credited with managing aging for the reactor system components.

Table 3.1-1 below provides a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.2 that are addressed in the GALL Report.

Table 3.1-1

Staff Evaluation Table for Ginna Reactor System Components in the GALL Report

Component Group	Aging Effect/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Reactor coolant pressure boundary components	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.1 below).
Steam generator shell assembly	Loss of material due to pitting and crevice corrosion	Inservice Inspection; Water Chemistry	Water Chemistry (B2.1.37), ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2), and Steam Generator Tube Integrity (B2.1.31) Programs	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.2 below).
Isolation condenser	Loss of material due to general, pitting and crevice corrosion	Inservice Inspection; Water Chemistry	Not applicable since Ginna is a PWR	BWR-Not applicable since Ginna is a PWR
Pressure vessel ferritic materials that have a neutron fluence greater than 10^{17} n/cm^2 (E>1 MeV)	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR 50 and RG 1.99	TLAA	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.3 below).
Reactor vessel beltline shell and welds	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor Vessel Surveillance	Reactor Vessel Surveillance Program (B1.1.28)	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.3 below).
Westinghouse and B&W baffle/former bolts	Loss of fracture toughness due to neutron irradiation embrittlement and void swelling	Plant Specific	ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2), and Reactor Vessel Internals (B2.1.27) Programs	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.3 below).
Small-bore reactor coolant system and connected systems piping	Crack initiation and growth due to SCC, intergranular SCC, and thermal and mechanical loading	Inservice Inspection; Water Chemistry; One-Time Inspection	Water Chemistry (B2.1.37), ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2), and One-Time Inspection (B2.1.21) Programs	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.4 below).
Jet pump sensing line, and reactor vessel flange leak detection line	Crack initiation and growth due to SCC, intergranular stress corrosion cracking (IGSCC), or cyclic loading	Plant Specific	Water Chemistry (B2.1.37), and One-Time Inspection (B2.1.21) Programs	GALL recommends further evaluation of the reactor vessel flange leak detection line (see Section 3.1.2.2.4 below).
Isolation condenser	Crack initiation and growth due to stress corrosion cracking (SCC) or cyclic loading;	Inservice Inspection; Water Chemistry	Not applicable since Ginna is a PWR	BWR-Not applicable since Ginna is a PWR

Component Group	Aging Effects/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Vessel shell	Crack growth due to cyclic loading	TLAA	TLAA - See SER section 4.3	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.5 below).
Reactor internals	Changes in dimension due to void swelling	Plant Specific	Reactor Vessel Internals (B2.1.27) Program	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.6 below).
PWR core support pads, instrument tubes (bottom head penetrations), pressurizer spray heads and nozzles for the steam generator instruments and drains	Crack initiation and growth due to SCC and/or primary water stress corrosion cracking (PWSCC)	Plant Specific	Water Chemistry (B2.1.37), and Reactor Vessel Head Penetration (B2.1.26) Programs	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.7 below).
Cast austenitic stainless steel (CASS) reactor coolant system piping	Crack initiation and growth due to SCC	Plant Specific	Water Chemistry (B2.1.37),and Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (B2.1.34) Programs	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.7 below).
Pressurizer instrumentation penetrations and heater sheaths and sleeves made of Ni-alloys	Crack initiation and growth due to PWSCC	Inservice Inspection; Water Chemistry	None since there are no pressurizer components fabricated from Alloy 600	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.7 below).
Westinghouse and B&W baffle former bolts	Crack initiation and growth due to SCC and IASCC	Plant Specific	Water Chemistry (B2.1.37), ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2), and Reactor Vessel Internals (B2.1.27) Programs	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.8 below).
Westinghouse and B&W baffle former bolts	Loss of preload due to stress relaxation	Plant Specific	ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2), and Reactor Vessel Internals (B2.1.27) Programs	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.9 below).
Steam generator feedwater impingement plate and support	Loss of section thickness due to erosion	Plant Specific	None, not applicable for Ginna	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.10 below).

Component Group	Aging Effects/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
(Alloy 600) Steam generator tubes, repair sleeves, and plugs	Crack initiation and growth due to PWSCC, outside diameter stress corrosion cracking (ODSCC), and/or intergranular attack (IGA) or loss of material due to wastage and pitting corrosion, and fretting and wear; or deformation due to corrosion at tube support plate intersections	Steam generator tubing integrity; water chemistry	Water Chemistry (B2.1.37), and Steam Generator Tube Integrity (B2.1.31) Programs	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.11 below).
Tube support lattice bars made of carbon steel	Loss of section thickness due to FAC	Plant Specific	None since component fabricated from Type 410 stainless steel	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.12 below).
Carbon steel tube support plate	Ligament cracking due to corrosion	Plant Specific	Water Chemistry (B2.1.37), and Steam Generator Tube Integrity (B2.1.31) Programs	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.13 below).
Steam generator feedwater inlet ring and supports	Loss of material due to flow-corrosion	Combustion Engineering (CE) Steam Generator Feedwater Ring Inspection	None, not applicable for Ginna	Consistent with GALL. GALL recommends further evaluation (see Section 3.1.2.2.14 below).
Reactor vessel closure studs and stud assembly	Crack initiation and growth due to SCC and/or IGSCC	Reactor Head Closure Studs	Reactor Head Closure Studs (B2.1.25) Program	Consistent with GALL (see Section 3.1.2.1 below).
CASS pump casing and valve body	Loss of fracture toughness due to thermal aging embrittlement	Inservice Inspection	ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2) Program	Consistent with GALL (see Section 3.1.2.1 below).
CASS piping	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (B2.1.34) Program	Consistent with GALL (see Section 3.1.2.1 below).
BWR piping and fittings; steam generator components	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated corrosion	Flow Accelerated Corrosion (B2.1.15) Program	BWR piping-Not Applicable. Steam Generator components are discussed in SER Section 3.1.2.3.4
Reactor coolant pressure boundary (RCPB) valve closure bolting, manway and holding bolting, and closure bolting in high pressure and high temperature systems	Loss of material due to wear; loss of preload due to stress relaxation; crack initiation and growth due to cyclic loading and/or SCC	Bolting Integrity	Bolting Integrity (B2.1.5) and ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2) Programs	Consistent with GALL (see Section 3.1.2.1 below).
BWR Feedwater and control rod drive (CRD) return line nozzles	Crack initiation and growth due to cyclic loading	BWR Feedwater nozzle; CRD return line nozzle	Water Chemistry (B2.1.37), and Reactor Vessel Head Penetration (B2.1.26) Programs	BWR-Not applicable since Ginna is a PWR.
Vessel shell attachment welds	Crack initiation and growth due to SCC, IGSCC	BWR vessel ID attachment welds; Water Chemistry	Not applicable since Ginna is a PWR	BWR-Not applicable since Ginna is a PWR.

Component Group	Aging Effects/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Nozzle safe ends, recirculation pump casing, connected systems piping and fittings, body and bonnet of valves	Crack initiation and growth due to SCC, IGSCC	BWR stress corrosion cracking; Water Chemistry	Not applicable since Ginna is a PWR	BWR-Not applicable since Ginna is a PWR.
Penetrations	Crack initiation and growth due to SCC, IGSCC, cyclic loading	BWR penetrations; Water Chemistry	Not applicable since Ginna is a PWR	BWR-Not applicable since Ginna is a PWR.
Core shroud and core plate, support structure, top guide, core spray lines and spargers, jet pump assemblies, control rod drive housing, nuclear instrumentation guide tubes	Crack initiation and growth due to SCC, IGSCC, IASCC	BWR vessel internals; Water Chemistry	Not applicable since Ginna is a PWR	BWR-Not applicable since Ginna is a PWR.
Core shroud and core plate access hole cover (welded and mechanical covers)	Crack initiation and growth due to SCC, IGSCC, IASCC	ASME Section XI Inservice Inspection; Water Chemistry	Not applicable since Ginna is a PWR	BWR-Not applicable since Ginna is a PWR
Jet pump assembly castings; orificed fuel support	Loss of fracture toughness due to thermal aging and neutron embrittlement	Thermal Aging and Neutron Irradiation Embrittlement	Not applicable since Ginna is a PWR	BWR-Not applicable since Ginna is a PWR
Unclad top head and nozzles	Loss of material due to general, pitting, and crevice corrosion	Inservice Inspection; Water Chemistry	Not applicable since Ginna is a PWR	BWR-Not applicable since Ginna is a PWR
CRD nozzle	Crack initiation and growth due to PWSCC	Ni-alloy nozzles and penetrations; water chemistry	Water Chemistry (B2.1.37), and Reactor Vessel Head Penetration (B2.1.26) Programs	Consistent with GALL (see Section 3.1.2.1 below).
Reactor vessel nozzles safe ends and CRD housing; reactor coolant system components (except CASS and bolting)	Crack initiation and growth due to cyclic loading, and/or SCC and PWSCC	Inservice Inspection; water chemistry	Water Chemistry (B2.1.37) and ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2) Programs	Consistent with GALL (see Section 3.1.2.1 below).
Reactor vessel internals CASS components	Loss of fracture toughness due to thermal aging, neutron irradiation embrittlement, and void swelling	Thermal Aging and Neutron Irradiation Embrittlement	None since no reactor vessel internals components made of CASS that serve a license renewal function has been identified	None since no reactor vessel internals components made of CASS that serve a license renewal function has been identified
External surfaces of carbon steel components in reactor coolant system pressure boundary	Loss of material due to boric acid corrosion	Boric Acid Corrosion	Boric Acid Corrosion (B2.1.6) Program	Consistent with GALL (see Section 3.1.2.1 below).
Once Through Steam generator secondary manways and handholds (CS)	Loss of material due to erosion	Inservice Inspection	None since Ginna is not a Once Through Steam Generator	Consistent with GALL (see Section 3.1.2.1 below).

Component Group	Aging Effects/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Reactor internals, reactor vessel closure studs, and core support pads	Loss of material due to wear	Inservice Inspection	ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2) Program	Consistent with GALL (see Section 3.1.2.1 below).
Pressurizer integral support	Crack initiation and growth due to cyclic loading	Inservice Inspection	ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2) Program	Consistent with GALL (see Section 3.1.2.1 below).
Upper and lower internal assembly (Westinghouse)	Loss of preload due to stress relaxation	Inservice Inspection; Loose Part and/or Neutron Noise Monitoring	ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2) Program	Not Consistent with GALL - No loose parts and no neutron noise monitoring (see SER Section 3.1.2.4.3.2).
Reactor vessel internals in fuel zone region (except Westinghouse and Babcock & Wilcox [B&W] baffle bolts)	Loss of fracture toughness due to neutron irradiation embrittlement, and void swelling	PWR Vessel Internals; Water Chemistry	Reactor Vessel Internals (B2.1.27) Program	Consistent with GALL (see Section 3.1.2.1 below).
Steam generator upper and lower heads; tubesheets; primary nozzles and safe ends	Crack initiation and growth due to SCC, PWSCC, IASCC	Inservice Inspection; Water Chemistry	Water Chemistry (B2.1.37) and ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2) Programs	Consistent with GALL (see Section 3.1.2.1 below).
Vessel internals (except Westinghouse and B&W baffle former bolts)	Crack initiation and growth due to SCC and IASCC	PWR Vessel Internals; Water Chemistry	Water Chemistry (B2.1.37) and ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2) Programs	Consistent with GALL (see Section 3.1.2.1 below).
Reactor internals (B&W screws and bolts)	Loss of preload due to stress relaxation	Inservice inspection; Loose Part Monitoring	Not applicable since Ginna is not a B&W designed plant	Consistent with GALL (see Section 3.1.2.1 below).
Reactor vessel closure studs and stud assembly	Loss of material due to wear	Reactor Head Closure Studs	Reactor Head Closure Studs (B2.1.25) Program	Consistent with GALL (see Section 3.1.2.1 below).
Reactor internals (Westinghouse upper and lower internal assemblies; CE bolts and tie rods)	Loss of preload due to stress relaxation	Inservice Inspection; Loose Part Monitoring	ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection (B2.1.2) Program	Not Consistent with GALL - No loose parts and no neutron noise monitoring (see SER Section 3.1.2.4.3.2).

The staff's review of the reactor systems group for the Ginna LRA is contained within four sections of this SER. Section 3.1.2.1 is the staff review of components in the reactor systems that the applicant indicates are consistent with GALL and do not require further evaluation. Section 3.1.2.2 is the staff review of components in the reactor systems that the applicant indicates are consistent with GALL and GALL recommends further evaluation. Section 3.1.2.3 is the staff evaluation of AMP that are specific to the reactor systems. Section 3.1.2.4 contains an evaluation of the adequacy of aging management for components in each system in the reactor systems group and includes an evaluation of components in the reactor systems that the applicant indicates are not in GALL. Section 3.1.2.4 is divided into six subsections, reactor

coolant (Class 1), reactor vessel, reactor vessel internals, pressurizer, steam generators, and reactor coolant (Non-Class 1).

3.1.2.1 Aging Management Evaluations in the GALL Report That Are Relied On For License Renewal, Which Do Not Require Further Evaluation

For component groups evaluated in GALL for which the applicant has claimed consistency with GALL, and for which GALL does not recommend further evaluation, the staff sampled components in these groups to determine whether the plant-specific components contained in these GALL component groups were bounded by the GALL evaluation. The staff also sampled component groups to determine whether the applicant had properly identified those component groups in GALL that were not applicable to its plant. The staff identified several areas where additional information or clarification was needed. The staff's evaluation of the applicants responses to those RAIs is included in Section 3.1.2.4 of this SER.

On the basis of its review, the staff has verified the applicant's claim of consistency with the GALL report. The staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 50.21(a)(3).

3.1.2.1.1 Cracking of CRD Housings

Programs identified in GALL are generic programs. When components experience unusual aging effects, the programs identified in GALL may not be applicable. Control rod drive (CRD) housings (LRA Table 3.2-1, Item 23) are identified as being susceptible to SCC and PWSCC with aging management provided by the Water Chemistry Program (B2.1.37) and the Reactor Vessel Head Penetration Program (B2.1.26). Cracking has been reported on CRD Housings at Fort Calhoun (January 25, 2002, letter from Omaha Public Power District (OPPD)) and Palisades (Nuclear Management Company letters to NRC dated August 20, 2001, and March 14, 2002). To determine whether the proposed AMPs are adequate for the Ginna CRD housings, the staff requested that (a) the applicant compare the design and materials used in the Ginna CRD housings to those in the Palisades and Fort Calhoun housings, and (b) the applicant provide the inspection history for the Ginna CRD housings.

In response to RAI 3.1.2-1 in a May 13, 2003, letter, the applicant indicates that the materials of construction and design of the CRD housings at Fort Calhoun and Palisades, which are both Combustion Engineering design plants, are different from those at Ginna, which is a Westinghouse design plant. The CRD housings at Fort Calhoun and Palisades are flanged and bolted. The upper housing assembly is fabricated from Type 347 stainless steel. The cracking observed at Fort Calhoun occurred at the upper housing assembly pipe-to-eccentric reducer weld. The through-wall crack was axially oriented and located in the weld. No such configuration or materials exist in the Ginna CRD housings.

The upper CRD housings on the Ginna reactor vessel are joined to the CRD nozzle adapters by a threaded connection which is the pressure boundary. The adapter and housing are both Type 304 stainless steel. The Type 304 adapter is welded to the Alloy 600 CRD nozzle by a full penetration single V-groove butt weld using Alloy 82/182 weld metal. These welds have been periodically examined on the peripheral CRD rows by both dye-penetrant and ultrasonic testing.

No evidence of leakage from these welds has ever been observed. The upper CRD housing contains no pressure-boundary welds, and therefore the combination of materials and design which resulted in the cracking observed at Fort Calhoun and Palisades does not exist at Ginna. Since the CRD upper housings at Ginna do not contain welds and the cracking at FCS was observed in the welds in the CRD upper housing, the Ginna CRD upper housings will not be susceptible to the type of cracking observed in the Fort Calhoun CRD upper housings and the proposed AMPs need not be modified.

3.1.2.2 Aging Management Evaluations in the GALL Report That Are Relied On For License Renewal, For Which GALL Recommends Further Evaluation

For component groups evaluated in GALL for which the applicant has claimed consistency with GALL, and for which GALL recommends further evaluation, the staff reviewed the applicant's evaluation to determine whether it adequately addressed the issues for which GALL recommended further evaluation. In addition, the staff sampled components in these groups to determine whether the plant-specific components contained in these GALL component groups were bounded by the GALL evaluation.

The GALL Report indicates that further evaluation should be performed for the following.

3.1.2.2.1 Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The staff's evaluation of this TLAA is documented in Section 4.3 of this SER, following the guidance in Section 4.3 of the SRP-LR.

3.1.2.2.2 Loss of Material due to Pitting and Crevice Corrosion

Loss of material due to pitting and crevice corrosion could occur in the pressurized water reactor (PWR) steam generator shell assembly. The existing program relies on control of chemistry to mitigate corrosion and ISI to detect loss of material. The extent and schedule of the existing steam generator inspections are designed to ensure that flaws cannot attain a depth sufficient to threaten the integrity of the welds. However, according to NRC Information Notice (IN) 90-04, "Cracking of the Upper Shell-to-Transition Cone Girth Welds in Steam Generators," January 26, 1990, if general corrosion pitting of the shell exists, the program may not be sufficient to detect pitting and corrosion. The GALL Report recommends augmented inspection to manage this aging effect. The staff review verifies that the applicant has proposed a program that will manage loss of material due to pitting and crevice corrosion by providing enhanced inspection and supplemental methods to detect loss of material and ensure that the component intended functions will be maintained during the period of extended operation.

The applicant proposed the Water Chemistry (B2.1.37), ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection (B2.1.2), and Steam Generator Tube Integrity (B2.1.31) Programs to manage loss of material due to pitting and crevice corrosion in steam generator shell assembly. The Water Chemistry Program is reviewed in SER Section 3.0.3.1. The ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection Program is reviewed in SER section 3.0.3.2. The Steam Generator Tube Integrity Program is reviewed in SER Section 3.1.2.3.5.

On the basis of its review, the staff finds that the applicant has adequately evaluated the AMR results involving management of loss of material due to pitting and crevice corrosion for components in the reactor system, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

Certain aspects of neutron irradiation embrittlement are TLAAs as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The staff's evaluation of this TLAA can be found in Section 4.2 of this SER, following the guidance in Section 4.2 of the SRP-LR.

Loss of fracture toughness due to neutron irradiation embrittlement could occur in the reactor vessel. A Reactor Vessel Materials Surveillance Program monitors neutron irradiation embrittlement of the reactor vessel. Reactor vessel surveillance programs are plant-specific, depending on matters such as the composition of limiting materials, availability of surveillance capsules, and projected fluence levels. In accordance with 10 CFR Part 50, Appendix H, an applicant is required to submit its proposed withdrawal schedule for approval prior to implementation. Thus, further staff evaluation is required for license renewal. The GALL Report recommends further evaluation of the Reactor Vessel Materials Surveillance Program for the period of extended operation. The staff verifies that the applicant has proposed an adequate Reactor Vessel Materials Surveillance Program for the period of extended operation.

The limiting beltline material in the Ginna reactor vessel is the intermediate-to-lower shell beltline circumferential weld. The Ginna Reactor Vessel Surveillance Program, in conjunction with TLAA, effectively manages loss of fracture toughness in the beltline materials. The Reactor Vessel Surveillance Program provides adequate material property and neutron dosimetry data to predict fracture toughness in beltline materials at the end of the period of extended operation. In addition, equivalent margins analyses have been performed in accordance with 10 CFR 50, Appendix G methods. These fracture mechanics analyses (see TLAAs, SER Section 4.2) provide assurance that beltline material toughness values in the Ginna reactor vessel will remain at acceptable levels through the period of extended operation. The Reactor Vessel Surveillance Program is reviewed in SER section 3.1.2.3.4.

Loss of fracture toughness due to neutron irradiation embrittlement and void swelling could occur in Westinghouse and Babcock and Wilcox (B&W) baffle/former bolts. The staff reviews the applicant's proposed program on a case-by case basis to ensure that an adequate program will be in place for management of these aging effects. A combination of the ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program and the Reactor Vessel Internals Program will be used to manage loss of fracture toughness due to neutron irradiation embrittlement and void swelling in baffle/former bolts. Ginna will continue to participate in Westinghouse Owner's Group (WOG) activities and monitor industry initiatives for the purpose of evaluating the significance of void swelling on selected PWR reactor vessel internals components. As new information and technology becomes available, the plant-specific Reactor Vessel Internals Program will be modified to incorporate enhanced surveillance techniques.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of loss of fracture toughness due to neutron irradiation embrittlement for components in the reactor system, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.4 Crack Initiation and Growth Due to Thermal and Mechanical Loading or Stress Corrosion Cracking

Crack initiation and growth due to thermal and mechanical loading or SCC (including intergranular stress corrosion cracking [IGSCC]) could occur in small-bore reactor coolant system and connected system piping less than NPS 4 inches. The existing program relies on ASME Section XI ISI and on control of water chemistry to mitigate SCC. The GALL Report recommends that a plant-specific destructive examination or an NDE that permits inspection of the inside surfaces of the piping be conducted to ensure that cracking has not occurred and the component intended function will be maintained during the extended period. The AMPs should be augmented by verifying that service-induced weld cracking is not occurring in the small-bore piping less than NPS 4 inches, including pipe, fittings, and branch connections. A one-time inspection of a sample of locations is an acceptable method to ensure that the aging effect is not occurring and the component's intended function will be maintained during the period of extended operation. GALL Chapter XI.M32, "One-Time Inspection," contains an acceptable verification method.

The GALL Report recommends that the inspection include a representative sample of the system population, and, where practical and prudent, focus on the bounding or lead components most susceptible to aging due to time in service, severity of operating conditions, and lowest design margin. For small-bore piping, actual inspection locations should be based on physical accessibility, exposure levels, NDE techniques, and locations identified in IN 97-46, "Unisolable Crack in High-Pressure Injection Piping." Combinations of NDE, including visual, ultrasonic, and surface techniques, are performed by qualified personnel following procedures consistent with the ASME Code and 10 CFR 50 Appendix B. For small-bore piping less than NPS 4 inches, including pipe, fittings, and branch connections, a plant-specific destructive examination or NDE that permits inspection of the inside surfaces of the piping should be conducted to ensure that cracking has not occurred. Follow up of unacceptable inspection findings should include expansion of the inspection sample size and locations. The inspection and test techniques prescribed by the program should verify any aging effects because these techniques, used by qualified personnel, have been proven effective and consistent with staff expectations. The staff's review confirms that the program includes measures to verify that unacceptable degradation is not occurring, thereby validating the effectiveness of existing programs, or confirming that there is no need to manage aging-related degradation for the period of extended operation. If an applicant proposes a one-time inspection of select components and susceptible locations to ensure that corrosion is not occurring, the reviewer verifies that the proposed inspection will be performed using techniques similar to ASME Code and ASTM standards, including visual, ultrasonic, and surface techniques, to ensure that the component's intended function will be maintained during the period of extended operation.

Aging management of service-induced cracking will be accomplished by a combination of the Water Chemistry Control Program and the One-Time Inspection Program (described in Appendix B). A sample of small-bore piping welds will be inspected using appropriate volumetric examination techniques near, but prior to, the end of the current license period. This sample will be selected to include various piping sizes, configurations, and flow conditions. If a flaw is detected in the sample, the successive examinations described in ASME Code, Section XI, IWB-2420 and additional examinations as described in IWB-2430 would apply as appropriate.

Based on operating experiences of small bore piping in RCS, the staff is concerned that small bore piping in the RCS could be susceptible to SCC and thermal fatigue resulting from turbulent penetration and thermal stratification.

In response to RAI 3.2.1-1 in a May 13, 2003, letter, the applicant indicates that the sample population of small-bore (< 4 inches NPS) Class 1 RCS and connected systems piping welds will be derived using ASME Section XI Code, 1995 Edition with 1996 Addenda, Category B-J. All locations are considered susceptible to cracking due to SCC. An assessment of small-bore piping for susceptibility to thermal fatigue has also been performed. This assessment included Class 1 piping systems that are connected to the reactor coolant pressure boundary and are normally stagnant and not isolable from the reactor coolant pressure boundary, including safety injection, residual heat removal, drain, alternate charging, and auxiliary spray lines. The assessment addressed the potential for leakage, stratification, and turbulence penetration using interim thermal fatigue management guidelines developed by EPRI/Materials Reliability Program (MRP). Locations judged to be potentially susceptible to thermal fatigue will be included in the sample population of small bore piping to be examined by an appropriate volumetric technique.

The GALL Report recommends that a plant-specific AMP be evaluated for the management of crack initiation and growth due to thermal and mechanical loading or SCC (including IGSCC) in boiling water reactor (BWR) vessel flange leak detection line and BWR jet pump sensing line. Since reactor vessel flange leak detection lines are also utilized in PWRs, this issue is applicable to PWRs. The staff reviews the applicant’s proposed program on a case-by-case basis to ensure that an adequate program will be in place for the management of these aging effects.

The reactor vessel leak detection line is fabricated from stainless steel. The portion of the line that is in scope to license renewal is included in the small-bore piping category. Aging management of service-induced cracking will be accomplished by a combination of the Water Chemistry Control Program and the One-Time Inspection Program (described in Appendix B).

GALL AMP XI.M32 indicates the one-time inspection is to be utilized when an aging effect is not expected to occur but there is insufficient data to completely rule it out or an aging effect is expected to progress very slowly. The one-time inspection provides additional assurance that either aging is not occurring or the evidence of aging is so insignificant that an aging management program is not warranted. In order to determine whether crack initiation and growth for the reactor vessel flange leak detection line is not expected to occur, the applicant must review its inspection records to determine whether this aging effect has previously occurred at Ginna. If it has not occurred the proposed program is acceptable. If a component has experienced this aging effect in the past, the applicant should identify when it occurred, the

corrective action, and the reason for not expecting it to occur in the future. If this aging effect is expected to occur in the future, periodic examination is necessary.

In response to RAI 3.1.2-2 in a May 13, 2003, letter, the applicant indicated that a review of plant specific operating experience revealed that there had been no age-related degradation of the reactor vessel flange leak detection line. Since there has been no age-related degradation of the reactor vessel flange leak detection line, the staff believes that cracking of this line is not likely and therefore, the One-Time Inspection Program is appropriate in managing the aging effect of crack initiation and growth.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of crack initiation and growth due to thermal and mechanical loading or stress corrosion cracking for components in the reactor system, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.5 Crack Growth Due to Cyclic Loading

The GALL Report recommends further evaluation of programs to manage crack growth due to cyclic loading in reactor vessel shell. Crack growth due to cyclic loading in reactor vessel shells are evaluated as a TLAA. Growth of intergranular separations (underclad cracks) in low-alloy or carbon steel heat affected zones under austenitic stainless steel cladding is a TLAA to be evaluated for the period of extended operation for all the SA 508-Cl 2 forgings where the cladding was deposited with a high heat input welding process. The methodology for evaluating the underclad flaw should be consistent with the current well-established flaw evaluation procedure and criterion in the ASME Section XI Code. Section 4.7, "Other Plant-Specific Time-Limited Aging Analysis," of the SRP-LR provides generic guidance for meeting the requirements of 10 CFR 54.21(c). The staff's evaluation of this TLAA can be found in Section 4.3.2.3 of this SER, following the guidance in Section 4.7 of the SRP-LR.

3.1.2.2.6 Changes in Dimension Due to Void Swelling (PWR)

Changes in dimension due to void swelling could occur in reactor vessel internal components. The GALL Report recommends further evaluation to ensure that this aging effect is adequately managed. The reactor vessel internals receive a visual inspection (VT-3) according to Category B-N-3 of Subsection IXB of ASME Section XI. However, this inspection is not sufficient to detect the effects of changes in dimension due to void swelling. Therefore, the GALL Report recommends that a plant-specific AMP should be evaluated. The applicant provides a plant-specific AMP or participates in industry programs to investigate aging effects and determine an appropriate AMP. Otherwise, the applicant provides the basis for concluding that void swelling is not an issue for the component. The applicant should either provide the basis for concluding that void swelling is not an issue for the component or provide a program to manage the effects of changes in dimension due to void swelling and the loss of ductility associated with swelling. The staff verifies that the applicant has either proposed a program to manage changes in dimension due to void swelling in the pressure vessel internal components or provided the basis for concluding that void swelling is not an issue.

The Reactor Vessel Internals Program manages changes in dimension due to void swelling. In addition to ISIs performed according to the requirements of ASME Section XI, Subsection IWB, the Reactor Vessel Internals Program provides for augmented visual (VT-1) inspections for certain susceptible (or limiting) components using high resolution techniques yet to be developed. Ginna will continue to participate in industry investigations of aging effects applicable to reactor vessel internals as well as initiatives to develop advanced inspection techniques which will permit resolution and measurement of very small features of interest. Ginna will incorporate applicable results of industry initiatives related to void swelling in the Reactor Vessel Internals Program.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of changes in dimension due to void swelling for components in the reactor system, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.7 Crack Initiation and Growth Due to Stress Corrosion Cracking or Primary Water Stress Corrosion Cracking

Crack initiation and growth due to SCC and PWSCC could occur in PWR 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. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of the SRP-LR). The staff reviews the applicant's proposed program to ensure that an adequate program will be in place for the management of these aging effects.

Crack initiation and growth due to SCC could occur in PWR cast austenitic stainless steel (CASS) RCS piping and fittings and the pressurizer surge line nozzle. For PWR's, the GALL Report recommends further evaluation of piping that does not meet the reactor water chemistry guidelines of TR-105714, "PWR Primary Water Chemistry Guidelines, Revision 3," November 1995. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of the SRP-LR). The staff reviews the applicant's proposed program to ensure that an adequate program will be in place for the management of these aging effects.

Crack initiation and growth due to PWSCC could occur in PWR pressurizer instrumentation penetrations and heater sheaths and sleeves made of nickel-based 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 components fabricated from nickel-based alloys. The GALL Report recommends that the applicant provide a plant-specific AMP or participate in industry programs to determine an appropriate AMP for PWSCC of Inconel 182 weld. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of the SRP-LR). The staff reviews the applicant's proposed program to ensure that an adequate program will be in place for the management of these aging effects.

The pressurizer spray head performs no license renewal intended functions as defined in 10 CFR 54.4 at Ginna. Therefore, AMR review is not required for the pressurizer spray head. In response to RAI 3.2.2-2 in a May 13, 2003, letter the applicant indicated that there are no locations in the RCS piping at Ginna which contain Alloy 82/182 welds or weld buttering. The only Alloy 600 and Alloy 82/182 materials in the RCS at Ginna are located in the reactor vessel and the replacement steam generators. The control rod drive mechanism (CRDM) nozzles in the reactor vessel closure head and the BMI penetrations in the bottom head are Alloy 600 and are welded to the heads with partial penetration J-groove Alloy 82/182 welds. The radial core support pads in the reactor vessel are Alloy 600 and are welded to the lower shell with Alloy 82/182 weld metal. The tubesheets in the replacement steam generators are overlaid with Alloy 82 weld metal (nonpressure boundary). The reactor vessel closure head is scheduled to be replaced at Ginna in the fall of 2003. The replacement head will have Alloy 690 penetrations welded to the head with partial penetration J-groove Alloy 52 welds. In response to RAI 3.2.1-2 in a May 13, 2003, letter, the applicant indicates that the core support pads and bottom head instrumentation penetrations are included in the scope of the Reactor Vessel Head Penetration Inspection Program and will be evaluated as part of any industry initiatives related to management of cracking in Alloy 600 penetrations. The Reactor Vessel Head Penetration Inspection Program is a plant-specific program which includes participation in industry initiatives related to management of Alloy 600 penetration cracking issues. The Reactor Vessel Head Penetration Program is discussed in SER Section 3.1.2.3.2.

The steam generator instrument nozzles are low-alloy steel, not Alloy 600, and therefore are not included in this component group. Since the steam generator instrument nozzles are fabricated from low-alloy steel, they are not susceptible to crack initiation and growth due to SCC or PWSCC.

The RCS piping is forged Type 316 stainless steel and the fittings (elbows) and RCP casings are CASS (Type CF8M). Crack initiation and growth due to SCC was identified as an aging effect requiring management for RCS CASS components. The Ginna Water Chemistry Control Program monitors and controls primary water chemistry in accordance with the guidelines of EPRI TR-105714 (Rev. 5). Since the Water Chemistry Control Program is in accordance with the guidelines of EPRI TR-105714, the Type 316 stainless steel and CASS (Type CF8M) components will not be susceptible to crack initiation and growth due to SCC or PWSCC.

Instrument penetrations, heater well tubes, and adapters are wrought Type 316 stainless steel. Since instrumentation, heater well tubes, and adapters are not fabricated from nickel based alloys, they are not susceptible to crack initiation and growth due to SCC or PWSCC in PWR reactor coolant.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of crack initiation and growth due to SCC or PWSCC for components in the reactor system, as recommended in the GALL report. Since the applicant’s AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.8 Crack Initiation and Growth Due to Stress Corrosion Cracking or Irradiation-Assisted Stress Corrosion Cracking

Crack initiation and growth due to SCC or irradiation-assisted stress corrosion cracking (IASCC) could occur in baffle/former bolts in Westinghouse and B&W reactors.

A combination of the Water Chemistry Control Program, ASME Section XI, Subsections IWB, IWC and IWD Inservice Inspection Program and the Reactor Vessel Internals Program will be used to manage this aging effect. Ginna will continue to participate in WOG activities and monitor industry initiatives for the purpose of evaluating the significance of cracking due to IASCC on selected PWR reactor vessel internals components. As new information and technology becomes available, the plant-specific Reactor Vessel Internals Program will be modified to incorporate enhanced surveillance techniques.

On the basis of its review, the staff finds that the applicant has adequately evaluated the management of crack initiation and growth due to SCC or IASCC for components in the reactor system, as recommended in the GALL Report. On the basis of this finding, and the finding that the remainder of the applicant’s program is consistent with GALL, the staff concludes that there is reasonable assurance that this aging effect will be adequately managed during the period of extended operation.

3.1.2.2.9 Loss of Preload due to Stress Relaxation

Loss of preload due to stress relaxation could occur in baffle/former bolts in Westinghouse and B&W reactors.

Loss of preload due to stress relaxation will be managed jointly by the ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program and the Reactor Vessel Internals Program. Ginna will continue to participate in industry investigations of aging effects applicable to reactor vessel internals as well as initiatives to develop advanced inspection techniques which will permit resolution and measurement of very small features of interest. Aging management activities or surveillance techniques resulting from these initiatives will be incorporated, as required, as enhancements to the Reactor Vessel Internals Program.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of loss of preload due to stress relaxation for components in the reactor system, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.10 Loss of Section Thickness Due to Erosion

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. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this standard review plan).

The staff reviews the applicant’s proposed program to ensure that an adequate program will be in place for the management of these aging effects.

This component group is not applicable to Ginna. The feedwater delivery to the steam generators at Ginna is through feed rings to Alloy 690 J-tubes. The feed rings and J-tubes perform no license renewal intended function.

3.1.2.2.11 Crack Initiation and Growth Due to PWSCC, ODSCC, or Intergranular Attack, or Loss of Material Due to Wastage and Pitting Corrosion, or Loss of Section Thickness Due to Fretting and Wear, or Denting due to Corrosion of Carbon Steel Tube Support Plate

Crack initiation and growth due to PWSCC, ODSCC, or intergranular attack (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 degradation management program described in NEI 97-06, "Steam Generator Program Guidelines." The GALL Report recommends that an AMP based on the recommendation of staff-approved NEI 97-06 guidelines, or other alternate regulatory basis for steam generator degradation management, should be developed to ensure that this aging effect is adequately managed. At present, the staff does not plan to endorse NEI 97-06 or detailed industry guidelines referenced therein. The staff is working with the industry to revise plant technical specifications to incorporate the essential elements of the industry's NEI 97-06 initiative, as necessary, to ensure tube integrity is maintained. This would require implementation of programs to ensure that performance criteria for tube structural and leakage integrity are maintained, consistent with the plant design and licensing basis. NEI 97-06 provides guidance on programmatic details for accomplishing this objective. These guidelines apply to all degradation or damage mechanisms. However, these programmatic details would be outside the scope of the technical specifications. As part of the NRC Reactor Oversight Program, NRC would monitor the effectiveness of these programs in terms of whether the goals of these programs are being met; namely, that the tube structural and leakage integrity performance criteria are in fact being maintained. The staff reviews the applicant's proposed program to ensure that an adequate program will be in place for the management of these aging effects for the period of extended operation.

The applicant has proposed to manage (1) crack initiation and growth due to PWSCC, ODSCC, or IGA, or (2) loss of material due to wastage and pitting corrosion, or (3) loss of section thickness due to fretting and wear, or denting due to corrosion of carbon steel tube support plate, in the steam generator tubes, repair sleeves and plugs by the Steam Generator Integrity Program and Water Chemistry Control Program. The staff's review of the Steam Generator Integrity Program is discussed in SER Section 3.1.2.3.5. The staff's review of the Water Chemistry Control Program is discussed in SER Section 3.0.3.1.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of crack initiation and growth due to PWSCC, ODSCC, or IGA 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 for components in the reactor system, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be

maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.12 Loss of Section Thickness Due to Flow-accelerated Corrosion

Loss of section thickness due to FAC could occur in steam generator tube support lattice bars made of carbon steel. The GALL Report recommends further evaluation of loss of section thickness due to FAC of the tube support lattice bars made of carbon steel. The GALL Report recommends 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 should be developed to ensure that this aging effect is adequately managed. The staff reviews the applicant's proposed program to ensure that an adequate program will be in place for the management of these aging effects. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of the SRP-LR).

Tube support lattice bars are fabricated from Type 410 stainless steel in Ginna replacement steam generators. Type 410 stainless steel is not susceptible to FAC. Therefore, this component group is not applicable to Ginna. A discussion of steam generator components susceptible to FAC is given in Item 21 in Table 3.2-1 of the application.

3.1.2.2.13 Ligament Cracking Due to Corrosion

Ligament cracking due to corrosion could occur in carbon steel components in the steam generator tube support plate. The GALL Report recommends further evaluation of ligament cracking due to corrosion in carbon steel components in the steam generator tube support plate. All PWR licensees have committed voluntarily to a steam generator degradation management program described in NEI 97-06; these guidelines are currently under NRC staff review. The GALL Report recommends that an AMP based on the recommendations of staff-approved NEI 97-06 guidelines, or other alternate regulatory basis for steam generator degradation management, be developed to ensure that this aging effect is adequately managed. The staff reviews the applicant's proposed program on a case-by-case basis to ensure that an adequate program will be in place for the management of these aging effects.

Cracking due to SCC and loss of material due to pitting and crevice corrosion were identified as aging effects requiring management for the lattice grid support bars in the Ginna steam generators. These aging effects are managed jointly by the Water Chemistry Control Program and the Steam Generator Tube Integrity Program, which provides for secondary side inspections to verify the effectiveness of water chemistry control . These AMPs will be identified in Appendix B. Item 17 in Table 3.2-1 indicates that there are no carbon steel tube support plates in Ginna. Therefore, ligament cracking due to corrosion is not applicable to Ginna.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of ligament cracking due to corrosion for components in the reactor system, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.14 Loss of Material due to Flow-accelerated Corrosion

Loss of material due to FAC could occur in the feedwater inlet ring and supports. The GALL Report recommends that a plant-specific AMP be evaluated to manage loss of material due to flow-accelerated corrosion in the feedwater inlet ring and supports. As noted in IN 90-04, IN 91-19, "Steam Generator Feedwater Distribution Piping Damage," and licensee event report (LER) 50-362/90-05-01, this form of degradation has been detected only in certain CE System 80 steam generators. The GALL Report recommends that a plant-specific AMP be evaluated because existing programs may not be capable of mitigating or detecting loss of material due to FAC. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of this standard review plan). The staff reviews the applicant's proposed program to ensure that an adequate program will be in place for the management of these aging effects.

This component group is not applicable to Ginna. The feedwater delivery to the steam generators at Ginna is through feed rings to Alloy 690 J-tubes. The feed rings and J-tubes perform no license renewal intended function.

3.1.2.2.15 Conclusions

The staff has reviewed the applicant's evaluation of the issues for which GALL recommends further evaluation for components in the reactor systems. On the basis of its review, the staff finds that the applicant has adequately evaluated the management of the issues for which the GALL Report recommends further evaluation for components in the reactor system. On the basis of this finding, and the finding that the remainder of the applicant's program is consistent with GALL, the staff concludes that there is reasonable assurance that these aging effects will be adequately managed during the period of extended operation.

3.1.2.3 Aging Management Programs for Reactor Coolant System Components

In SER Sections 3.1.2.1 and 3.1.2.2, the staff determined that the applicant's AMRs and associated AMPs will adequately manage component aging in the reactor systems. The staff then reviewed specific components in the reactor systems to ensure that they were properly evaluated in the applicant's AMR.

To perform its evaluation, the staff reviewed the components listed in LRA Tables 2.3.1-1 through 2.3.1-6 to determine whether the applicant had properly identified the applicable AMRs and AMPs needed to adequately manage the aging effects for the components. This portion of the staff review involved identification of the aging effects for each component, ensuring that each aging effect was evaluated using the appropriate AMR in Section 3, and that management of the aging effect was captured in the appropriate AMP. The results of the staff's review are provided below.

The staff also reviewed the UFSAR Supplements for the AMPs credited with managing aging in reactor system components to determine whether the program description adequately describes the program.

The applicant credits 15 AMPs to manage the aging effects associated with components in the RCS. Seven of the AMPs are credited to manage aging for components in other system groups (common AMPs) while eight AMPs are credited with managing aging only for RCS

components. The staff's evaluation of the common AMPs that are credited with managing aging in RCS components is provided in Section 3.0.3 of this SER. The common AMPs along with their section numbers, are listed here;

- Water Chemistry Program (3.0.3.1)
- ASME Section XI, Subsections IWB, IWC and IWD Inservice Inspection Program (3.0.3.2)
- Bolting Integrity Program (3.0.3.3)
- Boric Acid Corrosion Prevention Program (3.0.3.4)
- One-Time Inspection Program (3.0.3.7)
- Periodic Surveillance and Preventive Maintenance Program (3.0.3.8)
- System Monitoring Program (3.0.3.11)

The staff's evaluation of the seven RCS AMPs are provided below.

3.1.2.3.1 Reactor Head Closure Studs Program

<u>3.1.2.3.1.1 Summary of Technical Information in the Application.</u> The applicant's Reactor Head Closure Studs Program is discussed in LRA Section B2.1.25, "Reactor Head Closure Studs." Component item (18) in Table 3.2-1 indicates that this program is consistent with GALL except that SCC has not been identified as an applicable aging effect. The Reactor Head Closure Stud Program includes (a) ISI in accordance with the requirements of the ASME Code, Section XI, Subsection IWB (1995 Edition through the 1996 Addenda), Table IWB 2500-1, and (b) preventive measures to mitigate cracking. The ISI portion of the program is described in its entirety in the program description for "ASME Section XI, Subsection IWB, IWC, and IWD, Inservice Inspection." The reactor head closure studs are fabricated from ASME SA-320 Grade L43 American Iron and Steel Institute (AISI 4340) low-alloy steel and according to the applicant are not susceptible to SCC (specified minimum yield strength of 105 ksi). A comprehensive discussion of this subject is provided in the program description for "Bolting Integrity," (Section 3.0.3.3).

<u>3.1.2.3.1.2 Staff Evaluation</u>. GALL indicates that reactor head closure studs are susceptible to loss of material due to wear, and to crack initiation and growth due to SCC. GALL recommends Chapter XI.M3, "Reactor Head Closure Studs," program as a program acceptable for mitigating and monitoring these aging effects. This program relies on ASME Code Section XI, Subsection IWB to monitor and detect this aging effect. Preventive measures identified in the GALL program include avoiding the use of metal-plated stud bolting to prevent degradation due to corrosion or hydrogen embrittlement, and using manganese phosphate or other acceptable surface treatments and stable lubricants (RG 1.65). In response to C-RAI 4.2.2-1 in a letter dated July 30, 2003, the applicant stated that the reactor vessel closure studs are not plated with a metal coating. The studs were "Parkerized," which is a process for producing a manganese phosphate surface coating on steels. The lubricant used on the studs is N-7000, which is a stable, high-purity metal-free anti-seize lubricant suitable for use up to 2400 °F. The coating process and lubricants used for the closure head studs will prevent degradation due to corrosion or hydrogen embrittlement.

Section B2.1.25 of the LRA indicates that the reactor head closure studs are fabricated from ASME SA-320 Grade L43 (AISI 4340) low-alloy steel and are not susceptible to SCC. The studs are fabricated with a specified minimum yield strength of 105 ksi. In response to RAI

B2.1.25-1 in the May 13, 2003, letter, the applicant provided its plant-specific inspection experience and described mitigation measures initiated at Ginna to prevent SCC. The reactor head closure studs have been periodically inspected under the ASME Section XI Inservice Inspection (ISI) Program. All 48 studs have been inspected during each 10-year ISI interval. Both surface (magnetic particle) and volumetric (ultrasonic) inspections were performed on each stud. No evidence of degradation has ever been reported on any of the studs.

EPRI NP-5769, "Degradation and Failure of Bolting in Nuclear Power Plants," indicates that for bolting materials with yield strength less than 150 ksi, susceptibility to SCC should not be considered a problem provided lubricants containing molybdenum disulfide are not used. Use of such lubricants is specifically prohibited under the Ginna Quality Assurance Program. Since the studs are fabricated with a specified minimum yield strength of 105 ksi, it is possible that they could be heat treated to a yield stress of 150 ksi and could be susceptible to SCC. However, since the Reactor Head Closure Studs Program relies on ASME Code Section XI, Subsection IWB to monitor for SCC, this aging effect will be managed by this program.

3.1.2.3.1.3 Conclusions On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.1.2.3.2 Reactor Vessel Head Penetration Inspection

3.1.2.3.2.1 Summary of Technical Information in the Application. The applicant describes the AMP for reactor vessel head penetration inspection in Section B2.1.26 of the LRA. The applicant stated that this program includes, (1) primary water stress corrosion cracking PWSCC, susceptibility assessment to identify susceptible components, (2) monitoring and control of reactor coolant water chemistry to mitigate PWSCC, and (3) ASME Code ISI of reactor vessel head penetrations and bottom-mounted instrument tube penetrations. The 10 program elements were briefly described.

The significant operating experience regarding the PWSCC of Alloy 600 vessel head penetrations has been documented in GL 97-01 and NRC Bulletins 2001-01 and 2002-01. In response to GL 97-01, comprehensive eddy current examinations of the reactor pressure vessel (RPV) head penetrations were performed at Ginna in 1999. No significant degradation was found. However, the applicant has plans to proactively replace the reactor vessel head and CRDM penetrations with penetrations using Alloy 690TT material. This replacement is scheduled for fall of 2003. The bottom mounted instrument penetrations were routinely examined in accordance with ASME Section XI, Subsection IWB-2500-1. The applicant stated

that the type and extent of inspections for the new reactor vessel head will be determined as Ginna continues to follow industry events and developments.

3.1.2.3.2.2 Staff Evaluation. In its response to the staff's RAI (RAI B2.1.26-1), the applicant stated that the Reactor Vessel Head Penetration Inspection Program is consistent with the guidelines provided in AMP XI.M11, "Nickel-Alloy Nozzles and Penetrations," of NUREG-1801 (GALL Report) and complies with NRC Order EA-03-009, "Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors," issued on February 11, 2003. No exception to the GALL Program XI.M11 was identified. The staff confirmed the applicant's claim of consistency during the AMP audit.

In response to GL 97-01, the applicant used a probabilistic model developed by Westinghouse for WOG plants to assess the susceptibility to PWSCC of reactor vessel head penetrations. Based on this model, the reactor pressure vessel (RPV) head penetrations at Ginna fell into the <15 effective full power year (EFPY) category, representing moderate susceptibility.

Based on the guidelines provided in NRC Order of February 11, 2003, the susceptibility ranking in terms of effective degradation years (EDY) can be calculated based on head temperature at 100 percent power and the operating time at each specific head temperature. The calculated EDY for the RPV head at Ginna is 16.182, which is in category "high."

The applicant indicated that susceptibility models for other Alloy 600 and 82/182 pressure boundary components have not yet been developed. The applicant will perform susceptibility assessment when the models become available.

The applicant has scheduled to replace the reactor vessel head during the fall 2003 refueling outage. The new head will have enhancements in materials and design. The CRDM penetrations will be fabricated with Alloy 690TT (UNSN06690 thermally treated) with Alloy 52 (UNS 06052) for weld buttering and J-groove welds. Both thermal treated Alloy 690 and Alloy 52 will provide enhanced resistance to PWSCC. The replacement head will also be insulated with mirror insulation, allowing full access to the exterior surface and the interface of each penetration with head for bare metal visual inspections.

The applicant stated that the RPV bottom head penetrations at Ginna are expected to be much less susceptible to PWSCC than the CRDM penetrations at the top head for the following reasons:

- much lower operating temperature

- lower residual stresses resulting from welding due to much smaller size in bottom head penetrations.

- lower residual stresses resulting from straightening process due to less stringent requirements in verticality.

- stress relieved with reactor vessel bottom head after completion of installation of bottom head penetrations.

The applicant also stated that Ginna is committed to participate in industry initiatives and closely follow relevant industry operating experience related to bottom head penetration degradation, and that appropriate susceptibility assessments will be made as new models become available.

In a response to the staff's RAI (RAI 3.2.2-2) regarding the V. C. Summer event where a through-wall crack developed in a primary loop hot leg reactor vessel nozzle to pipe weld made of Alloy 182/82 materials, the applicant stated that there are no locations in the RCS piping at Ginna which contain Alloy 82-182 welds or weld buttering. The applicant identified the following locations in the reactor vessel and the replacement steam generators as containing Alloy 600 and Alloy 82/182 materials.

(1) The CRDM nozzle in the reactor vessel closure head and the BMI penetrations in the bottom head are Alloy 600 and are welded to the heads with partial penetration J-groove Alloy 82/182 welds.

(2) The radial core support lugs in the reactor vessel are Alloy 600 and are welded to the lower shell with Alloy 82/182 weld metal.

(3) The tube-sheets in the replacement steam generators are overlaid with Alloy 82 weld metal (nonpressure boundary).

The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program. The staff finds the subject supplement acceptable.

3.1.2.3.2.3 Conclusions. On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL Program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.1.2.3.3 Reactor Vessel Internals Program

3.1.2.3.3.1 Summary of Technical Information in the Application. The applicant's Reactor Vessel Internals Program is discussed in LRA Section B2.1.27, "Reactor Vessel Internals." The applicant states that this program is consistent with NUREG-1801 relative to monitoring and control of reactor coolant water chemistry in accordance with the EPRI Guidelines in TR-105714. RG&E is also committed to ASME Section XI, Subsection IWB (1995 Edition with 1996 Addenda). The current ASME Section XI Inservice Inspection Program is considered to provide reasonable assurance that aging effects will be managed such that the intended functions of reactor vessel internal (RVI) components will be maintained during the license

renewal period. That notwithstanding, RG&E will participate in industry activities concerning the development of augmented inspection techniques in order to visually inspect for fine cracks (0.0005 inch) and other changes in dimension in nonbolted components.

3.1.2.3.3.2 Staff Evaluation. The applicant must identify whether all 10 elements of the program are in accordance with GALL Program XI.M16 and whether the applicant's program contains any exceptions or enhancements to the 10 elements in GALL Program XI.M16.

In response to RAI B2.1.27-2 in a May 13, 2003, letter, the applicant indicated that the Reactor Vessel Internals Program is consistent with, but includes one exception to, NUREG-1801 GALL Section XI.M16, "PWR Vessel Internals." The only exception is that NUREG-1801, Section XI.M16, specifies examination schedules in accordance with IWB-2400, which requires core support structures to be inspected once during each 10-year interval. While this is correctly applied to the VT-3 examinations, some augmented examinations as specified by the industry recommended program may be performed only once, unless degradation is detected.

RG&E will participate in industry activities concerning the development of augmented inspection techniques for inspection of core support structures. The required inspections and frequency of inspection will depend upon the results of the industry program on RVI. Therefore, the exception may not be relevant and will be further evaluated by the staff when the results of the industry program are known. In a letter dated September 16, 2003, the applicant indicated that the Reactor Vessel Internals Program will be submitted for staff review and approval prior to Gina entering the period of extended operation. Since the applicant will be submitting the program for staff review and approval (reference item #31 Appendix A of this SER) prior to entering the period of extended operation, the staff will be able to review the program to ensure all issues have been addressed. This completes the staff review of the Reactor Vessel Internals Program at this time. This resolves RAI B2.1.27-2.

Section B2.1.27 of the LRA identifies the following RVI components to be most susceptible to crack initiation and growth due to IASCC, and loss of fracture toughness due to neutron irradiation embrittlement and/or void swelling.

- lower core plate and fuel alignment pins
- lower support columns
- core barrel and core barrel flange in active core region
- thermal shield and neutron panels
- bolting–lower support column, baffle–former, and barrel–former

The staff requested that the applicant explain why these components were selected as the RVI components most susceptible to crack initiation and growth due to IASCC, and loss of fracture toughness due to neutron irradiation embrittlement and/or void swelling. In response to RAI B2.1.27 in a May 13, 2003, letter, the applicant indicated that these component were identified as most susceptible to IASCC, neutron embrittlement, and void swelling because they are being exposed to the highest in-core neutron radiation fields. Since these components are exposed to the highest in-core neutron radiation field, the staff agrees that these components will be

most susceptible to crack initiation and growth due to IASCC, and loss of fracture toughness due to neutron irradiation embrittlement and void swelling.

3.1.2.3.3.3 Conclusion. On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL Program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.1.2.3.4 Reactor Vessel Surveillance Program

3.1.2.3.4.1 Summary of Technical Information in the Application. The applicant's Reactor Vessel Surveillance Program is discussed in LR Section B2.1.28, "Reactor Vessel Surveillance." The applicant states that the program is consistent with NUREG-1801, GALL Report, Sections XI.M31, "Reactor Vessel Surveillance."

3.1.2.3.4.2 Staff Evaluation. In LRA Section B2.1.28, "Reactor Vessel Surveillance," the applicant described its AMP to manage aging in reactor vessel beltline materials. The LRA stated that this AMP is consistent with GALL AMP XI.M31, "Reactor Vessel Surveillance," with no deviations. For this AMP, GALL recommends further evaluation. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program. Furthermore, the staff reviewed the applicant's evaluation to determine whether it addressed the additional issues recommended in the GALL Report and confirmed that the AMP would adequately address these issues. Finally, the staff determined whether the applicant properly applied the GALL program to its facility.

Section B2.1.28 indicates that an additional capsule will be withdrawn at a neutron fluence equivalent to approximately 52 EFPY of exposure. Items 5 through 7 in GALL XI.M31 provide recommendations for withdrawal of capsules during the period of license renewal. The staff requested that the applicant identify how the Ginna capsule withdrawal schedule for the period of license renewal complies with Items 5 through 7 in GALL XI.M31. In response to RAI B2.1.28-1, the applicant indicated that Ginna has two surveillance capsules left in the core. Their current schedule is to withdraw one of the capsules during the 2003 refueling outage. At that time, the capsule will have received a fast neutron fluence of 5.25E19, more than the projected dose at 60 years of 4.85E19. Since Ginna has performed, and submitted to the NRC, a reactor vessel equivalent margins analysis, they indicated that they do not plan on testing that capsule. In addition, the current plan is to leave one capsule in the reactor vessel until about 2009, at which point it will have received a fast neutron fluence equivalent to 80 years of operation. Since Item 6 in GALL XI.M31 indicates the applicant is to withdraw one capsule at an outage in which the capsule receives a neutron fluence equivalent to the 60-year fluence to

test the capsule in accordance with the requirements of ASTM E 185, the staff believes the capsule withdrawn during the 2003 refueling outage should be tested. Testing of this capsule is important because the reference temperature for pressurized thermal shock (RT_{PTS}) value in the pressurized thermal shock evaluation was determined using Ginna surveillance data. The highest capsule neutron fluence is 3.746 x 10^{19} n/cm ^{2}, which is below the neutron fluence projected for the reactor vessel at the end of the period of extended operation. Testing this capsule, which has a projected neutron fluence of 5.25 x 10^{19} n/cm^{2}, will ensure that the reactor vessel will remain below the pressurized thermal shock screening criteria at the end of the period of extended operation. Item 7 in GALL XI.M31 indicates applicants without in-vessel capsules during the period of extended operation should use alternative dosimetry to monitor neutron fluence during the period of extended operation. Since the last capsule is to be removed in 2009, and capsules will not be available to determine the neutron fluence during the period of extended operation, alternative dosimetry should be utilized during the period of extended operation to monitor neutron fluence.

In a response to C-RAI 4.2-1, in a letter dated July 30, 2003, the applicant indicated that the capsule withdrawn in 2003 will not be tested in accordance with Table 10 Footnote E in ASTM E-185. This footnote indicates this capsule may be held without testing following withdrawal. ASTM E-185 provides guidance for withdrawal and testing for 40 years of operation. Also in this clarification response, the applicant indicated that Item 7 in GALL XI.M31 is not applicable to Ginna because they will be using the guidance in Item 6. Item 6 and 7 are separate guidance and they should not be substituted for each other. Based on the above discussion, the staff believes this capsule should be tested. This is Open Item B2.1.28-1.

3.1.2.3.4.3 Conclusions On the basis of its review and audit of the applicant's program, pending satisfactory resolution of Open Item B2.1.28-1, the staff 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, the staff has reviewed the exceptions to the GALL Program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.1.2.3.5 Steam Generator Integrity Program

3.1.2.3.5.1 Summary of Technical Information in the Application. The applicant's Steam Generator Integrity Program is discussed in LRA Section B2.1.31, "Steam Generator Integrity Program." The applicant states that the program is consistent with GALL Program XI.M19, "Steam Generator Tube Integrity." Based on the applicant's response to RAI B2.1.31-1, the applicant added the enhancement that aging management activities to address plant-specific AMP requirements identified in Table 3.2-1 of the LRA, and the enhancement that the applicant

has added plant-specific components, beyond those discussed in GALL and identified in Table 3.2-2 of the LRA, for which the Steam Generator Integrity Program is identified as an AMP.

This AMP is credited with managing aging in the steam generator shell assembly; steam generator tubes, repair sleeves, and plugs; and other secondary side components.

The applicant stated that the Steam Generator Integrity Program manages aging effects such as cracking due to PWSCC, outside diameter stress corrosion cracking (ODSCC), IGA, pitting, wastage, wear fouling due to corrosion product buildup, mechanical degradation due to denting and impingement damage, and fatigue. The applicant further stated that the Steam Generator Integrity Program manages these aging effects/mechanisms through a balance of prevention, inspection, examination, assessment, evaluation, repair and leakage monitoring measures. The program is administered through a series of plant directives and interface procedures, as well as the plant technical specifications. Key program attributes include NDE, sludge lancing, primary and secondary water chemistry control, and primary-to-secondary leakage trending and monitoring. Lastly, in June 1996, the steam generators at Ginna were replaced with steam generators with a new design which incorporate design and manufacturing improvements to reduce and/or prevent many of the problems that the industry experienced with the original design.

<u>3.1.2.3.5.2 Staff Evaluation</u>. In LRA Section B2.1.31, “Steam Generator Integrity Program,” the applicant described its AMP to manage aging in steam generator components. The LRA stated that this AMP is consistent with GALL AMP XI.M19, “Steam Generator Tube Integrity,” with the exception that the applicant included aging management activities to address plant-specific AMP requirements identified in Table 3.2-1 of the LRA, and the applicant added plant-specific components, beyond those discussed in GALL and identified in Tables 3.2-1 and 3.2-2 of the LRA, for which the Steam Generator Integrity Program is identified as an AMP. For this AMP, GALL recommends further evaluation. The staff reviewed the applicant’s evaluation to determine whether it addressed the issues recommended for further evaluation in the GALL Report to confirm whether the AMP would adequately address these issues. In addition, the staff reviewed the clarifications and related justifications to determine whether the AMP remains adequate to manage the aging effects for which it is credited. Furthermore, the staff reviewed the UFSAR Supplement to determine whether it provides an adequate description of the revised program. Finally, for Ginna, the staff determined whether the applicant properly applied the GALL Program to its facility.

3.1.2.3.5.2.1 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

This program manages tube degradation related to corrosion phenomena, such as PWSCC, ODSCC, IGA, pitting, and wastage, along with other mechanically induced phenomena, such as denting, wear, impingement damage, and fatigue. NDE techniques are used to identify tubes that are defective and need to be removed from service or repaired in accordance with the guidelines of the plant technical specifications. In addition, operational leakage limits are included to ensure that, should substantial tube leakage develop, prompt action is taken to shut

down the plant and limit the frequency of steam generator tube ruptures. In addition, this program manages degradation of steam generator repair sleeves and plugs.

The program incorporates provisions of NEI 97-06, “Steam Generator Program Guidelines,” which includes an assessment of degradation mechanisms that considers operating experience from similar steam generators to identify degradation mechanisms and, for each mechanism, defines the inspection techniques, measurement uncertainty, and sampling strategy. The industry guidelines provide criteria for the qualification of personnel, specific techniques, and the associated acquisition and analysis of data, including procedures, probe selection, analysis protocols, and reporting criteria. The performance criteria pertain to structural integrity, accident-induced leakage, and operational leakage. The Steam Generator Monitoring Program includes guidance on assessment of degradation mechanisms, inspection, tube integrity assessment, maintenance, plugging, repair, and leakage monitoring, as well as procedures for monitoring and controlling secondary-side and primary-side water chemistry. The Water Chemistry Program for PWRs relies on monitoring and control of reactor (primary) water chemistry and secondary water chemistry. Generic revisions to the standard technical specifications based on the provisions of NEI 97-06 are currently being reviewed by the NRC staff. Since this review is ongoing, the applicant's program was reviewed on a plant-specific basis. NRC regulations including the plant technical specifications, provide an adequate regulatory basis for managing the effects of aging on the Steam Generator tubes.

The applicant has proposed to manage (1) crack initiation and growth due to PWSCC, ODSCC, or IGA, or (2) loss of material due to wastage and pitting corrosion, or (3) loss of section thickness due to fretting and wear, or denting due to corrosion of carbon steel tube support plate, in the steam generator tubes, repair sleeves, and plugs by the Steam Generator Integrity Program and Water Chemistry Control Program. The staff’s review of the Steam Generator Integrity Program is discussed here. The staff’s review of the Water Chemistry Control Program is discussed in Section 3.0.3.1 of the SER. The applicant states that the Steam Generator Integrity Program is consistent with GALL Report Section XI.19, “Steam Generator Tube Integrity Program,” and incorporates guidance contained in NEI 97-06.

On the basis of its review and audit of the applicant’s program, the staff 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, the staff has reviewed the exceptions to the GALL Program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.1.2.3.5.2.2 Plant-Specific Components from Tables 3.2-1 and 3.2-2 of the LRA.

The applicant identified a number of plant-specific components which referenced the Steam Generator Integrity Program as the program which manages aging of those components. Since the AMP in the GALL Report is only related to steam generator tubes, the staff reviewed the aging management activities related to the additional components against the 10 program elements using the Branch Technical Position RLSB-1 in Appendix A of the SRP-LR. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program.

The applicant indicated that the corrective actions, confirmation process, and administrative controls for license renewal are in accordance with the site-controlled Quality Assurance Program pursuant to 10 CFR Part 50, Appendix B, and covers all structures and components subject to AMR. The staff evaluation of the applicant's Quality Assurance Program is provided separately in Section 3.0.4 of this SER. This program satisfies the elements of corrective actions, confirmation process, and administrative controls. The remaining seven elements are discussed below.

Program Scope. The applicant described the inspection program related to the steam generator shell assembly, repair sleeves and plugs, and lattice grid tube supports and U-bend fan bar restraints. The staff finds it is reasonable to include these components in the steam generator integrity program, because the applicant adequately addressed the remaining 9 AMP program elements.

Preventive Actions. In response to RAI B2.1.31-1, the applicant described the control of primary and secondary water chemistry, as described in the Water Chemistry Control Program, as measures in place to mitigate the degradation related to corrosion of primary- and secondary-side steam generator components. In addition, the applicant indicated that the NEI 97-06 guidelines include foreign material exclusion requirements. The staff finds this acceptable because these actions will assist in managing the degradation of the affected components.

Parameters Monitored/Inspected. In response to RAI B2.1.31-1, the applicant identified the steam generator tube volumetric inspection technique (i.e., eddy current testing) as the primary means of monitoring for degradation of steam generator tubes. In addition, the applicant indicated that secondary -side visual inspections and foreign object surveys and retrieval (FOSAR) inspections are the primary means of monitoring the secondary-side steam generator components to provide reasonable assurance of the detection of degradation which could lead to loss of intended functions. The staff finds this acceptable because these type of inspections will provide meaningful information regarding aging of the secondary-side steam generator components.

Detection of Aging Effects. In response to RAI B2.1.31-1, the applicant stated that the primary method for detection of tube aging effects is by eddy current testing in accordance with Revision 5 of the EPRI Steam Generator Examination Guidelines. The extent and schedule of the inspections prescribed by the program are designed to ensure that flaws do not exceed established performance criteria. The extent and schedule of the inspections prescribed by the program are designed to ensure timely detection and replacement of leaking repair plugs and sleeves. In addition, periodic visual inspections of the secondary-side, including mid and upper bundle, tube support structure, such as lattice grid tube supports and U-bend fan bar restraints,

accessible areas of the shell, and upper internals, provide assurance for early detection of age-related degradation of secondary-side structural components.

In response to an NRC request for clarification of RAI B2.1.31-1, the applicant stated that secondary-side inspections of the steam generators are presently performed whenever primary-side inspections are performed (i.e., every other refueling outage). The applicant also provided additional details on the scope of the secondary-side inspections, which are stated to be consistent with the guidelines of NEI 97-06.

The staff finds that the methods, scope, and extent of inspections are acceptable because they provide a valid method for detection of the aging effects in the steam generator secondary side components.

Monitoring and Trending. In response to RAI B2.1.31-1, the applicant indicated that condition monitoring assessments are performed after each inspection to determine whether steam generator tube structural and accident leakage criteria were satisfied. In addition, operational assessments are performed to verify that structural and accident leakage criteria are maintained during the operating interval until the next required inspection. Comparison of the results of the condition monitoring assessment with the predictions of the previous operational assessment provides feedback for evaluation of the adequacy of the operational assessment and additional insights that can be incorporated into the next operational assessment. The staff finds this acceptable because this process will allow the applicant to adequately monitor and trend the aging effects in the steam generator.

Acceptance Criteria. In response to RAI B2.1.31-1, the applicant stated that the acceptance criteria for the steam generator tubes, plugs, and sleeves are in accordance with plant technical specifications and NEI 97-06, which include ensuring the tube integrity performance criteria are not exceeded. In response to a request for clarification of RAI B2.1.31-1, the applicant stated that visual examinations of the secondary-side steam generator components are performed by personnel qualified in accordance with the approved Ginna NDE procedures. The qualification is based on the requirements of Recommended Practice American Society for Nondestructive Testing (ASNT) SNT-TC-1A, American Welding Society (AWS) QC1 “Qualification Standard for Visual Personnel”, ANSI/ASNT CP-189 “Standard for Qualification and Certification of Non-Destructive Testing Personnel,” and AWS D1.1 “Structural Welding Code.” Acceptance criteria for visual examinations are explicitly detailed in approved Ginna NDE procedures. Any condition observed by the visual examiner which does not meet the acceptance criteria in the NDE procedures or any condition judged by the examiner to require further investigation is documented and evaluated in accordance with the Ginna Corrective Action Program. The staff finds this acceptable because this procedure will allow the applicant to determine if the intended functions of the added components will be affected by any aging identified.

Operating Experience. The applicant indicated that in June 1996, the Ginna steam generators were replaced with a new design. The replacement steam generators incorporate design and manufacturing improvements to reduce and/or prevent many of the problems that the industry has experienced. To date, the applicant has completed steam generator tube examinations, sludge lancing, and secondary -side foreign material/loose parts inspections in accordance with the Steam Generator Tube Integrity Program requirements during three refueling outages. No degradation has been observed. The staff concluded that this operating experience supports the applicant’s conclusion that the Steam Generator Integrity Program provides reasonable

assurance that aging effects will be managed such that the intended function of the components will be maintained during the license renewal period.

On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL Program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.1.2.3.5.3 Conclusions. On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL Program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.1.2.3.6 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel

3.1.2.3.6.1 Summary of Technical Information in the Application. The applicant describes the AMP for thermal aging embrittlement of CASS in Section B2.1.34 of the LRA. The applicant stated that an evaluation of the susceptibility of CASS components at Ginna was made, based on the casting method, molybdenum content, and percent of ferrite. Based on this evaluation, it was determined that the CASS RCS elbows were susceptible to loss of fracture toughness due to thermal aging.
The applicant also stated that a plant-specific flaw tolerance evaluation was conducted in Westinghouse Commercial Atomic Power (WCAP)-15837, "Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for the R. E. Ginna Nuclear Power Plant for the License Renewal Program," April 2002. The results of this evaluation showed that adequate fracture toughness exists for the RCS loop components, including the cast elbows, for the period of extended operation (60 years).

The applicant also stated that another evaluation was made for the RCP casings in WCAP-15873, "A Demonstration of the Applicability of ASME Code Case N-481 to the Primary Loop Pump Casings of R. E. Ginna Nuclear Power Plant for the License Renewal Program," May 2002. This evaluation supported the application of Code Case N-481 to the inspection of primary loop pump casings for the period of extended operation (60 years).

3.1.2.3.6.2 Staff Evaluation. In its response to the staff's RAI (RAI B2.1.34-1), the applicant stated that the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program implemented at Ginna is consistent with the guidelines provided in AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)." No exception to GALL Program XI.M12 was identified. The staff audited the subject program during the AMP audit and confirmed that the subject program is consistent with GALL AMP XI.M12.

In AMP XI.M12, it is stated that the existing ASME Section XI requirements, including the alternative requirements of ASME Code Case N-481 for pump casings, are adequate for all pump casings and valve bodies. It is also stated in the program element for detection of aging effects that, for pump casings and valve bodies and "not susceptible" piping, no additional inspection or evaluations are required to demonstrate that the material has adequate fracture toughness. For "potentially susceptible" piping, it can either be examined using methods that meet the criteria of the ASME Section XI, Appendix VIII, or perform a plant- or component-specific flaw tolerance evaluation to demonstrate that the thermally embrittled material has adequate toughness.

The applicant stated that this program covers the following CASS components – (1) valve bodies for valves equal or larger than 4 inches NPS, (2) RCP casings and flanges, and (3) RCS elbows.

The applicant stated that the CASS elbow to pipe welds in the RCS have been examined by UT and radiography in accordance with the ASME, Section XI, Inservice Inspection Program. No recordable indications were ever reported. The applicant reviewed the plant-specific operating experience and did not find any service-related degradation or leakage from CASS components at Ginna.

The staff finds that the CASS valve bodies are inspected by radiography at Ginna. The staff finds that RT is a Code acceptable inspection method for volumetric examination, therefore, based on GALL guidelines, no additional examinations or evaluation to demonstrate adequate fracture toughness are required.

The staff finds that the applicant did not provide the UFSAR Supplement for this program in its initial LRA submittal and requested the applicant to submit the UFSAR Supplement. In its response to the staff's RAI (C-RAI B2.1.34), the applicant provided the UFSAR Supplement for this program. The staff reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program. The staff finds that the subject supplement is acceptable (pending resolution of Open Item 4.7.7-1) with the exception that discussions in the supplement pertaining to the RCP casings should be deleted, since no additional examination or evaluation are required for RCP casings.

3.1.2.3.6.3 Conclusions. On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL Program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and, pending satisfactory resolution of Open Item 4.7.7-1, finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.1.2.3.7 Thimble Tube Inspection Program

3.1.2.3.7.1 Summary of Technical Information in the Application. The applicant's Thimble Tube Inspection Program is discussed in LRA Section B2.1.36, "Thermal Tubes Inspection." GALL does not have a program that corresponds to the applicant's Thimble Tube Inspection Program. Details of this program are described in the staff's technical evaluation section of this program, which follows.

3.1.2.3.7.2 Staff Evaluation. In LRA Section B2.1.36, "Thimble Tubes Inspection," the applicant described its AMP to manage the integrity of the incore neutron monitoring thimble tubes, which serve as a portion of the reactor coolant pressure boundary. As discussed in NRC Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors," July 26, 1988, thimble tube wall-thinning can occur as a result of flow-induced vibration. This wear damage is detected at locations associated with geometric discontinuities or area changes along the reactor coolant flow path, such as areas near the lower core plate, the core support forging, the lower tie plate, and the vessel penetrations.

The Thimble Tubes Inspection Program was initially designed to inspect for wear damage. However, the program was expanded to include inspection of the thimble and guide tubes for SCC. Section 3 of Table 3.2-2 of the application for renewed operating license, component (1), Bottom Mounted Instrument (BMI) Guide Tubes and Seal Table Fittings identifies these components as being susceptible to cracking from SCC. The AMP for the BMI guide tubes includes the Water Chemistry Program and ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection Program. The AMP for the seal table fittings is the Water Chemistry Program.

In response to RAI 3.2.2-1 in a May 13, 2003, letter, the applicant indicated that SCC is an aging effect requiring management for the BMI guide tubes because over some length they are exposed to primary water at temperatures above 140 ^{o}F. SCC was incorrectly identified as an aging effect requiring management for the seal table fittings because the temperature at the seal table is ambient containment temperature, i.e., less than 140 ^{o}F. In addition, the annular space between the thimble tubes and guide tubes is periodically flushed and water samples are analyzed for chloride, fluoride, and sulfate ion. GL 88-01 indicates that at temperatures below 200 ^{o}F stainless steel components are not susceptible to SCC. Since the seal table fittings are

below 200 ^{o}F and are stainless steel, the staff agrees that this component is not susceptible to SCC and aging management for SCC is not necessary.

In addition, in this response the applicant indicates that credit is taken for the thimble tube inspections performed under the Thimble Tube Inspection Program as managing cracking due to SCC of the guide tubes. Details of these inspections, including scope, examination method, acceptance criteria, and examination frequencies, are included in the Thimble Tube Inspection Program description in Section B2.1.36 of the LRA. All thimble tube inspections are performed by personnel qualified in accordance with the requirements of ASME Section XI, Article IWA-2300, SNT-TC-1A, and ANSI/ASNT CP-189. Since the outside diameter surface of the thimble tubes is exposed to the same environment as the inner diameter surface of the guide tube, and both components are fabricated from stainless steel, they would both be susceptible to SCC. The Thimble Tube Inspection Program, as described in Section B2.1.36 of the LRA, was for detection of wear, not SCC. In order for the thimble tube inspection to be utilized for detection of SCC in the guide tube, the Thimble Tube Inspection Program must be modified to include inspection for SCC. The staff requested that the applicant revise the Thimble Tube Inspection Program and the associated Ginna inspection procedures, to perform inspections for SCC.

In response to C-RAI 3.2.2-1 in a letter dated July 30, 2003, the applicant revised Sections A2.1.25 to indicate that the Thimble Tube Inspection Program is credited for managing cracking due to SCC of the thimble and guide tubes, and revised B2.1.36 to indicate that the aging effects which are detected by eddy current testing of the thimble tube are loss of material due to fretting wear and cracking due to SCC.

This AMP is not evaluated in GALL. Therefore, the staff reviewed this AMP against the 10 program elements using the guidance in Branch Technical Position RLSB-1 in Appendix A of the SRP-LR. Three of the 10 attributes are associated with the quality assurance activities of corrective action, confirmation processes, and administrative controls and are discussed in Section 3.0.4 of this SER. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program.

<u>Program Scope</u>. The applicant's program inspects locations in the thimble tube associated with geometric discontinuities or area changes along the reactor coolant flow path, such as areas near the lower core plate, the core support forging, the lower tie plate, and the vessel penetrations because these are locations that are susceptible to wear resulting from flow-induced vibration. The applicant states that all 36 thimble tubes are within the scope of this inspection program. The staff found the scope of the program to be adequate because all 36 thimble tubes are within scope and the inspection is performed at locations most susceptible to wear resulting from flow-induced vibration. The applicant has not identified the locations on the thimble tubes and guide tubes to be inspected for SCC. (This is Open Item B2.1.36-1(a)).

<u>Preventive Actions</u>. As noted in Operating Experience below, the replacement of tube G-6 with chrome plating at the wear area constitutes a preventive action. In addition, flushing of the tubes during refueling outages is also considered mitigative in nature. Eddy current examinations are performed on a periodicity consistent with the severity of wear damage for each thimble tube. When wall loss in a tube exceeds 55 percent, but less than 65 percent, the tube is repositioned such that wear is redistributed, or other corrective action is taken.

Parameters Monitored/Inspected. The eddy current examinations determine the wall thickness of the thimble tubes, allowing an assessment of the wear, and wear rate, of each tube in each location. Eddy current examination will also be utilized to detect SCC. This is acceptable because eddy current examination has been successfully utilized to determine wall thickness and wear rate. The applicant has not identified whether the eddy current examination has been qualified to detect and size SCC. (This is Open Item B2.1.36-1(b)).

Detection of Aging Effects. Thimble tube inspections are conducted using a methodology specified in a Ginna plant-specific procedure. This procedure requires the use of a Zetec MIZ-18 Multifrequency Eddy Current Testing System. These inspections provide indication of tube wear, and tube wear rate. This is acceptable because eddy current examination has been successfully utilized to determine wall thickness and wear rate. The applicant has not identified whether the eddy current examination has been qualified to detect and size SCC. (This is Open Item B2.1.36-1(c)).

Monitoring and Trending. Based on the results of a plant-specific analysis, examination results are compared to an upper allowable limit of 65 percent through-wall wear.

Eddy current examinations performed in 1988, 1989, 1990, 1991, and 1992 provided a basis for establishing the wear rates, and thus the inspection intervals, for thimble tubes. Based on those results, the inspection frequency and acceptance criteria are as follows.

- previous indication 10 percent to less than 45 percent — every third refueling outage (approximately once every 4.2 years)

- previous indication 45 percent to less than 55 percent — every other refueling outage (approximately once every 3 years)

- previous indication 55 percent or greater — perform corrective action, if support plate wear is the suspected cause. For other indications, corrective action will be taken at 65 percent or greater. Future inspection frequency will be every other or every third outage, as stated above.

- previous inspection never exceeded 10 percent through wall — no specified frequency. Future inspections will be based on a Ginna periodic assessment.

In response to RAI B2.1.36-1 in a May 13, 2003, letter, the applicant provided the results from the inspections performed between 1988 and 1992. These inspections indicated that "none of the 36 thimble tubes have indicated a discernible increasing wear trend outside of the band of uncertainty (10 percent) assumed for the Eddy Current measurement technique" and that "the cumulative test results show that a conservatively predicted annual increase in wear is less than 5 percent. Therefore, for a tube whose inspection indicated less than 45 percent, there is adequate assurance that the 65 percent criterion would not be exceeded in four years." Similarly, for a tube with a previous indication between 45 percent and 55 percent, an inspection interval of 2 years would assure that the 65 percent criterion would not be exceeded.

This response also reported the results from the 1995 through 2002 inspections. Annual wear rates determined from inspections performed on all thimble tubes in 1995, 1997, and 1999 were within the predicted wear rate (5 percent) reported in 1993. Four tubes were replaced in 1999,

three due to indications outside of the vessel and one (tube G-6) due to a wear indication which was sized at 59 percent through wall.

All thimble tubes were again inspected in 2000. Wear rates determined from the 2000 inspections were within the 5 percent rate for all tubes except for the four tubes which had been replaced in 1999. Three of these four tubes exhibited wear indications ranging from 16 percent to 22 percent through wall. One tube (G-6) exhibited a wear indication measuring 69 percent through wall. Corrective action was taken on tube G-6 by repositioning and isolating the tube at the seal table. The unusual wear on this tube was attributed to the absence of chromium plating on the tube in the lower core plate region prone to wear.

All thimble tubes were again inspected during the refueling outage in April 2002. Tube G-6 was again replaced during this outage with a new chromium-plated tube. All other tubes exhibited wear rates within the predicted 5 percent rate except for one tube, B-6, which exhibited an increase in wall loss from 22 percent to 37 percent through wall. Based on the inspection results through April 2002 and the applicant's actions to replace tubes that exhibit higher than predicted wear rate, the inspection methods and criteria described in the applicant's Thimble Tube Inspection Program are adequate for maintaining the integrity of the thimble tubes.

In response to RAI B2.1.36-1 in a May 13, 2003, letter, the applicant also indicated that the thimble tube inspection will be performed every refueling outage during the period of extended operation unless inspections on a reduced frequency can be justified by engineering evaluation. However, the applicant has not identified the frequency and the basis for the frequency of inspection for detection of SCC for thimble tubes and guide tubes. (This is Open Item B2.1.36-1(d)).

Acceptance Criteria. The acceptance criteria are provided in Monitoring and Trending. The acceptance criteria are acceptable because the criteria allows tubes to be replaced prior to the wear, reducing the wall thickness to a size that could result in failure of the tube. However, the applicant has not identified the acceptance criteria for detection of SCC for thimble tubes and guide tubes. (This is Open Item B2.1.36-1(e)).

Operating Experience. Thimble tube wear in Westinghouse reactors was documented in NRC IN 87-44, "Thimble Tube Thinning in Westinghouse Reactors," and NRC Bulletin 88-09. In response to these notifications, eddy current examination of thimble tubes was performed annually from 1988 to 1992 at Ginna. In 1990, thimble tube G-6 had indication of wear greater than 55 percent. Corrective action was taken by repositioning (moving worn areas away from the lower support plate by 1–2 inches) the tube. Three other thimble tubes had indications noted in the 1997 examination that resulted in the need for corrective action (action report 97-1889). All four thimble tubes were replaced during the 1999 refueling outage. One thimble had an indication of IGA. The conduit water was sampled, and analysis showed the presence of chlorides, fluorides, and sulfates in concentrations significantly above RCS water. These conduits were flushed during the thimble tube replacement. All other thimble tube conduits were flushed during the 2000 refueling outage. During the 2000 refueling outage, inspection of tube G-6 again indicated degradation due to flow-induced vibration. This tube was replaced with a chrome-plated tube during the 2002 refueling outage. Although this program has not eliminated wear of thimble tubes, it has been successful in identifying tubes that need to be replaced. It is acceptable because tubes are replaced prior to the wear, reducing the wall thickness to a size that could result in failure of the tube.

3.1.2.3.7.3 Conclusions. On the basis of its review of the applicant's program, pending satisfactory resolution of Open Item B2.1.36-1, the staff 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, the staff has reviewed the exceptions to the GALL Program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.1.2.3.8 Fatigue Monitoring Program

3.1.2.3.8.1 Summary of Technical Information in the Application. The applicant described its Fatigue Monitoring Program in Section B3.2 of the LRA. This program monitors loading cycles due to pressure and temperature transients for selected critical components. The applicant indicates that the program is consistent with GALL Program X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary." The applicant characterized the Fatigue Monitoring Program as a program to confirm that the number of cycles established by the analysis of record will not be exceeded before the end of the period of extended operation. The applicant indicated that the effects of the reactor coolant environment are considered through the evaluation of the seven component locations identified in NUREG/CR-6260 using the appropriate environmental fatigue factors. The applicant stated that the Fatigue Monitoring Program includes reviews of both industry and plant-specific operating experience regarding fatigue cracking for applicability to Ginna.

3.1.2.3.8.2 Staff Evaluation. The LRA indicated that this AMP is consistent with GALL AMP X.M1. The staff confirmed the applicant's claim of consistency during the AMP audit. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program. In addition, for Ginna, the staff determined whether the applicant properly applied the GALL Program to its facility.

The applicant discussed the scope of the Fatigue Monitoring Program in Section B3.2.1 of the LRA. The scope of the program includes those components for which a cyclic or fatigue design basis exists. The program monitors loading cycles due to pressure and thermal transients for the selected critical components listed in Section B3.2.1 of the LRA. The staff confirmed that these selected critical components include the components identified in NUREG/CR-6260. The staff also reviewed the transients monitored by the program and the applicant's evaluation of the effects of the reactor environment. The staff evaluation of the transients monitored by the Fatigue Monitoring Program and the applicant's evaluation of the effects of the reactor water environment are discussed in Section 4.3 of this SER. The staff found that the applicant identified the thermal transients that are significant contributors to the design fatigue usage of RCS components and that the applicant had appropriately addressed the impact of the reactor water environment of the components identified in NUREG/CR-6260.

3.1.2.3.8.3 Conclusions. On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL Program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.1.2.4 *Aging Management Review of Plant-Specific Components*

This section includes reactor coolant (class 1) components, reactor vessel, reactor vessel internals, pressurizer, steam generators and reactor coolant (non-class 1) components.

3.1.2.4.1 Reactor Coolant (Class 1)

3.1.2.4.1.1 Summary of Technical Information in the Application. The description of the reactor coolant (class 1) can be found in Section 2.3.1.1 of the LRA. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.1-1. This includes valves, pipes, elbows, fittings, RCP casings, RCP main flange, RCP lugs, thermal barrier heat exchanger tubing, orifices, reducers, and bolting. The components, aging effects, and AMPs are provided in LRA Tables 3.2-1 and 3.2-2.

Aging Effects

The LRA identified the following applicable aging effects for the reactor coolant (class 1).

- cracking
- fatigue
- loss of fracture toughness due to thermal embrittlement
- loss of material
- loss of preload
- fatigue

Aging Management Programs

The LRA credited the following AMPs with managing the identified aging effects for the reactor coolant (class 1).

- Water Chemistry (B2.1.37)
- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (B2.1.34)
- One-Time Inspection (B2.1.21)
- Bolting Integrity (B2.1.5)

- Boric Acid Corrosion (B2.1.6)
- ASME Section XI, Subsection IWB, IWC, and IWD Inservice Inspection (B2.1.2)

The applicant concluded that these AMPs will manage the effects of aging, such that the intended function of the reactor coolant (class 1) will be maintained consistent with the CLB under all design loading conditions throughout the period of extended operation, as required by 10 CFR 54.21(a)(3). The applicant identified fatigue as a TLAA in Section 3.2 of the LRA that is applicable to reactor coolant (class 1) components. This TLAA is described in Section 4.3 of the LRA and is discussed in Section 4.3 of this SER.

3.1.2.4.1.2 Staff Evaluation. This section provides the results of the staff's evaluation of the applicant's AMR for the aging effects and the AMPs credited for managing the aging effects in reactor coolant (class 1). The staff also reviewed the applicable UFSAR Supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects

The LRA identified the following applicable aging effects for the reactor coolant (class 1).

- loss of fracture toughness due to thermal embrittlement
- fatigue
- cracking
- loss of preload
- loss of material
- fatigue

The passive, long-lived components in the reactor coolant (class 1) that are subject to an AMR are identified in LRA Tables 3.2-1 and 3.2-2. LRA Table 3.2-1 includes components which were evaluated in the GALL Report. Components that the applicant indicates are consistent with GALL need no additional evaluation since GALL components and programs that are identified in GALL, and require no further evaluation, are acceptable to the staff. Components that require further evaluation are discussed in SER Section 3.1.2.2. The materials and environment for these components are identified in GALL.

LRA Table 3.2-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environment, and program proposed for managing the aging effect. The staff has reviewed the information in this table and agrees that the applicant has identified the applicable aging effects because the aging effects are appropriate for these materials and environment and are consistent nuclear power plant operating experiences.

On the basis of its review, the staff finds the applicant has identified the appropriate aging effects for the materials and environments associated with reactor coolant (class 1).

Aging Management Programs

The applicant has credited the following AMPs to manage the aging effects described above for the reactor coolant (class 1).

- Water Chemistry (B2.1.37)

- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (B2.1.34)
- One-Time Inspection (B2.1.21)
- Bolting Integrity (B2.1.5)
- Boric Acid Corrosion (B2.1.6)
- ASME Section XI, Subsection IWB, IWC, and IWD Inservice Inspection (B2.1.2)

As discussed above, components that the applicant indicates are consistent with GALL need no additional evaluation since GALL components and programs that are identified in GALL, and require no further evaluation, are acceptable to the staff. The components and programs that are used to manage the aging effects are discussed in SER Section 3.1.2.2.

LRA Table 3.2-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environment, and program proposed for managing the aging effect. The staff has reviewed the information in this table and agrees that the applicant has identified AMPs to manage the aging effects identified in LRA Table 3.2-2.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with reactor coolant (class 1). In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable.

3.1.2.4.1.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the reactor coolant (class 1), such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the reactor coolant (class 1), as required by 10 CFR 54.21(d).

3.1.2.4.2 Reactor Vessel

3.1.2.4.2.1 Summary of Technical Information in the Application. The description of the reactor vessel can be found in Section 2.3.1.2 of the LRA. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.1-2. This includes the RPV, O-ring leak monitor tubes, primary nozzle safe-ends, core support lugs, instrumentation tubes and safe-ends, bottom mounted instrument guide tubes, seal table fittings, ventilation shroud support ring, closure studs, nuts and washers, refueling seal ledge, and nozzle supports. The components, aging effects, and AMPs are provided in LRA Tables 3.2-1 and 3.2-2.

Aging Effects

The LRA identified the following applicable aging effects for the reactor vessel.

- cracking
- fatigue
- loss of fracture toughness due to neutron irradiation embrittlement
- loss of material
- loss of mechanical closure integrity due to stress relaxation

- change in dimension due to void swelling

Aging Management Programs

The LRA credited the following AMPs with managing the identified aging effects for the reactor vessel.

- Water Chemistry (B2.1.37)
- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (B2.1.34)
- Reactor Vessel Head Penetration (B2.1.26)
- Systems Monitoring (B2.1.33)
- Reactor Head Closure Studs (B2.1.25)
- Thimble Tube Inspection (B2.1.36)
- Reactor Vessel Surveillance (B2.1.28)
- Boric Acid Corrosion (B2.1.6)
- ASME Section XI, Subsection IWB, IWC, and IWD Inservice Inspection (B2.1.2)

The applicant concluded that these AMPs will manage the effects of aging, such that the intended function of the reactor vessel will be maintained consistent with the CLB under all design loading conditions throughout the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.4.2.2 Staff Evaluation. This section provides the results of the staff's evaluation of the applicant's AMR for the aging effects and the AMPs credited for managing the aging effects in the reactor vessel. The staff also reviewed the applicable UFSAR Supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects

The LRA identified the following applicable aging effects for the reactor vessel.

- cracking
- fatigue
- loss of fracture toughness due to neutron irradiation embrittlement
- loss of material
- loss of mechanical closure integrity due to stress relaxation
- change in dimension due to void swelling

The passive, long-lived components in the reactor vessel that are subject to an AMR are identified in LRA Tables 3.2-1 and 3.2-2. LRA Table 3.2-1 includes components which were evaluated in the GALL Report. Components that the applicant indicates are consistent with GALL need no additional evaluation since GALL components and programs that are identified in GALL, and require no further evaluation, are acceptable to the staff. Components that require further evaluation are discussed in SER section 3.1.2.2.

LRA Table 3.2-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environment, and program proposed for managing the aging effect. The staff has reviewed the information in this table and agrees that the applicant has identified

the applicable aging effects because the aging effects are appropriate for these materials and environment and are consistent with other nuclear plants operating experiences.

On the basis of its review, the staff finds the applicant has identified all of the aging effects for the materials and environments associated with the reactor vessel.

Aging Management Program

The applicant has credited the following AMPs to manage the aging effects described above for the reactor vessel.

- Water Chemistry (B2.1.37)
- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (B2.1.34)
- Reactor Vessel Head Penetration (B2.1.26)
- Systems Monitoring (B2.1.33)
- Reactor Head Closure Studs (B2.1.25)
- Thimble Tube Inspection (B2.1.36)
- Reactor Vessel Surveillance (B2.1.28)
- Boric Acid Corrosion (B2.1.6)
- ASME Section XI, Subsection IWB, IWC, and IWD Inservice Inspection (B2.1.2)

As discussed above, components that the applicant indicates are consistent with GALL need no additional evaluation since GALL components and programs that are identified in GALL, and require no further evaluation, are acceptable to the staff. The components and programs that are used to manage the aging effect are discussed in SER Section 3.1.2.2.

LRA Table 3.2-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environment, and program proposed for managing the aging effect. The staff has reviewed the information in this table and agrees that the applicant has identified AMPs to manage the aging effects identified in LRA Table 3.2-2.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the reactor vessel. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable.

3.1.2.4.2.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the reactor vessel, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the reactor vessel, as required by 10 CFR 54.21(d)

3.1.2.4.3 Reactor Vessel Internals

3.1.2.4.3.1 Summary of Technical Information in the Application. The description of the reactor vessel internals can be found in Section 2.3.1.3 of the LRA. The passive, long-lived

components in this system that are subject to an AMR are identified in LRA Table 2.3.1-3. The components, aging effects, and AMPs are provided in LRA Tables 3.2-1 and 3.2-2.

Aging Effects

The LRA identified the following applicable aging effects for the RVI.

- cracking
- fatigue
- loss of fracture toughness due to neutron irradiation embrittlement
- loss of material
- loss of preload
- change in dimension due to void swelling

Aging Management Programs

The LRA credited the following AMPs with managing the identified aging effects for the RVI.

- Water Chemistry (B2.1.37)
- Reactor Vessel Internals (B2.1.27)
- Thimble Tube Inspection (B2.1.36)
- ASME Section XI, Subsection IWB, IWC and IWD Inservice Inspection (B2.1.2)

The applicant concluded that these AMPs will manage the effects of aging, such that the intended function of the RVI will be maintained consistent with the CLB under all design loading conditions throughout the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.4.3.2 Staff Evaluation. This section provides the results of the staff's evaluation of the applicant's AMR for the aging effects and the AMPs credited for managing the aging effects in the RVI. The staff also reviewed the applicable UFSAR Supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects

The LRA identified the following applicable aging effects for the reactor vessel internals.

- cracking
- fatigue
- loss of fracture toughness due to neutron irradiation embrittlement
- loss of material
- loss of preload
- change in dimension due to void swelling

The passive, long-lived components in the RVI that are subject to an AMR are identified in LRA Tables 3.2-1 and 3.2-2. LRA Table 3.2-1 includes components which were evaluated in the GALL Report. Components that the applicant indicates are consistent with GALL need no additional evaluation since GALL components and programs that are identified in GALL, and require no further evaluation, are acceptable to the staff. Components that require further

evaluation are discussed in SER Section 3.1.2.2. The materials and environment for these components are identified in GALL.

LRA Table 3.2-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environment, and program proposed for managing the aging effect. The staff has reviewed the information in this table and agrees that the applicant has identified the applicable aging effects because the aging effects are appropriate for these materials and environment and are consistent nuclear power plant operating experiences.

On the basis of its review, the staff finds the applicant has identified all of the aging effects for the materials and environments associated with reactor vessel internals.

<u>Aging Management Programs</u>

The applicant has credited the following AMPs to manage the aging effects described above for the reactor vessel internals:

- Water Chemistry (B2.1.37)
- Reactor Vessel Internals (B2.1.27)
- Thimble Tube Inspection (B2.1.36)
- ASME Section XI, Subsection IWB, IWC, and IWD Inservice Inspection (B2.1.2)

As discussed above, components that the applicant indicates are consistent with GALL need no additional evaluation since GALL components and programs that are identified in GALL and require no further evaluation, are acceptable to the staff. The components and programs that are used to manage the aging effect are discussed in SER section 3.1.2.2.

LRA Table 3.2-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environment, and program proposed for managing the aging effect. The staff has reviewed the information in this table and agrees that the applicant has identified AMPs to manage the aging effects identified in LRA Table 3.2-2, except for component (11), which is discussed below.

<u>Component (11) in LRA Table 3.2.2</u>

Section 3 of Table 3.2-2 of the application for renewed operating license, component (11), secondary core support, diffuser plate, guide tube support pins, head vessel alignment pins, BMI columns and flux tubes, head cooling spray nozzles, upper instrumentation column, conduits, and supports, credits the Water Chemistry Control Program, but does not credit the Inservice Inspection Program for monitoring SCC.

GALL item IV B2.2.3 identifies rod cluster control assembly guide tube support pins constructed from stainless steel as being susceptible to crack initiation and growth, SCC, PWSCC, and IASCC. GALL requires the use of a PWR vessel internals AMP in addition to a water chemistry AMP.

In response to RAI 3.2.2-3 in a May 13, 2003, letter, the applicant indicated that the Reactor Vessel Internals Program, which is implemented by a combination of Water Chemistry Control and ASME Section XI, Subsection IWB, was inadvertently omitted from Table 3.2-2 as an

applicable AMP for components susceptible to SCC listed in line number (11). The Reactor Vessel Internals Program will be applied to these components. Since the Reactor Vessel Internals Program provides for monitoring of cracking, the staff finds that the combination of the Reactor Vessel Internals Program and the Water Chemistry Control Program will be adequate for managing SCC for these components.

Component (12) in LRA Table 3.2.2

Section 3 of Table 3.2.2-2 of the application for renewed operating license, component (12), upper and lower internals assembly, holddown spring, upper and lower support column bolts, and clevis insert bolts identifies these components as being susceptible to loss of preload due to stress relaxation and credits the ASME Inservice Inspection Program for managing this aging effect. GALL Items IV B2.1-d, IV B2.1-k, IV B2.5-h, and IV B2.5-i identify the upper internals assembly, holddown spring, lower internals assembly, and clevis insert bolts as being managed by ASME ISI and loose parts monitoring or neutron noise monitoring.

In response to RAI3.2.2-4 in a May 13, 2003, letter, the applicant indicated that neutron noise or loose-parts monitoring methods are not employed at Ginna. Plant-specific operating experience demonstrates that ISI performed under the ASME Section XI, Subsections IWB Inservice Inspection Program have been effective in managing loss of preload due to stress relaxation. These inspections have revealed no missing or loose reactor vessel or internals parts since the inception of plant operation. Based on acceptable plant-specific experience and the use of ASME Code Section XI Inservice Inspection Program to manage loss of preload due to stress relaxation, the staff agrees that loose parts monitoring is not necessary

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with RVI. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.1.2.4.3.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the RVI, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the reactor vessel, as required by 10 CFR 54.21(d).

3.1.2.4.4 Pressurizer

3.1.2.4.4.1 Summary of Technical Information in the Application. The description of the pressurizer can be found in Section 2.3.1.4 of the LRA. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.1-4. The components, aging effects, and AMPs are provided in LRA Tables 3.2-1 and 3.2-2.

Aging Effects

The LRA identified the following applicable aging effects for the pressurizer.

- cracking
- fatigue
- loss of material
- loss of preload

Aging Management Programs

The LRA credited the following AMPs with managing the identified aging effects for the pressurizer.

- Water Chemistry (B2.1.37)
- Boric Acid Corrosion (B2.1.6)
- Systems Monitoring (B2.1.33)
- ASME Section XI, Subsection IWB, IWC, and IWD Inservice Inspection (B2.1.2)
- Bolting Integrity (B2.1.5)

The applicant concluded that these AMPs will manage the effects of aging, such that the intended function of the pressurizer will be maintained consistent with the CLB under all design loading conditions throughout the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.4.4.2 Staff Evaluation. This section provides the results of the staff's evaluation of the applicant's AMR for the aging effects and the AMPs credited for managing the aging effects in the pressurizer. The staff also reviewed the applicable UFSAR Supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects

The LRA identified the following applicable aging effects for the pressurizer.

- cracking
- fatigue
- loss of material
- loss of preload

The passive, long-lived components in the pressurizer that are subject to an AMR are identified in LRA Tables 3.2-1 and 3.2-2. LRA Table 3.2-1 includes components which were evaluated in the GALL Report. Components that the applicant indicates are consistent with GALL, need no additional evaluation since GALL components and programs that are identified in GALL and require no further evaluation, are acceptable to the staff. Components that require further evaluation are discussed in SER Section 3.1.2.2. The materials and environment for these components are identified in GALL.

LRA Table 3.2-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environment, and program proposed for managing the aging effect. The staff has reviewed the information in this table and agrees that the applicant has identified the applicable aging effects because the aging effects are appropriate for these materials and environment and are consistent nuclear power plant operating experiences.

On the basis of its review, the staff finds the applicant has identified all of the aging effects for the materials and environments associated with the pressurizer.

Aging Management Programs

The applicant has credited the following AMPs to manage the aging effects described above for the pressurizer.

- Water Chemistry (B2.1.37)
- Boric Acid Corrosion (B2.1.6)
- Systems Monitoring (B2.1.33)
- ASME Section XI, Subsection IWB, IWC, and IWD Inservice Inspection (B2.1.2)
- Bolting Integrity (B2.1.5)

As discussed above, components that the applicant indicates are consistent with GALL need no additional evaluation since GALL components and programs that are identified in GALL, and require no further evaluation, are acceptable to the staff. The components and programs that are used to manage the aging effect are discussed in SER Section 3.1.2.2.

LRA Table 3.2-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environment, and program proposed for managing the aging effect. The staff has reviewed the information in this table and agrees that the applicant has identified AMPs to manage the aging effects identified in LRA Table 3.2-2, except for component (18), which is discussed below.

Component (18) in LRA Table 3.2.2

Section 3 of Table 3.2.2-2 of the application for renewed operating license, component (18), pressurizer manway cover, is identified as being constructed of carbon steel with a stainless steel disc insert and being susceptible to SCC. This table indicates that the Water Chemistry Control Program will be used to manage this aging effect.

GALL Item IV C2.5-m identifies pressurizer manway and flanges constructed from low-alloy steel with stainless steel cladding in a primary water environment as being susceptible to SCC. GALL requires an ASME Section XI Inservice Inspection Program in addition to a Water Chemistry Control Program.

In response to RAI 3.2.2-5 in a May 13, 2003, letter, the applicant indicated that the ASME Section XI Inservice Inspection Program was mistakenly omitted from this item in Table 3.2.2-2. To ensure that this program will be implemented for the pressurizer manway stainless steel insert, the applicant added to section 7.2 of procedure GMM-47-01-05, "Removal and Installation of Pressurizer Manway Cover" to perform a visual and surface examination of the stainless steel insert. The step will include reference to the Inspection Program and aging mechanism of SCC. Since the applicant proposes to include the pressurizer manway insert in its ASME Section XI Inservice Inspection Program and to utilize the Water Chemistry Control Program to mitigate SCC, the staff agrees that the proposed program will manage this aging effect.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the pressurizer. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.1.2.4.4.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the pressurizer, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the pressurizer, as required by 10 CFR 54.21(d).

3.1.2.4.5 Steam Generators

3.1.2.4.5.1 Summary of Technical Information in the Application. The description of the steam generators can be found in Section 2.3.1.5 of the LRA. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.1-5. The components, aging effects, and AMPs are provided in LRA Tables 3.2-1 and 3.2-2.

Aging Effects

The LRA identified the following applicable aging effects for the steam generators.

- cracking
- fatigue
- loss of material
- loss of preload

Aging Management Programs

The LRA credited the following AMPs with managing the identified aging effects for the steam generators.

- Water Chemistry (B2.1.37)
- Boric Acid Corrosion (B2.1.6)
- System Monitoring (B2.1.33)
- ASME Section XI, Subsection IWB, IWC and IWD Inservice Inspection (B2.1.2)
- Bolting Integrity (B2.1.5)
- Flow-Accelerated Corrosion (B2.1.15)
- Steam Generator Tube Integrity (B2.1.31)

The applicant concluded that these AMPs will manage the effects of aging, such that the intended function of the steam generators will be maintained consistent with the CLB under all design loading conditions throughout the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.4.5.2 Staff Evaluation. This section provides the results of the staff's evaluation of the applicant's AMR for the aging effects and the AMPs credited for managing the aging effects in the steam generators. The staff also reviewed the applicable UFSAR Supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects

The LRA identified the following applicable aging effects for the steam generators.

- cracking
- fatigue
- loss of material
- loss of preload

The passive, long-lived components in the steam generators that are subject to an AMR are identified in LRA Tables 3.2-1 and 3.2-2. LRA Table 3.2-1 includes components which were evaluated in the GALL Report. Components that the applicant indicates are consistent with GALL need no additional evaluation since GALL components and programs that are identified in GALL, and require no further evaluation, are acceptable to the staff. Components that require further evaluation are discussed in SER Section 3.1.2.2. The materials and environment for these components are identified in GALL.

LRA Table 3.2-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environment, and program proposed for managing the aging effect. The staff has reviewed the information in this table and agrees that the applicant has identified the applicable aging effects because the aging effects are appropriate for these materials and environment and are consistent nuclear power plant operating experiences.

On the basis of its review, the staff finds the applicant has identified all of the aging effects for the materials and environments associated with the steam generators.

Aging Management Programs

The applicant has credited the following AMPs to manage the aging effects described above for the steam generators.

- Water Chemistry (B2.1.37)
- Boric Acid Corrosion (B2.1.6)
- Systems Monitoring (B2.1.33)
- ASME Section XI, Subsection IWB, IWC and IWD Inservice Inspection (B2.1.2)
- Bolting Integrity (B2.1.5)
- Flow-Accelerated Corrosion (B2.1.15)
- Steam Generator Tube Integrity (B2.1.31)

As discussed above, components that the applicant indicates are consistent with GALL need no additional evaluation since GALL components and programs that are identified in GALL, and require no further evaluation, are acceptable to the staff. The components and programs that are used to manage the aging effect are discussed in SER Section 3.1.2.2.

LRA Table 3.2-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environment, and program proposed for managing the aging effect. The staff has reviewed the information in this table and agrees that the applicant has identified AMPs to manage the aging effects identified in LRA Table 3.2-2.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the steam generators. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.1.2.4.5.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the steam generators, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the steam generators, as required by 10 CFR 54.21(d).

3.1.2.4.6 Reactor Coolant (Non-Class 1) Components

3.1.2.4.6.1 Summary of Technical Information in the Application. The description of the reactor coolant (non-class 1) system can be found in Section 2.3.1.6 of the LRA. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.1-6. The components, aging effects, and AMPs are provided in LRA Tables 3.2-1 and 3.2-2.

Aging Effects

The LRA identified the following applicable aging effects for the reactor coolant (non-class 1) components.

- cracking
- fatigue
- loss of material
- loss of preload
- loss of heat transfer due to particulate and biological fouling

Aging Management Programs

The LRA credited the following AMPs with managing the identified aging effects for the reactor coolant (non-class 1) components.

- Water Chemistry (B2.1.37)
- Boric Acid Corrosion (B2.1.6)
- Systems Monitoring (B2.1.33)
- ASME Section XI, Subsection IWB, IWC and IWD Inservice Inspection (B2.1.2)
- Bolting Integrity (B2.1.5)

- Periodic Surveillance and Preventive Maintenance (B2.1.23)
- One-Time Inspection (B2.1.21)

The applicant concluded that these AMPs will manage the effects of aging, such that the intended function of the reactor coolant (non-class 1) components will be maintained consistent with the CLB under all design loading conditions throughout the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.4.6.2 Staff Evaluation. This section provides the results of the staff's evaluation of the applicant's AMR for the aging effects and the AMPs credited for managing the aging effects in the reactor coolant (non-class 1). The staff also reviewed the applicable UFSAR Supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects

The LRA identified the following applicable aging effects for the reactor coolant (non-class 1) components.

- cracking
- fatigue
- loss of material
- loss of preload
- loss of heat transfer due to particulate and biological fouling

The passive, long-lived components in the reactor coolant (non-class 1) systems that are subject to an AMR are identified in LRA Tables 3.2-1 and 3.2-2. LRA Table 3.2-1 includes components which were evaluated in the GALL Report. Components that the applicant indicates are consistent with GALL need no additional evaluation since GALL components and programs that are identified in GALL, and require no further evaluation, are acceptable to the staff. Components that require further evaluation are discussed in SER Section 3.1.2.2. The materials and environment for these components are identified in GALL.

LRA Table 3.2-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environment, and program proposed for managing the aging effect. The staff has reviewed the information in this table and agrees that the applicant has identified the applicable aging effects because the aging effects are appropriate for these materials and environment and are consistent nuclear power plant operating experiences.

On the basis of its review, the staff finds the applicant has identified all of the aging effects for the materials and environments associated with the reactor coolant (non-class 1) systems.

Aging Management Programs

The applicant has credited the following AMPs to manage the aging effects described above for the reactor coolant (non-class 1) components.

- Water Chemistry (B2.1.37)
- Boric Acid Corrosion (B2.1.6)
- System Monitoring (B2.1.33)

- ASME Section XI, Subsection IWB, IWC and IWD Inservice Inspection (B2.1.2)
- Bolting Integrity (B2.1.5)
- Periodic Surveillance and Preventive Maintenance (B2.1.23)
- One-Time Inspection (B2.1.21)

As discussed above, components that the applicant indicates are consistent with GALL need no additional evaluation since GALL components and programs that are identified in GALL, and require no further evaluation, are acceptable to the staff. The components and programs that are used to manage the aging effects are discussed in SER Section 3.1.2.2.

LRA Table 3.2-2 includes components which were not evaluated in GALL. The table identifies the aging effects, materials, environment, and program proposed for managing the aging effect. The staff has reviewed the information in this table and agrees that the applicant has identified AMPs to manage the aging effects identified in LRA Table 3.2-2.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the reactor coolant (non-class 1) components. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.1.2.4.6.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the reactor coolant (non-class 1), such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the reactor coolant (non-class 1), as required by 10 CFR 54.21(d).

3.1.3 Evaluation Findings

The staff has reviewed the information in Section 3.2 of the LRA. On the basis of its review, pending satisfactory resolution of Open Items B2.1.28-1and B2.1.36-1, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the reactor system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.29(a). The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging effects, as required by 10 CFR 54.21(d).

3.2 Engineered Safety Features Systems

This section addresses the aging management of the components of the engineered safety features (ESF) systems group. The systems that make up the ESF systems group are described in the following SER Sections.

- Safety Injection (2.3.2.1)
- Containment Spray (2.3.2.2)
- Residual Heat Removal (2.3.2.3)
- Containment Hydrogen Detectors and Recombiners (2.3.2.4)
- Containment Isolation Components (2.3.2.5)

As discussed in Section 3.0.1 of this SER, the components in each of these ESF systems are included in one of two LRA tables. LRA Table 3.3-1 consists of ESF systems components that are evaluated in the GALL Report, and LRA Table 3.3-2 consists of ESF systems components that are not evaluated in the GALL Report.

3.2.1 Summary of Technical Information in the Application

In LRA Section 3.3, the applicant described its AMRs for the ESF systems group at Ginna. The description of the systems that comprise the ESF systems group can be found in LRA Section 2.3.2. The passive, long-lived components in these systems that are subject to an AMR are identified in LRA Tables 2.3.2-1 through 2.3.2-5.

The applicant's AMRs included an 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 aging effects that require management. These reviews concluded that the aging effects requiring management based on Ginna operating experience were consistent with aging effects identified in GALL.

The applicant's review of industry operating experience included a review of operating experience through 2002. The results of this review concluded that aging effects requiring management based on industry operating experience were consistent with aging effects identified in GALL.

The applicant's ongoing review of plant-specific and industry-wide operating experience is conducted in accordance with the Ginna Operating Experience Program.

3.2.2 Staff Evaluation

In Section 3.3 of the LRA, the applicant describes its AMR for the ESF systems. The staff reviewed LRA Section 3.3 to determine whether the applicant has provided sufficient information to demonstrate that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB throughout the period of extended operation, in accordance with the requirements of 10 CFR 54.21(a)(3), for the ESF system components that are determined to be within the scope of license renewal and subject to an AMR.

The applicant referenced the GALL Report in its AMR. The staff has previously evaluated the adequacy of the aging management of ESF system components for license renewal as documented in the GALL Report. Thus, the staff did not repeat its review of the matters described in the GALL Report, except to ensure that the material presented in the LRA was applicable, and to verify that the applicant had identified the appropriate programs as described and evaluated in the GALL Report. The staff evaluated those aging management issues

recommended for further evaluation in the GALL Report. The staff also reviewed aging management information submitted by the applicant that was different from that in the GALL Report or was not addressed in the GALL Report. Finally, the staff reviewed the UFSAR Supplement to ensure that it provided an adequate description of the programs credited with managing aging for the ESF systems components.

In LRA Section 3.3, the applicant provided brief descriptions of the ESF systems and summarized the results of its AMR of the ESF systems at Ginna.

Table 3.2-1 below provides a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.3 that are addressed in the GALL Report.

Table 3.2-1

Staff Evaluation for Ginna Engineered Safety Features System Components in the GALL Report

Component Group	Aging Effect/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Piping, fittings, and valves in emergency core cooling system	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA	Consistent with GALL. GALL recommends further evaluation (see Section 3.2.2.2.1 below.)
Piping, fittings, pumps, and valves in emergency core cooling system	Loss of material due to general corrosion	Water Chemistry and One-Time Inspection	N/A	BWR
Components in containment spray (PWR only), standby gas treatment (BWR only), containment isolation, and emergency core cooling systems	Loss of material due to general corrosion	Plant-Specific	None	Not applicable to Ginna. GALL recommends further evaluation (see Section 3.2.2.2.2 below).
Piping, fittings, pumps, and valves in emergency core cooling system	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	N/A	BWR
Components in containment spray (PWR only), standby gas treatment (BWR only), containment isolation, and emergency core cooling systems	Loss of material due to pitting and crevice corrosion	Plant-Specific	One-Time Inspection Systems Monitoring	Consistent with GALL. GALL recommends further evaluation (see Section 3.2.2.2.3 below).
Containment isolation valves and associated piping	Loss of material due to microbiologically influenced corrosion	Plant-Specific	Periodic Surveillance and Preventive Maintenance	Consistent with GALL. GALL recommends further evaluation (see Section 3.2.2.2.4 below).
Seals in standby gas treatment system	Changes in properties due to elastomer degradation	Plant-Specific	N/A	BWR
High pressure safety injection (charging) pump miniflow orifice	Loss of material due to erosion	Plant-Specific	None	Not applicable to Ginna (see Section 3.2.2.2.5 below).
Drywell and suppression chamber spray system nozzles and flow orifices	Plugging of nozzles and flow orifices due to general corrosion	Plant-Specific	N/A	BWR
Piping and fittings of CASS in emergency core cooling system	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement CASS	None	Not applicable to Ginna.

Component Group	Aging Effects/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Components serviced by open-cycle cooling system	Local loss of material due to corrosion and/or buildup of deposit due to biofouling	Open-cycle Cooling Water System	None	Not applicable at Ginna.
Components serviced by closed-cycle cooling system	Loss of material due to general, pitting, and crevice corrosion	Closed-cycle Cooling Water System	Closed-Cycle (Component) Cooling Water System	Consistent with GALL (see Section 3.2.2.1 below).
Emergency core cooling system valves and lines to and from HPCI and RCIC pump turbines	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	N/A	BWR
Pumps, valves, piping, and fittings in containment spray and emergency core cooling systems	Crack initiation and growth due to SCC	Water Chemistry	Water Chemistry Control One-Time Inspection	Consistent with GALL (see Section 3.2.2.1 below).
Pumps, valves, piping, and fittings in emergency core cooling systems	Crack initiation and growth due SCC and IGSCC	Water Chemistry and BWR Stress Corrosion Cracking	N/A	BWR
Carbon steel components	Loss of material due to boric acid corrosion	Boric Acid Corrosion	Boric Acid Corrosion	Consistent with GALL (see Section 3.2.2.1 below).
Closure bolting in high pressure or high temperature systems	Loss of material due to general corrosion, loss of preload due to stress relaxation, and crack initiation and growth due to cyclic loading or SCC	Bolting Integrity	Bolting Integrity	Consistent with GALL (see Section 3.2.2.1 below).

The staff's review of the ESF systems for the Ginna LRA is contained within four sections of this SER. Section 3.2.2.1 is the staff review of components in the ESF systems that the applicant indicates are consistent with GALL and do not require further evaluation. Section 3.2.2.2 is the staff review of components in the ESF systems that the applicant indicates are consistent with GALL and for which GALL recommends further evaluation. Section 3.2.2.3 is the staff evaluation of AMPs that are specific to the ESF systems. Section 3.2.2.4 contains an evaluation of the adequacy of aging management for components in each system in the ESF systems group, and includes an evaluation of components in the ESF systems that the applicant indicates are not in GALL.

3.2.2.1 Aging Management Evaluations in the GALL Report That Are Relied on for License Renewal, Which Do Not Require Further Evaluation

For component groups evaluated in GALL for which the applicant has claimed consistency with GALL, and for which GALL does not recommend further evaluation, the staff sampled components in these groups to determine whether the plant-specific components contained in these GALL component groups were bounded by the GALL evaluation. The staff also sampled

component groups to determine whether the applicant had properly identified those component groups in GALL that were not applicable to its plant. The staff identified several areas where additional information or clarification was needed. The staff's evaluation of the applicants responses to those RAIs is included in Section 3.2.2.4 of this SER.

On the basis of its review, the staff has verified the applicant's claim of consistency with the GALL report. The staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 50.21(a)(3).

3.2.2.2 Aging Management Evaluations in the GALL Report That Are Relied on for License Renewal, For Which GALL Recommends Further Evaluation

For component groups evaluated in GALL for which the applicant has claimed consistency with GALL, and for which GALL recommends further evaluation, the staff reviewed the applicant's evaluation to determine whether it adequately addressed the issues for which GALL recommended further evaluation. In addition, the staff sampled components in these groups to determine whether the plant-specific components contained in these GALL component groups were bounded by the GALL evaluation.

The GALL Report indicates that further evaluation should be performed for the following**.**

3.2.2.2.1 Cumulative Fatigue Damage

The GALL Report identifies fatigue as 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 staff reviewed the evaluation of this TLAA in Section 4.3 of this SER, following the guidance in Section 4.3 of the SRP-LR.

The applicant indicated that all TLAAs were evaluated in the RCS section of the LRA; nothing in the ESF section. Safety injection nozzles are designated class 1 and were included in the RCS section. The applicant discusses the TLAA in Section 4.3 of the LRA, "Metal Fatigue." This TLAA is evaluated in Section 4.3 of this SER.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of cumulative fatigue damage for components in the applicable ESF systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.2 Loss of Material Due to General Corrosion

Loss of material due to general corrosion could occur in the containment spray system header and spray nozzle components and the external surfaces of PWR carbon steel components. The GALL Report recommends further evaluation on a plant-specific basis to ensure that the aging effect is adequately managed. The staff reviewed the applicant's proposed programs to

ensure that an adequate program will be in place for the management of general corrosion of these components.

The applicant indicated in LRA Table 3.3-1, line number (2), that the carbon steel containment spray headers and spray nozzles, and the associated components, in air environments, as identified in GALL Items V.A.2-a and V.A.5-a, are not applicable to components in Ginna containment spray system. The applicant also stated that containment isolation components identified in Item V.C.1-a, such as valve body and bonnet, and pipe penetrations, are included in the containment isolation valves and associated piping entry in LRA Table 3.3-1, line number (4). This component grouping is evaluated in Section 3.2.2.2.4 of this SER.

3.2.2.2.3 Local Loss of Material Due to Pitting and Crevice Corrosion

Local loss of material from pitting and crevice corrosion could occur in containment spray components, containment isolation valves and associated piping, and buried portions of the refueling water tank external surface. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed. The staff reviewed the applicant's proposed programs to ensure that an adequate program will be in place for the management of local loss of material due to pitting and crevice corrosion of these components.

In LRA Table 3.3-1, line number (3), the applicant credited its One-Time Inspection Program for managing the loss of material due to pitting and crevice corrosion for containment isolation components and the refueling water storage tank bottom. The applicant also credited a Systems Monitoring Program for managing all other applicable aging effects. The staff's review of these two AMPs is documented in Sections 3.0.3.7 and 3.0.3.11, respectively, of this SER.

The staff reviewed the applicant's One-Time Inspection Program to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation. The staff verified that the applicant's one-time inspection of selected components is performed at susceptible locations, based on severity of conditions, time of service, and the lowest design margin. The staff also verified that the proposed inspection would be performed using techniques similar to ASME Code and ASTM standards, including visual, ultrasonic, and surface techniques. The staff concludes that the AMP is sufficient to manage the identified aging effect of loss of material.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of local loss of material due to pitting and crevice corrosion for components in the applicable ESF systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.4 Local Loss of Material Due to Microbiologically Influenced Corrosion

Local loss of material due to MIC could occur in PWR containment isolation valves and associated piping in systems that are not addressed in other chapters of the GALL Report. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed. The staff reviewed the applicant's proposed programs to ensure that an adequate

program will be in place for the management of local loss of material due to MIC of the containment isolation barriers.

In LRA Table 3.3-1, line number (4), the applicant stated that, for containment isolation components such as valves and pipe penetrations, the aging effect of loss of material due to MIC is managed by the plant-specific Periodic Surveillance and Preventive Maintenance Program. The staff review of this AMP is documented in Section 3.0.3.8 of this SER.

The staff reviewed the applicant's proposed program to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation. The staff's review verified that the applicant's AMP is sufficient to manage the identified aging effect of loss of material.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of local loss of material due to MIC for components in the applicable ESF systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.5 Local Loss of Material Due to Erosion

Local loss of material due to erosion could occur in the high pressure safety injection pump miniflow orifice. This aging mechanism and effect will apply only to pumps that are normally used as charging pumps in the chemical and volume control systems. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed for these components. The staff reviewed the applicant's proposed programs to ensure that an adequate program will be in place to manage this aging effect.

The applicant stated in LRA Table 3.3-1, line number (5), that the high pressure safety injection (charging) pump miniflow orifice, as identified in GALL, is not applicable to Ginna. Since this GALL component grouping does not exist in Ginna, loss of material due to erosion is not a relevant aging effect requiring management. Therefore, the staff agrees that no AMP is required.

3.2.2.2.6 Conclusions

The staff has reviewed the applicant's evaluation of the issues for which GALL recommends further evaluation for components in the ESF systems. On the basis of its review, the staff finds that the applicant has provided sufficient information to demonstrate that the issues for which the GALL report recommends further evaluation have been adequately addressed and that there is reasonable assurance that the subject aging effects will be adequately managed for the period of extended operation.

3.2.2.3 *Aging Management Programs for Engineered Safety Features Systems Component*

In SER Section 3.2.2.1, the staff evaluated the applicant's conformance with the aging management recommended by GALL for ESF systems. In SER Section 3.2.2.2, the staff

reviewed the applicant's evaluation of the issues for which GALL recommends further evaluation. In this SER section, the staff presents its evaluation of the programs used by the applicant to manage the aging of the component groups within the ESF systems.

The applicant credits seven AMPs to manage the aging effects associated with components in the ESF systems. All seven AMPs are credited to manage aging for components in other system groups (common AMPs). The staff's evaluation of the common AMPs that are credited with managing aging in ESF system components is provided in Section 3.0.3 of this SER. The common AMPs credited for ESF components are as follows.

- Water Chemistry Control 3.0.3.1
- Bolting Integrity 3.0.3.3
- Boric Acid Corrosion Prevention 3.0.3.4
- Closed-Cycle (Component) Cooling Water System 3.0.3.5
- Periodic Surveillance and Preventive Maintenance 3.0.3.8
- One-Time Inspection 3.0.3.7
- Systems Monitoring 3.0.3.11

There are no AMPs that are specific to ESF systems.

3.2.2.4 AMR of Plant-Specific Engineered Safety Features Systems Components

In this section of the SER, the staff presents its review of the applicant's AMR for specific components within the ESF systems. To perform its evaluation, the staff reviewed the components listed in LRA Tables 2.3.2-1 through 2.3.2-5 to determine whether the applicant had properly identified the applicable aging effects and the AMPs needed to adequately manage these aging effects. This portion of the staff's review involved identification of the aging effects for each ESF component, ensuring that each aging effect was evaluated in the appropriate LRA AMR table in Section 3, and that management of the aging effect was captured in the appropriate AMP. The results of the staff's review are provided below.

3.2.2.4.1 Safety Injection System

<u>3.2.2.4.1.1 Summary of Technical Information in the Application.</u> The description of the safety injection system can be found in Section 2.3.2.1 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.2-1. The components, aging effects, and AMPs are provided in LRA Tables 3.3-1 and 3.3-2.

<u>Aging Effects</u>

Components of the safety injection system are described in LRA Section 2.3.2.1 as being within the scope of licence renewal, and subject to an AMR. Table 2.3.2-1 of the LRA lists individual components of the system including accumulator, carbon steel components, fasteners (bolting), flow element, heat exchanger, indicator, orifice, pipe, pump casing, tank, and valve body.

Stainless steel and CASS components in treated water–borated <140°F are identified as being subject to loss of material. Stainless steel and CASS components in treated water–borated >140°F are identified as being subject to loss of material and cracking due to SCC. Stainless steel tank bottom sitting on concrete is identified as being subject to loss of material. No aging

effects are identified for stainless steel and cast austenitic stainless steel components in air and gas, containment, and indoor not-air-conditioned environments. No aging effects are identified for stainless steel fasteners (bolting) exposed to borated water leaks from other plant systems.

Carbon and low-alloy steel components in containment air are identified as being subject to loss of material. Carbon steel and low-alloy steel fasteners (bolting) in indoor not-air-conditioned are identified for being subject to loss of material and loss of preload due to stress relaxation. Carbon steel components, including fasteners (bolting), in borated water leaks environments are identified as being subject to loss of material. Since there are no bolts with a specified minimum yield strength greater than 150 ksi in the ESF systems, SCC is not an applicable aging effect/mechanism.

Cast iron and nickel alloy heat exchanger components are identified as being subject to loss of material when exposed to oil and fuel oil, raw water, treated water–borated <140°F, and treated water–other environments. These heat exchanger components are also subject to loss of heat transfer when exposed to the same environments. Cast iron components in indoor not-air-conditioned environments are identified as being subject to loss of material.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the safety injection system.

- Bolting Integrity
- Water Chemistry Control
- Boric Acid Corrosion Prevention
- Periodic Surveillance and Preventive Maintenance
- One-Time Inspection
- System Monitoring
- Closed-Cycle (Component) Cooling Water System

A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the safety injection system will be adequately managed by these AMPs during the period of extended operation.

3.2.2.4.1.2 Staff Evaluation

Aging Effects

The staff reviewed the information in LRA Tables 2.3.2-1, 3.3-1, and 3.3-2 for the safety injection system. During its review, the staff determined that additional information was needed to complete its review.

In LRA Table 3.3-1, line number (7), the applicant stated that the combination of components, materials, and environments identified in Items V.A.6-a, V.A.6-b, V.D1.6-b, and V.D1.6-c of GALL are not applicable at Ginna. These GALL items address carbon and stainless steel heat exchangers, and associated components, in containment spray and ECCS systems, in chemically treated borated water and raw water environments. In RAI 3.3-1, the staff requested the applicant to discuss how AMR is performed for the above heat exchangers and their associated components at Ginna. By letter dated May 23, 2003, the applicant stated that the

containment spray and ECCS systems at Ginna have no heat exchangers that are provided cooling by the service water (open-cycle cooling water) system other than the safety injection pump thrust bearing coolers. These coolers are made of cast iron with a single, once-through passage of service water providing cooling to the oil supplying the thrust bearing (nonforced fed oil supply). Neither the material of construction (cast iron) nor the environment (oil) is covered by GALL. The applicant stated that these coolers are included in LRA Table 2.3.2-1 under the component group of heat exchanger, and are linked to Table 3.3-2, line numbers (23), (24), (25), (26), and (27) for AMR results. Based on its review of the information provided in Table 3.3-2, line numbers (23), (24), (25), (26), and (27), the staff finds the applicant has properly addressed the AMR for the containment spray and ECCS systems heat exchangers. Therefore, the staff considers RAI 3.3-1 closed.

In LRA Table 3.3-2, line number (11), the applicant identified no aging effects requiring management for the stainless steel fasteners (bolting) in borated water leakage environments. In RAI 3.3-3x2, the staff requested the applicant to provide the basis for such determination. By letter dated May 23, 2003, the applicant stated that the technical basis for identifying that there are no aging effects requiring management for stainless steel fasteners exposed to borated water leaks is found in EPRI TR-101108, “Boric Acid Corrosion Evaluation Program, Phase 1 - Task 1 Report” and in EPRI TR-104748, “Boric Acid Corrosion Guidebook.” These documents contain compilations of pertinent industry experience and summaries of corrosion test data which identify stainless steel and nickel-base alloys as alternative fastener materials which display excellent resistance to corrosion from borated water leaks. The staff considers the applicant’s reference of the industry’s experience to be acceptable. Therefore, the staff considers the response acceptable.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant’s responses to the above RAIs, the staff finds that the aging effects that result from contact of the safety injection system structures and components to the environments described in LRA Tables 2.3.2-1, 3.3-1, and 3.3-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the safety injection system.

<u>Aging Management Programs</u>

The applicant credited the following AMPs for managing the aging effects in the safety injection system.

- Water Chemistry Control
- Bolting Integrity
- Boric Acid Corrosion Prevention
- Closed-Cycle (Component) Cooling Water System
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Systems Monitoring

These AMPs are credited for managing the aging effects of several components in other structures and systems and are, therefore, considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects

identified for this system. The staff's evaluation of these AMPs is documented in Sections 3.0.3.1, 3.0.3.3, 3.0.3.4, 3.0.3.5, 3.0.3.7, 3.0.3.8, and 3.0.3.11 respectively, of this SER.

After evaluating the applicant's AMR for each of the components in the safety injection system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects. For those components identified in Table 3.3-1 of the LRA, the staff verified that the applicant credited the AMP(s) recommended by the GALL Report. For the components identified in LRA Table 3.3-2, the staff verified that the applicant credited an AMP that is appropriate for the identified aging effects.

In LRA Table 3.3-2, line number (25), the One-Time Inspection Program is credited to manage loss of material for the cast iron safety injection heat exchanger in raw water environments. In RAI 3.3-2, the staff requested the applicant to provide the basis that, for the above material/environment combination, the One-Time Inspection Program alone is adequate in ensuring that the aging effect will be effectively managed during the extended period of operation. By letter dated May 23, 2003, the applicant stated that a review of Ginna specific operating experience reveals that there has been no-age related degradation of this material/environment grouping found. The applicant stated that the raw water environment (service water system) at Ginna is supplied from Lake Ontario (fresh water), which is not an aggressive environment. Numerous inspections of service water pump casings made of the same material have identified no age-related degradation. The applicant stated that the one-time inspection will be performed on each safety injection pump outboard bearing cooler. The inspection will be completed prior to the end of the initial operating license. The staff finds the applicant's One-Time Inspection Program to be acceptable on the basis that (1) the raw water environment at Ginna is not an aggressive environment, (2) no age-related degradation has been found for the service water pump casings with similar material, and (3) based upon the results of the inspection, an engineering evaluation will be performed to determine if additional aging management activities will be required.

In LRA Table 3.3-2, line number (28), the Water Chemistry Control Program is utilized to manage the aging effect of loss of heat transfer for the nickel alloy heat exchanger from exposure to treated water — borated <140°F. In RAI 3.3-3, the staff requested the applicant to provide the basis for not supplementing with a one-time inspection to verify the effectiveness of the Water Chemistry Control Program. By letter dated May 23, 2003, the applicant stated that a one-time inspection is included in Table 3.3-2, line number (30), for the nickel alloy heat exchanger components. This is acceptable to the staff because the inspection will verify the effectiveness of the water chemistry controls.

Based on its review of the information provided in the LRA, the staff concludes that the above identified AMPs will effectively manage the aging effects for the components of the safety injection system.

<u>3.2.2.4.1.3 Conclusions.</u> On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the safety injection system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.29(a).

3.2.2.4.2 Containment Spray System

3.2.2.4.2.1 Summary of Technical Information in the Application. The description of the containment spray system can be found in Section 2.3.2.2 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.2-2. The components, aging effects, and AMPs are provided in LRA Tables 3.3-1 and 3.3-2.

Aging Effects

Components of the containment spray system are described in LRA Section 2.3.2.2 as being within the scope of licence renewal, and subject to an AMR. Table 2.3.2-2 of the LRA lists individual components of the system including carbon steel components, eductor, fasteners (bolting), flow nozzles, heat exchanger, indicator, orifice, pipe, pump casing, tank, transmitter, and valve body.

Stainless steel components are identified as being subject to loss of material when exposed to treated water–borated <140°F, treated water–other, and treated water–other (stagnant) environments. CASS components are identified as being subject to loss of material when exposed to treated water–borated <140°F, and treated water–other (stagnant) environments. No aging effects are identified for stainless steel components in air and gas, indoor not-air-conditioned, and containment environments. No aging effects are identified for CASS steel components in air and gas, and indoor not-air-conditioned environments. No aging effects are identified for stainless steel fasteners (bolting) in borated water leaks from other plant systems.

Carbon/low-alloy steel fasteners (bolting) in borated water leaks are identified as being subject to loss of material. Carbon/low-alloy steel fasteners (bolting) in indoor not-air-conditioned are identified as being subject to loss of material and loss of preload due to stress relaxation. Since there are no bolts with a specified minimum yield strength greater than 150 ksi in the ESF systems, SCC is not an applicable aging effect/mechanism.

Cast iron components in treated water other and indoor not-air-conditioned environments are identified as being subject to loss of material.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the containment spray system.

- Bolting Integrity
- Water Chemistry Control
- Boric Acid Corrosion Prevention
- One-Time Inspection
- Systems Monitoring
- Closed-Cycle (Component) Cooling Water System

A description of these AMPs is provided in Appendix B of the LRA.

3.2.2.4.2.2 Staff Evaluation.

Aging Effects

The staff reviewed the information in LRA Tables 2.3.2-2, 3.3-1, and 3.3-2 for the containment spray system. During its review, the staff determined that additional information was needed to complete its review.

In RAI 3.3-1, the staff requested the applicant to discuss how the AMR is performed for the heat exchangers, and their associated components, in the containment spray and ECCS systems. The staff's discussion of this RAI and its resolution by the applicant are provided in Section 3.2.2.4.1.2 of this SER.

In RAI 3.3-3x2, the staff requested the applicant to provide its basis of determining, in LRA Table 3.3-2, line number (11), that there are no aging effects requiring management for the stainless steel fasteners (bolting) in the borated water leakages environments. The staff's discussion of this RAI and its resolution by the applicant are provided in Section 3.2.2.4.1.2 of this SER.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff finds that the aging effects that result from contact of the containment spray system structures and components to the environments described in LRA Tables 2.3.2-2, 3.3-1, and 3.3-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the containment spray system.

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the containment spray system.

- Water Chemistry Control
- Bolting Integrity
- Boric Acid Corrosion Prevention
- Closed-Cycle (Component) Cooling Water System
- One-Time Inspection
- Systems Monitoring

These AMPs are credited for managing the aging effects of several components in other structures and systems and are, therefore, considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these AMPs is documented in Sections 3.0.3.1, 3.0.3.3, 3.0.3.4, 3.0.3.5, 3.0.3.7, and 3.0.3.11, respectively, of this SER.

After evaluating the applicant's AMR for each of the components in the containment spray system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects. For those components identified in Table 3.3-1 of the LRA, the staff verified that the applicant credited the AMP(s) recommended by the GALL Report. For the components identified in LRA Table 3.3-2, the staff verified that the applicant credited an AMP that is appropriate for the identified aging effects.

Based on its review of the information provided in the LRA, the staff concludes that the above identified AMPs will effectively manage the aging effects for the components of the containment spray system.

3.2.2.4.2.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the containment spray system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.29(a).

3.2.2.4.3 Residual Heat Removal System

3.2.2.4.3.1 Summary of Technical Information in the Application. The description of the residual heat removal (RHR) system can be found in Section 2.3.2.3 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.2-3. The components, aging effects, and AMPs are provided in LRA Tables 3.3-1 and 3.3-2.

Aging Effects

Components of the RHR system are described in LRA Section 2.3.2.3 as being within the scope of licence renewal, and subject to an AMR. Table 2.3.2-3 of the LRA lists individual components of the system including carbon steel components, fasteners (bolting), flow element, heat exchanger, indicator, orifice, pipe, pump casing, switch, temperature element, and valve body.

Stainless steel components are identified as being subject to loss of material when exposed to treated water-borated <140°F and treated water other environments. Stainless steel components in treated water-borated <140°F environments are identified as being subject to loss of material and cracking due to SCC. Stainless steel heat exchanger components are identified as being subject to loss of heat transfer when exposed to treated water-borated <140°F and treated water other environments. Cast austenitic stainless steel in treated water-borated 140 °F are identified as being subject to loss of material. No aging effects are identified for stainless steel components in air and gas, indoor (not-air-conditioned), concrete, and containment environments. No aging effects are identified for stainless steel fasteners (bolting) in borated water leaks from other plant systems. No aging effects are identified for CASS components in air and gas, containment, and indoor (not-air-conditioned) environments.

Carbon/low-alloy steel components in treated water other are identified as being subject to loss of material. Carbon/low-alloy steel components in borated water leaks are identified as being subject to loss of material. Carbon/low-alloy steel fasteners (bolting) in indoor (not-air-conditioned) are identified as being subject to loss of material and loss of preload due to stress relaxation. Since there are no bolts with a specified minimum yield strength greater than 150 ksi in the ESF systems, SCC is not an applicable aging effect/mechanism.

Cast iron components are identified as being subject to loss of material in treated water other and indoor (no-air-conditioned) environments.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the RHR system.

- Bolting Integrity
- Water Chemistry Control
- Boric Acid Corrosion Prevention
- One-Time Inspection
- Systems Monitoring
- Closed-Cycle (Component) Cooling Water System

A description of these AMPs is provided in Appendix B of the LRA.

3.2.2.4.3.2 Staff Evaluation

Aging Effects

The staff reviewed the information in LRA Tables 2.3.2-3, 3.3-1, and 3.3-2 for the RHR system. During its review, the staff determined that additional information was needed to complete its review.

In RAI 3.3-3x2, the staff requested the applicant to provide its basis of determining, in LRA Table 3.3-2, line number (11), that there are no aging effects requiring management for the stainless steel fasteners (bolting) in the borated water leakages environments. The staff's discussion of this RAI and its resolution by the applicant are provided in Section 3.2.2.4.1.2 of this SER.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff finds that the aging effects that result from contact of the RHR system SCs to the environments described in LRA Tables 2.3.2-3, 3.3-1 and 3.3-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the RHR system.

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the RHR system

- Water Chemistry Control
- Bolting Integrity
- Boric Acid Corrosion Prevention
- Closed-Cycle (Component) Cooling Water System
- One-Time Inspection
- Systems Monitoring

These AMPs are credited for managing the aging effects of several components in other structures and systems and are, therefore, considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these AMPs is documented in Sections 3.0.3.1, 3.0.3.3, 3.0.3.4, 3.0.3.5, 3.0.3.7, and 3.0.3.11 respectively, of this SER.

After evaluating the applicant's AMR for each of the components in the RHR system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects. For those components identified in Table 3.3-1 of the LRA, the staff verified that the applicant credited the AMP(s) recommended by the GALL Report. For the components identified in LRA Table 3.3-2, the staff verified that the applicant credited an AMP that is appropriate for the identified aging effects.

Based on its review of the information provided in the LRA, the staff concludes that the above identified AMPs will effectively manage the aging effects for the components of the RHR system.

3.2.2.4.3.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the RHR system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.29(a).

3.2.2.4.4 Containment Hydrogen Detectors and Recombiner System

3.2.2.4.4.1 Summary of Technical Information in the Application. The description of the containment hydrogen detectors and recombiner (CHDR) system can be found in Section 2.3.2.4 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.2-4. The components, aging effects, and AMPs are provided in LRA Tables 3.3-1 and 3.3-2.

Aging Effects

Components of the CHDR system are described in LRA Section 2.3.2.4 as being within the scope of licence renewal, and subject to an AMR. Table 2.3.2-4 of the LRA lists individual components of the system including blower casing, controller, carbon steel components, fasteners (bolting), filter housing, flow element, pipe, pump casing, recombiner casing, valve body, and ventilation ductwork.

Carbon/low-alloy steel components are identified as being subject to loss of material in air and gas (wetted) <140°F, borated water leakages, indoor (no-air-conditioned), buried, and containment environments. Carbon/low-alloy steel fasteners (bolting) in indoor (no-air-conditioned) are identified as being subject to loss of material and loss of preload due to stress relaxation. No aging effects are identified for carbon/low-alloy steel components in air and gas environments. Since there are no bolts with a specified minimum yield strength greater than 150 ksi in the ESF systems, SCC is not an applicable aging effect/mechanism.

No aging effects are identified for galvanized carbon steel in air and gas (wetted) <140°F, and containment environments. No aging effects are identified for copper alloy (Zn <15%) in air and gas, containment, and indoor (no-air-conditioned) environments.

No aging effects are identified for stainless steel components in air and gas, air and gas (wetted) <140°F, borated water leaks, containment, and outdoor environments. No aging effects are identified for cast austenitic stainless steel components in air and gas and indoor (no-air-conditioned) environments.

Cast iron components in indoor not-air-conditioned environments are identified as being subject to loss of material. No aging effects are identified for cast iron in air and gas environments.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the CHDR system.

- Bolting Integrity
- Boric Acid Corrosion Prevention
- Periodic Surveillance and Preventive Maintenance
- One-Time Inspection
- Systems Monitoring

A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the CHDR system will be adequately managed by these AMPs during the period of extended operation.

3.2.2.4.4.2 Staff Evaluation.

Aging Effects

The staff reviewed the information in LRA Tables 2.3.2-4, 3.3-1, and 3.3-2 for the CHDR system. During its review, the staff determined that additional information was needed to complete its review.

In RAI 3.3-3x2, the staff requested the applicant to provide its basis of determining, in LRA Table 3.3-2, line number (11), that there are no aging effects requiring management for the stainless steel fasteners (bolting) in the borated water leakages environments. The staff's discussion of this RAI and its resolution by the applicant are provided in Section 3.2.2.4.1.2 of this SER.

In LRA Table 3.3-2, row (44), (45), (67), (88), and (89), for copper alloy (Zn <15%) pipe, thermowell, and valve body exposed to containment or indoor (not-air-conditioned) environments, the applicant identified no aging effects requiring management. In RAI 3.3-4, the staff requested the applicant to provide the basis of such determination. By letter dated May 23, 2003, the applicant stated that copper and copper alloy materials (brass and bronzes) with Zn <15% display excellent resistance to atmospheric corrosion in a variety of environments, including industrial, marine, and rural atmospheres. The applicant stated that the American Society for Metals (ASM) Metal Handbook, Volume 13, "Corrosion," states that "Comprehensive tests conducted over a 20-year period under the supervision of ASTM, as well as many service records, have confirmed the suitability of copper and copper alloys for atmospheric exposure." Corrosion rate data published in Volume 13 of the American Society Management (ASM) Metal Handbook indicates that corrosion rates range from 0.002 mils/yr in rural environments to approximately 0.1 mils/yr in industrial/marine environments. These rates are essentially negligible. The applicant also stated that plant-specific operating experience at Ginna has also revealed no evidence of corrosion-related degradation of copper alloy components exposed to indoor not-air-conditioned and containment environments. On the basis of the above specific technical data and the plant-specific operating experience, the staff finds the applicant's response to this issue to be acceptable.

In LRA Table 3.3-2, line numbers (97) and (98), for galvanized carbon steel ventilation duct work, exposed to air and gas (wetted) <140°F, or containment environments, the applicant identified no aging effects requiring management. In RAI 3.3.5, the staff requested the applicant to provide the basis of such determination. By letter dated May 23, 2003, the applicant stated that the internal and external environments in the containment ventilation duct work are essentially equal in temperature and, therefore, condensation necessary to support corrosion on galvanized steel would not be expected to occur on ductwork surfaces. The galvanized coating on carbon steel substrate is intended to behave as a sacrificial layer, thereby protecting the carbon steel. Based on the above plant-specific review and the standard industry guidance which indicates that the galvanized carbon steel exposed to ventilation air (T <140°F) would be expected to exhibit minimal deterioration of the zinc coating, the staff finds the applicant's response to be acceptable.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff finds that the aging effects that result from contact of the CHDR system SCs to the environments described in LRA Tables 2.3.2-4, 3.3-1, and 3.3-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the CHDR system.

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the CHDR system.

- Bolting Integrity
- Boric Acid Corrosion Prevention
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Systems Monitoring

These AMPs are credited for managing the aging effects of several components in other structures and systems and are, therefore, considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these AMPs is documented in Sections 3.0.3.3, 3.0.3.4, 3.0.3.7, 3.0.3.8, and 3.0.3.11, respectively, of this SER.

After evaluating the applicant's AMR for each of the components in the CHDR system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects. For those components identified in Table 3.3-1 of the LRA, the staff verified that the applicant credited the AMP(s) recommended by the GALL Report. For the components identified in LRA Table 3.3-2, the staff verified that the applicant credited an AMP that is appropriate for the identified aging effects.

In LRA Table 3.3-2, line number (42), the One-Time Inspection Program is utilized to manage loss of material for the carbon/low-alloy steel pipe in a buried environment. In RAI 3.3-2, the staff requested the applicant to provide the basis that, for the above material/environment combination, the One-Time Inspection Program alone is adequate in ensuring that the aging effect will be effectively managed during the extended period of operation. By letter dated May

23, 2003, the applicant stated that the aging management activities associated with this buried pipe include removing the surrounding fill and performing a one-time inspection to verify that the pipe has not been degraded by corrosion. The applicant stated that omitted from the application was information that the pipe will subsequently be included in the plant-specific Systems Monitoring Program. Hence one-time inspections alone will not be used for this material/environment combination. On the basis that the One-Time Inspection Program will be supplemented by the Systems Monitoring Program, the staff finds the applicant's response to be acceptable for the buried pipe.

Based on its review of the information provided in the LRA, the staff concludes that the above identified AMPs will effectively manage the aging effects for the components of the CHDR system.

3.2.2.4.4.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the CHDR system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.29(a).

3.2.2.4.5 Containment Isolation Components

3.2.2.4.5.1 Summary of Technical Information in the Application. The description of the containment isolation component (CIC) system can be found in Section 2.3.2.5 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.2-5. The components, aging effects, and AMPs are provided in LRA Tables 3.3-1 and 3.3-2.

Aging Effects

Components of the CIC system are described in LRA Section 2.3.2.5 as being within the scope of licence renewal, and subject to an AMR. Table 2.3.2-5 of the LRA lists individual components of the system including carbon steel components, delay coil, fasteners (bolting), flange, pipe, thermowell, and valve body.

Stainless steel components in treated water primary, 140<T<480, are identified as being subject to loss of material and cracking due to SCC. CASS in raw water drainage is identified as being subject to loss of material. No aging effects are identified for stainless steel components in air and gas (wetted) <140°F, containment, borated water leaks, and indoor (not-air-conditioned) environments. No aging effects are identified for cast austenitic stainless steel components in air and gas (wetted) <140°F, containment, and indoor (not-air-conditioned) environments.

Carbon/low-alloy steel components are identified as being subject to loss of material in borated water leaks environments. Carbon/low-alloy steel fasteners (bolting) in indoor (not-air-conditioned) environments are identified as being subject to loss of material and loss of preload due to stress relaxation. Carbon/low-alloy steel are identified as being subject to loss of material when exposed to containment, outdoor, indoor (not-air-conditioned), and air and gas (wetted) <140°F environments. No aging effects are identified for carbon/low-alloy steel in air

and gas environments. Since there are no bolts with a specified minimum yield strength greater than 150 ksi in the ESF systems, SCC is not an applicable aging effect/mechanism.

Copper alloy (Zn <15%) components in air and gas (wetted) <140°F are identified as being subject to loss of material. No aging effects are identified for copper alloy (Zn <15%) in air and gas, containment, and indoor (not-air-conditioned) environments.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the CIC system.

- Bolting Integrity
- Water Chemistry Control
- Boric Acid Corrosion Prevention
- Periodic Surveillance and Preventive Maintenance
- One-Time Inspection
- System Monitoring

A description of these AMPs is provided in Appendix B of the LRA.

3.2.2.4.5.2 Staff Evaluation.

Aging Effects

The staff reviewed the information in LRA Tables 2.3.2-5, 3.3-1, and 3.3-2 for the CIC system. During its review, the staff determined that additional information was needed to complete its review.

In RAI 3.3-4, the staff requested the applicant to provide its basis of determining, in LRA Table 3.3-2, line numbers (44), (45), (67), (88), and (89), that there are no aging effects requiring management for copper alloy (Zn <15%) pipe, thermowell, and valve body exposed to containment or indoor not-air-conditioned environments. The staff's discussion of this RAI and its resolution by the applicant are provided in Section 3.2.2.4.4.2 of this SER.

In RAI 3.3-3x2, the staff requested the applicant to provide its basis of determining, in LRA Table 3.3-2, line number (11), that there are no aging effects requiring management for the stainless steel fasteners (bolting) in the borated water leakages environments. The staff's discussion of this RAI and its resolution by the applicant are provided in Section 3.2.2.4.1.2 of this SER.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff finds that the aging effects that result from contact of the CIC system structures and components to the environments described in LRA Tables 2.3.2-5, 3.3-1, and 3.3-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the CIC system.

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the CIC system.

- Water Chemistry Control
- Bolting Integrity
- Boric Acid Corrosion Prevention
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Systems Monitoring

These AMPs are credited for managing the aging effects of several components in other structures and systems and are, therefore, considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these AMPs is documented in Sections 3.0.3.1, 3.0.3.3, 3.0.3.4, 3.0.3.7, 3.0.3.8, and 3.0.3.11 respectively, of this SER.

After evaluating the applicant's AMR for each of the components in the CIC system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects. For those components identified in Table 3.3-1 of the LRA, the staff verified that the applicant credited the AMP(s) recommended by the GALL Report. For the components identified in LRA Table 3.3-2, the staff verified that the applicant credited an AMP that is appropriate for the identified aging effects.

In LRA Table 3.3-2, line numbers (41) and (66), the One-Time Inspection Program is utilized to manage loss of material for the carbon/low-alloy steel pipe and copper alloy (Zn <15%) thermowell, respectively, in air and gas (wetted) <140°F environments. In RAI 3.3-2, the staff requested the applicant to provide the basis that, for the above material/environment combination, the One-Time Inspection Program alone is adequate in ensuring that the aging effect will be effectively managed during the extended period of operation. By letter dated May 23, 2003, the applicant stated that for the carbon/low-alloy steel pipe included in line number (41), a review of Ginna specific operating experience for this material/environment grouping shows no instances of age-related degradation. This specific piping is associated with the heating steam system carbon steel piping to and from containment. This piping has been cut off and a pipe cap installed by welding at each end. The applicant stated that a one-time inspection of the piping segments at penetrations 301 and 303, which have been out of service for over 10 years, will be performed prior to the period of extended operation. This inspection will be performed on the exterior surfaces of the segments utilizing ultrasonic methods and include inspection locations along the bottom and sides of the pipe(s) on the containment and intermediate building sides. In addition, the applicant stated that appropriate corrective action will be taken as necessary. Based on the configuration of the piping segments, the proposed methods of inspection and locations, as well as the provisions of the corrective action, the staff finds the One-Time Inspection Program to be acceptable for managing the identified aging effect.

For the copper alloy (Zn <15%) thermowell in an air and gas (wetted) <140°F environment (line number (66)), the applicant stated that a review of Ginna specific operating experience reveals no occurrences of age related degradation for the material/environment grouping. The applicant stated that a one-time inspection of components in this material/environment grouping is appropriate to verify the improbability of age related degradation. Based on the Ginna specific operating experience and the applicant's response to RAI 3.3-4 regarding the corrosion

resistance of copper alloys (Zn <15%), the staff finds the applicant's use of the One-Time Inspection Program to be acceptable.

Based on its review of the information provided in the LRA, the staff concludes that the above identified AMPs will effectively manage the aging effects for the components of the CIC system.

3.2.2.4.5.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the CIC system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.29(a).

3.2.3 Evaluation Findings

The staff has reviewed the information in Section 3.3 of the LRA. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the ESF system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB during the period of extended operation. The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging effects, as required by 10 CFR 54.21(d).

3.3 Auxiliary Systems

This section addresses the aging management of the components of the auxiliary systems group. The systems that make up the auxiliary systems group are described in the following SER Sections.

- Chemical and Volume Control (2.3.3.1)
- Component Cooling Water (2.3.3.2)
- Spent Fuel Cooling and Fuel Storage (2.3.3.3)
- Waste Disposal (2.3.3.4)
- Service Water (2.3.3.5)
- Fire Protection (2.3.3.6)
- Heating (2.3.3.7)
- Emergency Power(2.3.3.8)
- Containment Ventilation (2.3.3.9)
- Essential Ventilation (2.3.3.10)
- Cranes, Hoists, and Lifting Devices (2.3.3.11)
- Treated Water (2.3.3.12)
- Radiation Monitoring (2.3.3.13)
- Circulating Water (2.3.3.14)
- Chilled Water (2.3.3.15)
- Fuel Handling (2.3.3.16)
- Plant Sampling (2.3.3.17)
- Plant Air (2.3.3.18)
- Non-Essential Ventilation (2.3.3.19)

- Site Service and Facility Support (2.3.3.20)

As discussed in Section 3.0.1 of this SER, the components in each of these auxiliary systems are included in one of two LRA tables. LRA Table 3.4-1 consists of auxiliary system components that are evaluated in the GALL Report and LRA Table 3.4-2 consists of auxiliary system components that are not evaluated in the GALL Report.

3.3.1 Summary of Technical Information in the Application

In LRA Section 3.4, the applicant described its AMRs for the auxiliary systems group at Ginna.

The description of the systems that comprise the auxiliary systems group can be found in LRA Section 2.3.3.

The passive, long-lived components in these systems that are subject to an AMR are identified in LRA Tables 2.3.3-1 through 2.3.3-20.

The applicant's AMRs included an 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 aging effects that require management. These reviews concluded that the aging effects requiring management based on Ginna's operating experience were consistent with aging effects identified in GALL.

The applicant's review of industry operating experience included a review of operating experience through 2002. The results of this review concluded that aging effects requiring management based on industry operating experience were consistent with aging effects identified in GALL.

The applicant's ongoing review of plant-specific and industry-wide operating experience is conducted in accordance with the Ginna Operating Experience Program.

3.3.2 Staff Evaluation

In Section 3.4 of the LRA, the applicant describes its AMR for the auxiliary systems at Ginna. The staff reviewed LRA Section 3.4 to determine whether the applicant has provided sufficient information to demonstrate that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB throughout the period of extended operation, in accordance with the requirements of 10 CFR 54.21(a)(3), for the auxiliary system components that are determined to be within the scope of license renewal and subject to an AMR.

The applicant referenced the GALL Report in its AMR. The staff has previously evaluated the adequacy of the aging management of auxiliary system components for license renewal as documented in the GALL Report. Thus, the staff did not repeat its review of the matters described in the GALL Report, except to ensure that the material presented in the LRA was applicable, and to verify that the applicant had identified the appropriate programs as described and evaluated in the GALL Report. The staff evaluated those aging management issues recommended for further evaluation in the GALL Report. The staff also reviewed aging

management information submitted by the applicant that was different from that in the GALL Report or was not addressed in the GALL Report. Finally, the staff reviewed the UFSAR Supplement to ensure that it provided an adequate description of the programs credited with managing aging for the auxiliary system components.

Table 3.3-1 below provides a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.4 that are addressed in the GALL Report.

Table 3.3-1

Staff Evaluation Table for Ginna Auxiliary System Components Evaluated in the GALL Report

Component Group	Aging Effect/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Components in spent fuel pool cooling and cleanup	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control Program, Periodic Surveillance and Preventive Maintenance Program, One-Time Inspection Program	GALL recommends further evaluation (see Section 3.3.2.2.1 below).
Linings in spent fuel pool cooling and cleanup system; seals and collars in ventilation systems	Hardening, cracking, and loss of strength due to elastomer degradation; loss of material due to wear	Plant Specific	One-Time Inspection Program, Periodic Surveillance and Preventive Maintenance Program, Systems Monitoring Program	Consistent with GALL. GALL recommends further evaluation (see Section 3.3.2.2.2 below).
Components in load handling, chemical and volume control system (PWR), and reactor water cleanup and shutdown cooling systems (older BWR)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10CFR 54.21(c)	Time-Limited Aging Analyses	GALL recommends further evaluation (see Section 3.3.2.2.3 below).
Heat exchangers in reactor water cleanup system (BWR); high pressure pumps in chemical and volume control system (PWR)	Crack initiation and growth to SCC or cracking	Plant Specific	Water Chemistry Control Program, One-Time Inspection Program, Periodic Surveillance and Preventive Maintenance Program	Consistent with GALL. GALL recommends further evaluation (see Section 3.3.2.2.4 below).
Components in ventilation systems, diesel fuel oil system, and emergency diesel generator systems; external surfaces of carbon steel components	Loss of material due to general, pitting, and crevice corrosion, and MIC	Plant Specific	One-Time Inspection Program, Periodic Surveillance and Preventive Maintenance Program, Closed-Cycle (Component) Cooling Water System Program, Fuel Oil Chemistry Program, Systems Monitoring Program	Consistent with GALL. GALL recommends further evaluation (see Section 3.3.2.2.5 below).
Components in reactor coolant pump oil collect system of fire protection	Loss of material due to galvanic, general, pitting, and crevice corrosion	One-Time Inspection	Fire Protection Program	Consistent with GALL (see Section 3.3.2.3.2).

Component Group	Aging Effects/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Diesel fuel oil tanks in diesel fuel oil system and emergency diesel generator system	Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling	Fuel Oil Chemistry and One-Time Inspection	Fuel Oil Chemistry Program, Periodic Surveillance and Preventive Maintenance Program	Consistent with GALL. GALL recommends further evaluation (see Section 3.3.2.2.7 below).
Piping, pump casing, and valve body and bonnets in shutdown cooling system (older BWR)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	not applicable	BWR
Heat exchangers in chemical and volume control system	Crack initiation and growth to SCC and cyclic loading	Water Chemistry and a Plant-Specific Verification Program	Water Chemistry Control Program, One-Time Inspection Program, Periodic Surveillance and Preventive Maintenance Program	Consistent with GALL. GALL recommends further evaluation (see Section 3.3.2.2.8 below).
Neutron absorbing sheets in spent fuel storage racks	Reduction of neutron absorbing capacity and loss of material due to general corrosion (Boral, boron steel)	Plant Specific	Periodic Surveillance and Preventive Maintenance Program, Spent Fuel Pool Neutron Absorber (Borated Stainless Steel) Monitoring Program	Consistent with GALL. GALL recommends further evaluation (see Section 3.3.2.2.9 below).
New fuel rack assembly	Loss of material due to general, pitting, and crevice corrosion	Structures Monitoring	Systems Monitoring Program	Consistent with GALL (See Section 3.3.2.1 below).
Spent fuel storage racks and valves in spent fuel pool cooling and cleanup	Crack initiation and growth due to stress corrosion cracking	Water Chemistry	Water Chemistry Control Program, One-Time Inspection Program, Periodic Surveillance and Preventive Maintenance Program	Consistent with GALL (see Section 3.3.2.1 below).
Neutron absorbing sheets in spent fuel storage racks	Reduction of neutron absorbing capacity due to Boraflex degradation	Boraflex Monitoring	not applicable	Ginna uses borated Stainless Steel sheets instead of boraflex sheets.
Closure bolting and external surfaces of carbon steel and low-alloy steel components	Loss of material due to boric acid	Boric Acid Corrosion	Boric Acid Corrosion Program	Consistent with GALL (see Section 3.3.2.1 below).
Components in or serviced by closed-cycle cooling water system	Loss of material due to general, pitting, and MIC	Closed-Cycle Cooling Water System	Closed-Cycle (Component) Cooling Water System Program	Consistent with GALL (see Section 3.3.2.1 below).

Component Group	Aging Effects/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Cranes including bridge and trolleys and rail system in load handling systems	Loss of material due to general corrosion and wear	Overhead Heavy Load and Light Load Handling Systems	Periodic Surveillance and Preventive Maintenance Program, and Heavy and Light Load (Related to Refueling) Handling Systems Program	Consistent with GALL (see Section 3.3.2.1 below).
Components in or serviced by open-cycle cooling water systems	Loss of material due to general, pitting, crevice and galvanic corrosion, MIC, and biofouling; buildup of deposit due to biofouling	Open-Cycle Cooling Water System	Open-Cycle Cooling (Service) Water System Program and Periodic Surveillance and Preventive Maintenance Program	Consistent with GALL (see Section 3.3.2.1 below).
Buried piping and fittings	Loss of material due to general, pitting, and crevice corrosion, and MIC	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection Program, Periodic Surveillance and Preventive Maintenance Program, One-Time Inspection Program, and Fire Water System Program	Consistent with GALL (see Section 3.3.2.1 below). GALL recommends further evaluation (see Sections 3.3.2.3.2 and 3.3.2.2.10 below).
Components in compressed air system	Loss of material due to general and pitting corrosion	Compressed Air Monitoring	not applicable	Components are not in the scope of LRA.
Components (doors and barrier penetration seals) and concrete structures in fire protection	Loss of material due to wear; hardening and shrinkage due to weathering	Fire Protection	Fire Protection Program.	Consistent with GALL (see Section 3.3.2.3.2).
Components in water-based fire protection	Loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling	Fire Water System	Fire Water System Program and Periodic Surveillance and Preventive maintenance Program	Consistent with GALL (see Sections 3.3.2.3.2 and 3.0.3.8).
Components in diesel fire system	Loss of material due to galvanic, general, pitting, and crevice corrosion	Fire Protection and Fuel Oil Chemistry	Fuel Oil Chemistry Program, and Periodic Surveillance and Preventive Maintenance Program.	Consistent with GALL (see Section 3.3.2.3.2).
Tanks in diesel fuel oil system	Loss of material due to general, pitting, and crevice corrosion	Aboveground Carbon Steel Tanks	not applicable	There are no aboveground tanks in Ginna's diesel fuel oil system.
Closure bolting	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and SCC	Bolting Integrity	Bolting Integrity Program	Consistent with GALL (see Section 3.3.2.1 below).

Component Group	Aging Effects/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Components in contact with sodium pentaborate solution in standby liquid control system (BWR)	Crack initiation and growth due to SCC	Water Chemistry	not applicable	BWR
Components in reactor water cleanup system	Crack initiation and growth due to SCC and IGSCC	Reactor Water Cleanup System Inspection	not applicable	BWR
Components in shutdown cooling system (older BWR)	Crack initiation and growth due to SCC	BWR Stress Corrosion Cracking and Water Chemistry	not applicable	BWR
Components in shutdown cooling system (older BWR)	Loss of material due to pitting and crevice corrosion and MIC	Closed-Cycle Cooling Water System	not applicable	BWR
Components (aluminum bronze, brass, cast iron, cast steel) in open-cycle and closed-cycle cooling water systems, and ultimate heat sink	Loss of material due to selective leaching	Selective Leaching of Materials	Open-Cycle Cooling (Service) Water System Program, Closed-Cycle (Component) Cooling Water System Program, and Periodic Surveillance and Preventive Maintenance Program or One-Time Inspection Program	Consistent with GALL (see Section 3.3.2.1 below).
Fire barriers, walls, ceilings and floors in fire protection	Concrete cracking and spalling due to freeze-thaw, aggressive chemical attack, and reaction with aggregates; loss of material due to corrosion of embedded steel	Fire Protection and Structures Monitoring	Fire Protection Program and Structures Monitoring Program.	Consistent with GALL (see Section 3.3.2.3.2).

The staff's review of the auxiliary systems for the Ginna LRA is contained within four sections of this SER. Section 3.3.2.1 is the staff review of components in the auxiliary systems that the applicant indicates are consistent with GALL and do not require further evaluation. Section 3.3.2.2 is the staff review of components in the auxiliary systems that the applicant indicates are consistent with GALL and GALL recommends further evaluation. Section 3.3.2.3 is the staff evaluation of AMPs that are specific to the auxiliary systems group. Section 3.3.2.4 contains an evaluation of the adequacy of aging management for components in each system in the auxiliary systems group and includes an evaluation of components in the auxiliary systems that the applicant indicates are not in GALL.

3.3.2.1 Aging Management Evaluations in the GALL Report That Are Relied On For License Renewal, Which Do Not Require Further Evaluation

For component groups evaluated in GALL for which the applicant has claimed consistency with GALL, and for which GALL does not recommend further evaluation, the staff sampled

components in these groups to determine whether the plant-specific components contained in these GALL component groups were bounded by the GALL evaluation. The staff also sampled component groups to determine whether the applicant had properly identified those component groups in GALL that were not applicable to its plant. The staff identified several areas where additional information or clarification was needed. The staff's evaluation of the applicants responses to those RAIs is included in Section 3.3.2.4 of this SER.

On the basis of its review, the staff has verified the applicant's claim of consistency with the GALL report. The staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 50.21(a)(3).

3.3.2.2 Aging Management Evaluations in the GALL Report That Are Relied On For License Renewal, For Which GALL Recommends Further Evaluation

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with GALL, and for which the GALL Report recommends further evaluation, the staff reviewed the applicant's evaluation to determine whether it adequately addressed the issues for which GALL recommended further evaluation. In addition, the staff sampled components in these groups to determine whether the plant-specific components contained in these GALL component groups were bounded by the GALL evaluation.

The GALL Report indicates that further evaluation should be performed for the following.

3.3.2.2.1 Loss of Material Due to General, Pitting, and Crevice Corrosion

Loss of material due to general, pitting, and crevice corrosion could occur in the channel head and access cover, tubes, and tubesheets of the heat exchanger in the spent fuel pool cooling and cleanup system, while loss of material due to pitting and crevice corrosion could occur in the filter housing, valve bodies, and nozzles of the ion exchanger in the spent fuel pool cooling and cleanup system. The Water Chemistry Program relies on monitoring and control of reactor water chemistry based on EPRI guidelines TR-105714 for primary water chemistry in PWRs, and TR-102134 for secondary water chemistry in PWRs, to manage the effects of loss of material from general, pitting, or crevice corrosion. However, high concentrations of impurities at crevices and locations of stagnant flow conditions could cause general, pitting, or crevice corrosion. Therefore, verification of the effectiveness of the Chemistry Control Program should be performed to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material from general, pitting, and crevice corrosion to verify the effectiveness of the Water Chemistry Program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's proposed program to ensure that corrosion is not occurring and that the components' intended functions will be maintained during the period of extended operation. If the applicant proposed a one-time inspection of select components at susceptible locations to ensure that corrosion is not occurring, the staff verified that the applicant's selection of susceptible locations is based on severity of conditions, time of service, and lowest design

margin. The staff also verified that the proposed inspection would be performed using techniques similar to ASME Code and ASTM standards, including visual, ultrasonic, and surface techniques.

The applicant credited the Water Chemistry Control Program to manage the aging effects of loss of material due to general, pitting, and crevice corrosion for the applicable spent fuel cooling and fuel storage system components. In addition, the One-Time Inspection Program, as well as the Periodic Surveillance and Preventive Maintenance Program, will be used to verify the effectiveness of the Water Chemistry Control Program. The staff evaluation of these AMPs is discussed in Sections 3.0.3.1, 3.0.3.7, and 3.0.3.8 of this SER, respectively. The staff finds that these AMPs can effectively manage the general, pitting, and crevice corrosion for the above components that are applicable to Ginna spent fuel cooling and fuel storage (SFC and FS) system.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of loss of material due to general, pitting, and crevice corrosion for applicable components in the SFC and FS system, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.2 Hardening and Cracking or Loss of Strength Due to Elastomer Degradation, or Loss of Material Due to Wear

The GALL Report recommends further evaluation of programs to manage the hardening and cracking due to elastomer degradation of valves in the spent fuel pool cooling and cleanup system. The GALL Report also recommends further evaluation of programs to manage the hardening and loss of strength due to elastomer degradation of the collars and seals of the duct, and of the elastomer seals of the filters in the control room area, auxiliary and radwaste area, and primary containment heating and ventilation systems, and of the collars and seals of the duct in the diesel generator building ventilation system. The GALL Report also recommends further evaluation of programs to manage the loss of material due to wear of the collars and seals of the ducts in the ventilation systems. The staff reviewed the applicant's proposed programs to ensure that an adequate program will be in place for the management of these aging effects.

The applicant stated that the spent fuel cooling system at Ginna contains no components that are elastomer lined. The applicant also stated that the One-Time Inspection and Periodic Surveillance and Preventive Maintenance Programs are credited for managing the aging effects of hardening, cracking, and loss of strength for the applicable ventilation systems components. In addition, the Systems Monitoring Program is credited for managing the aging effect of loss of material due to wear for these components. The staff evaluation of these AMPs is discussed in Sections 3.0.3.7, 3.0.3.8, and 3.0.3.11 of this SER, respectively. The staff finds that these AMPs can effectively manage the elastomer degradation of the above components that are applicable to Ginna auxiliary systems.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of hardening and cracking or loss of strength due to elastomer degradation or loss of material due to wear for components in the applicable auxiliary systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.3 Cumulative Fatigue Damage

Fatigue 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 staff's evaluation of this TLAA is documented in Section 4.3 of this SER, following the guidance in Section 4.3 of the SRP-LR.

3.3.2.2.4 Crack Initiation and Growth Due to Cracking or Stress-Corrosion Cracking

The GALL Report recommends further evaluation of programs to manage crack initiation and growth due to cracking of the high-pressure pump in the chemical and volume control system. The staff reviewed the applicant's proposed program to ensure that an adequate program will be in place for the management of this aging effect.

The applicant credited the Water Chemistry Control Program for managing the crack initiation and growth due to SCC in the high-pressure pump in the chemical and volume control system. The applicant stated that the Water Chemistry Control Program is consistent with the GALL Report and will preclude the possibility of crack initiation and growth due to SCC of the high-pressure pump in the chemical and volume control system. The applicant also stated that the One-Time Inspection Program, as well as the Periodic Surveillance and Preventive Maintenance Program, are credited with verifying the adequacy of the Water Chemistry Control Program. The staff evaluation of these AMPs is discussed in Sections 3.0.3.1, 3.0.3.7, and 3.0.3.8 of this SER, respectively. The One-Time Inspection Program and the Periodic Surveillance and Preventive Maintenance Program will be capable of detecting cracking, therefore, the staff finds the proposed inspections to be acceptable for managing the potential for cracking of the high-pressure pump in the chemical and volume control system.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of crack initiation and growth due to cracking or SCC for components in the applicable auxiliary systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.5 Loss of Material Due to General, Microbiologically Influenced, Pitting, and Crevice Corrosion

The GALL Report recommends further evaluation of programs to manage the loss of material due to general, pitting, and crevice corrosion of the piping, filter housing and supports in the control room area, the auxiliary and radwaste area, and the primary containment heating and ventilation systems; of the piping of the diesel generator building ventilation system; of the

aboveground piping and fittings, valves, and pumps in the diesel fuel oil system; and of the diesel engine starting air, combustion air intake, and combustion air exhaust subsystems in the EDG system. The GALL Report also recommends further evaluation of programs to manage the loss of material due to general, pitting, and crevice corrosion, and MIC of the duct fittings, access doors, closure bolts, equipment frames, and housing of the duct, due to pitting and crevice corrosion of the heating/cooling coils of the air handler heating/cooling, and due to general corrosion of the external surfaces of all carbon steel structures and components, including bolting exposed to operating temperatures less than 212 ºF in the ventilation systems. The staff reviewed the applicant's proposed program to ensure that an adequate program will be in place for the management of these aging effects.

The applicant credited the One-Time Inspection, Periodic Surveillance and Preventive Maintenance, Closed-Cycle (Component) Cooling Water System, and the Fuel Oil Chemistry Programs for managing the identified aging effects of the applicable components in the ventilation systems, the diesel fuel oil systems, and the EDG system. In addition, the applicant credited the Systems Monitoring Program for managing the aging effects of loss of material for the external surfaces of all carbon steel components. The staff evaluation of these AMPs is documented in Sections 3.0.3.7, 3.0.3.8, 3.0.3.5, 3.3.2.3.4, and 3.0.3.11 of this SER, respectively. The staff finds that these AMPs can effectively manage the corrosion of internal and external surfaces for the above components that are applicable to Ginna auxiliary systems.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of the loss of material due to general, MIC, pitting, and crevice corrosion for components in the applicable auxiliary systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.6 Loss of Material Due to General, Galvanic, Pitting, and Crevice Corrosion

The GALL Report recommends further evaluation of programs to manage the loss of material due to general, galvanic, pitting, and crevice corrosion of tanks, piping, valve bodies, and tubing in the RCP oil collection system in fire protection system. 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 not routinely examined. Therefore, verification of the effectiveness of the program should be performed to ensure that degradation is not occurring and that the component's intended function will be maintained during the period of extended operation. The staff reviewed the applicant's proposed program 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 has proposed a one-time visual inspection of the RCP oil collection system. A favorable result for this inspection will ensure that corrosion is not occurring. If corrosion is identified, additional examinations would then be conducted on any problematic areas. The results of the examinations will be used as a leading indicator of other susceptible components. The proposed inspection would be performed using techniques similar to ASME Code and ASTM standards, including visual, ultrasonic, and surface examination techniques.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of the loss of material due to general, galvanic, pitting, and crevice corrosion for components in the auxiliary systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.7 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion, and Biofouling

The GALL Report recommends further evaluation of programs to manage loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling of the internal surface of tanks in the diesel fuel oil system and due to general, pitting, crevice, and MIC of the tanks of the diesel engine fuel oil system in the EDG system. The Fuel Oil Chemistry Program relies on monitoring and control of fuel oil contamination in accordance with the guidelines of ASTM Standards D4057, D1796, D2709, and D2276 to manage loss of material due to corrosion or biofouling. Corrosion or biofouling may occur at locations where contaminants accumulate. Verification of the effectiveness of the Fuel Oil Program should be performed to ensure that corrosion/biofouling is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's proposed program to ensure that corrosion/biofouling is not occurring and that the component's intended function will be maintained during the period of extended operation. If an applicant proposes a one-time inspection of select components and susceptible locations to ensure that corrosion/biofouling is not occurring, the staff verified that the applicant's selection of susceptible locations is based on severity of conditions, time of service, and lowest design margin. The staff also verified that the proposed inspection would be performed using techniques similar to ASME Code and ASTM standards, including visual, ultrasonic, and surface techniques.

The applicant credited the Fuel Oil Chemistry Program for managing the identified aging effects for the components in the applicable emergency power systems. In lieu of the One-Time Inspection Program, the applicant has chosen to use the Periodic Surveillance and Preventive Maintenance Program to verify the adequacy of the Fuel Oil Chemistry Program in managing these aging effects. The staff evaluation of these AMPs is documented in Sections 3.3.2.3.4 and 3.0.3.8 of this SER, respectively. The staff finds that these AMPs can effectively manage the aging effects for the above components that are applicable to Ginna auxiliary systems.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of the loss of material due to general, pitting, crevice, and MIC, and biofouling for components in the applicable auxiliary systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.8 Crack Initiation and Growth Due to Stress-Corrosion Cracking and Cyclic Loading

Crack initiation and growth due to SCC and cyclic loading could occur in the channel head and access cover, tubesheet, tubes, shell and access cover, and closure bolting of the regenerative heat exchanger, and in the channel head and access cover, tubesheet, and tubes of the letdown heat exchanger in the chemical and volume control system. The Water Chemistry Program relies on monitoring and control of water chemistry based on the guidelines of TR- 105714 for primary water chemistry to manage the effects of crack initiation and growth due to SCC and cyclic loading. The GALL Report recommends further evaluation to manage crack initiation and growth from SCC and cyclic loading for this system to verify the effectiveness of the Water Chemistry Program. The staff reviewed the applicant's proposed program to ensure that cracking is not occurring and that the component's intended function will be maintained during the period of extended operation. 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 components' intended functions will be maintained during the period of extended operation. If the applicant proposed a one-time inspection of select components at susceptible locations to ensure that corrosion is not occurring, the staff verified that the applicant's selection of susceptible locations is based on severity of conditions, time of service, and lowest design margin. The staff also verified that the proposed inspection would be performed using techniques similar to ASME Code and ASTM standards, including visual, ultrasonic, and surface techniques.

The applicant credited the Water Chemistry Control Program for managing the aging effects of crack initiation and growth due to SCC of the heat exchanger in the chemical and volume control system. The applicant stated that the Water Chemistry Control Program is consistent with the GALL Report and will preclude the possibility of crack initiation and growth due to SCC of the high-pressure pump in the chemical and volume control system. The applicant also stated that the One-Time Inspection Program as well as the Periodic Surveillance and Preventive Maintenance Program are credited with verifying the adequacy of the Water Chemistry Control Program. The staff's evaluation of these AMPs is documented in Sections 3.0.3.1, 3.0.3.7, and 3.0.3.8 of this SER, respectively. The staff finds that these AMPs can effectively manage cracking of the applicable components in the chemical and volume control system.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of crack initiation and growth due to SCC and cyclic loading for components in the applicable auxiliary systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.9 Reduction of Neutron-Absorbing Capacity and Loss of Material due to General Corrosion

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 of programs to manage these aging effects. The staff reviewed the applicant's proposed program to ensure that an adequate program will be in place for the management of these aging effects.

The applicant credited the Periodic Surveillance and Preventive Maintenance Program and the Spent Fuel Pool Neutron Absorber (borated stainless steel) Monitoring Program for managing the applicable aging effects of neutron absorbing sheets in spent fuel storage racks. The staff evaluation of these AMPs is documented in Sections 3.0.3.8 and 3.3.2.3.7 of this SER, respectively. The staff finds that these AMPs can effectively manage the aging effects of neutron-absorbing sheets in spent fuel storage racks.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of the reduction of neutron-absorbing capacity and loss of material due to general corrosion for components in the applicable auxiliary systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.10 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

Loss of material due to general, pitting, and crevice corrosion, and MIC could occur in the underground piping and fittings in the open-cycle cooling water system (service water system) and in the diesel fuel oil system. The buried piping and tanks inspection program relies on industry practice, frequency of pipe excavation, and operating experience to manage the effects of loss of material from general, pitting, and crevice corrosion, and MIC. The staff reviews the effectiveness of the Buried Piping and Tanks Inspection Program, including its inspection frequency and operating experience, to ensure that loss of material is not occurring and that the component's intended function will be maintained during the period of extended operation.

The applicant credited the Buried Piping and Tanks Inspection Program for managing the identified aging effects for the applicable components in the emergency power system. The applicant stated that the Buried Piping and Tanks Inspection Program is implemented by the Periodic Surveillance and Preventive Maintenance Program at Ginna. Tanks in the emergency power system are periodically inspected for signs of applicable aging effects. In addition, a one-time ultrasonic inspection will be performed to verify the effectiveness of the Periodic Surveillance and Preventive Maintenance Program.

The applicant further stated that, for buried piping, the Fire Water System Program is credited for managing the effects of aging for buried cast iron piping and fittings. External surfaces of buried piping are visually examined during maintenance activities (inspections of opportunity) performed as a result of performance tests. No evidence of age-related degradation has been detected from inspections performed to date. Cast iron fire system and service water piping at Ginna is ductile cast iron, not gray cast iron. Ductile irons are not susceptible to loss of structural integrity due to selective leaching mechanisms, and generally display excellent resistance to general corrosion due to exposure to non-aggressive ground water. Ground water/lake water at Ginna is analyzed periodically and analyses performed to date confirm that the water is nonaggressive. The staff evaluation of these AMPs is documented in Sections 3.3.2.3.1, 3.0.3.8, 3.0.3.7, and 3.3.2.3.3 of this SER, respectively. The staff finds that these AMPs can effectively manage the aging effects for the above components that are applicable to Ginna auxiliary systems.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of the loss of material due to general, pitting, crevice, and MIC, for components in the auxiliary systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.11 Conclusions

The staff has reviewed the applicant's evaluation of the issues for which GALL recommends further evaluation for components in the auxiliary systems. On the basis of its review, the staff finds that the applicant has provided sufficient information to demonstrate that the issues for which the GALL Report recommends further evaluation have been adequately addressed and that there is reasonable assurance that the subject aging effects will be adequately managed for the period of extended operation, as required by 10 CFR 54.21(a)(3). In addition, the staff concludes that the applicant's UFSAR Supplement provides an adequate description of the programs credited with managing these aging effects, as required by 10 CFR 54.21(d).

3.3.2.3 Aging Management Programs (System-Specific)

In SER Sections 3.3.2.1 and 3.3.2.2, the staff determined that, the applicant's AMRs and associated AMPs will adequately manage component aging in the auxiliary systems. The staff then reviewed specific components in the auxiliary systems to ensure that they were properly evaluated in the applicant's AMR.

To perform its evaluation, the staff reviewed the components listed in LRA Tables 2.3.3-1 through 2.3.3-20 to determine whether the applicant had properly identified the applicable AMRs and AMPs needed to adequately manage the aging effects for the components. This portion of the staff review involved identification of the aging effects for each component, ensuring that each aging effect was evaluated using the appropriate AMR in Section 3, and that management of the aging effect was captured in the appropriate AMP. The results of the staff's review are provided below.

The staff also reviewed the UFSAR Supplements for the AMPs credited with managing aging in reactor system components to determine whether the program description adequately describes the program.

The applicant credits 19 AMPs to manage the aging effects associated with components in the auxiliary systems. Eleven of the AMPs are credited to manage aging for components in other system groups (common AMPs), while the other 8 AMPs are credited to manage aging only for auxiliary system components. The staff's evaluation of the common AMPs credited with managing aging in auxiliary system components is provided in Section 3.0.3 of this SER. The common AMPs are listed here along with their section number.

- Water Chemistry Program (3.0.3.1)
- ASME Section XI, Subsections IWB, IWC and IWD Inservice Inspection Program (3.0.3.2)
- Bolting Integrity Program (3.0.3.3)

- Boric Acid Corrosion Prevention Program (3.0.3.4)
- Closed-Cycle (Component) Cooling Water System Program (3.0.3.5)
- Flow-Accelerated Corrosion Program (3.0.3.6)
- One-Time Inspection Program (3.0.3.7)
- Periodic Surveillance and Preventive Maintenance Program (3.0.3.8)
- Selective Leaching of Materials Program (3.0.3.9)
- Structures Monitoring Program (3.0.3.10)
- System Monitoring Program (3.0.3.11)

The staff's evaluation of the nine auxiliary system AMPs are provided here.

3.3.2.3.1 Buried Piping and Tank Inspection Program

3.3.2.3.1.1 Summary of Technical Information in the Application. The applicant describes its AMP for buried piping and tank inspection in Section B2.1.7 of the LRA. The applicant stated that this program is not specifically used for aging management at Ginna since the inspection activities under the scope of this program in NUREG-1801 (GALL) are managed by the One-Time Inspection Program.

The applicant stated that preventive measures to mitigate corrosion on the buried carbon steel piping and tanks were applied in accordance with standard industry practice for maintaining protective coatings. The buried piping and tanks will be inspected when the opportunity of inspection arises, such as during excavation for maintenance activities.

The applicant described the following operating experience of the buried piping and tanks.

(1) Over the years, several sections of the fire-water loops have been inspected and replaced with upgraded materials.

(2) In 1974, a section of the service water discharge header from the auxiliary building was inspected.

(3) In 1995, portions of the underground service water header was inspected.

(4) In 2001, a yard hydrant and connecting piping, and a security diesel generator underground fuel oil storage tank were replaced.

The exterior surface condition of these components either inspected or replaced were all in good condition.

3.3.2.3.1.2 Staff Evaluation. In its response to the staff's RAI (RAI B2.1.7.1-a), the applicant stated that the Buried Piping and Tanks Inspection Program implemented at Ginna is consistent with the guidelines provided in NUREG-1081 (GALL Report), AMP XI.M34. No exception to GALL program XI.M34 was identified. The NRC inspection team audited the subject program at the plant site and confirmed that the subject program is consistent with GALL AMP XI.M34.

The staff finds that the inspection activities of buried piping and tanks are not identified in the One-Time Inspection Program. In its response to the staff's RAI (RAI B2.1.7.1-e), the applicant

stated that the inspections of buried piping and tanks is now included in the One-Time Inspection Program.

In its response to the staff's RAI (RAI B2.1.7-1 and RAI B2.1.8-1), the applicant described the past inspections performed on the buried components and the inspection results are summarized below.

(1) The TSC underground diesel storage tank, a carbon steel tank installed in 1980, was excavated to repair the mechanical damage of the vent pipe in 1998. The exterior surface of the tank, coated with an asphaltic coal tar protective coating was found to be in excellent condition.

(2) The security diesel storage tank is not in scope for LRA but similar in construction to TSC diesel storage tank. This tank was dug up and replaced in 2000. Both the internal surfaces of the tank and the exterior protective asphaltic coating were in excellent condition after 30 years of service.

(3) The underground portion of the service water piping at Ginna is made of pre-stressed concrete. In 1994, a remote visual inspection of the interior of approximately 500 feet of this piping was performed. In addition, the exterior of a portion of the concrete service water pipe was visually inspected during the construction of Diesel Generator Building in 1992. The results of the inspections showed that the subject underground concrete piping was in excellent condition.

(4) The fire water system piping at Ginna is made of cement-lined ductile cast iron with an external protective coating of coal tar. Visual inspection of the external and interior surfaces of the piping performed during maintenance activities showed that the subject underground piping was in excellent condition.

(5) The EDG diesel fuel oil storage tanks are carbon steel tanks with a protective external coal tar mastic coating. The interior of these tanks are cleaned, visually inspected, and ultrasonically measured for wall thickness under the Periodic Surveillance and Preventive Maintenance Program on a 9-year frequency. These inspections did not report any evidence of degradation.

Based on the inspection results and service experience of the buried components as discussed above, the staff agrees with the applicant that the buried environment at Ginna is considered benign and, therefore, additional mitigation measures such as the installation of cathodic protection system and augmented inspections, in addition to the One-Time Inspection Program, are not necessary.

The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program. The staff finds the subject supplement acceptable.

3.3.2.3.1.3 Conclusions. On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent

with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.3.2.3.2 Fire Protection Program and Fire Water System Program

3.3.2.3.2.1 Summary of Technical Information in the Application. The applicant's AMP for fire protection (FP) systems are discussed in LRA Sections B2.1.13, "Fire Protection," and B2.1.14, "Fire Water System." The Ginna Fire Protection Program includes provisions for aging management of fire barriers and fire pumps. The Fire Barrier Inspection Program requires periodic visual inspection and functional tests of fire barrier penetration seals, fire barrier walls, ceilings, and floors, and periodic visual inspection and functional tests of fire rated doors to ensure their operability is maintained. The program also requires the fire pumps to be periodically tested, with preventive maintenance and inspections performed to ensure their operability. The program also provides for periodic inspection and testing of the relay room halon fire suppression system.

The Ginna Fire Water System Program includes provisions for aging management of the fire water system and associated components. These components include sprinklers, nozzles, fittings, hydrants, hose stations, standpipes, fire water storage tank, fire booster pump, etc. System and component testing is conducted in accordance with the applicable National Fire Protection Association (NFPA) codes and standards. The fire water system and associated components are normally maintained at required pressure and monitored such that a loss of system pressure is immediately detected and corrective actions initiated. In addition to the testing performed per NFPA codes, portions of the fire water system are subjected to full flow testing. Also, internal portions of the fire water system are visually inspected when disassembled for maintenance. Volumetric NDE inspections using appropriate techniques are performed on sections of the system piping to detect wall loss and fouling. The flow testing and visual and/or volumetric inspections assure that any wall thinning due to corrosion, MIC, or biofouling are managed such that the system function is maintained. The applicant concluded that the Ginna Fire Water System Program is consistent with NUREG-1801, Section XI.M27, and that a review of previous inspection and maintenance records provide reasonable assurance that the fire water system remains capable of performing its intended function. The program will be enhanced to provide testing and, if necessary, replacement of sprinkler heads after 50 years in service, in accordance with the requirements of NFPA 25. The applicant further concludes that the aging effects for the fire water system and associated components will be managed such that the intended function of the components within the scope of the program will be maintained during the license renewal period.

LRA Table 3.4.1 Line Number 6 identifies the AMP for the reactor coolant pump oil collection system to be covered by the One-Time Inspection Program.

3.3.2.3.2.2 Staff Evaluation. The staff reviewed the program outlined in LRA Appendix B2.1.13 and B2.1.14, and UFSAR Supplement program descriptions in LRA Appendix A2.1.10 and A2.1.11. Based on the reviews of these LRA Appendices, no exceptions to GALL were identified.

The AMP audit performed on June 23 – 25, 2003, identified a discrepancy between the LRA and the applicant's Fire Protection Program basis document, LR-FP-PROGPLAN. The LRA states the Fire Protection Program is consistent with GALL, whereas the basis document states that the AMP is consistent with GALL with discrepancies. The applicant was asked to provide the basis for the discrepancies in GALL and LR-FP-PROGPLAN identified during the AMP audit. The applicant responded that the Fire Protection Program is consistent with, but includes exceptions to, NUREG-1801, Section XI.M26, “Fire Protection.” The exceptions identified are as follows.

Halon system testing frequency is different from the 6-month frequency stated in NUREG-1801. The applicant was requested to clarify the testing frequency and justify the exception. The applicant responded that the testing is based upon a performance-based evaluation of system components documented in DA-ME-97-081, “Engineering Evaluation of Fire Protection System Inspection and Testing,” February 10, 2000. This DA-ME-97-081 justifies a frequency of every two years for the functionality of the system. DA-ME-97-081 also applies to the aging management aspect of system components. When functional tests are performed, both the active and passive portions of the system are tested. The manual and automatic operation of the Halon system would not be successful without an intact pressure boundary, or with material conditions that could adversely affect the performance of the system. Corrosion, mechanical damage, or damage to dampers would all hinder successful performance of the functional tests.

Visual inspections of fire doors and verification of clearances are performed on a quarterly basis, not bi-monthly as stated in NUREG-1801. The applicant was requested to verify, based on plant experience, that these frequencies are adequate for aging management concerns related to fire doors. In a letter dated September 16, 2003, the applicant responded that "the aging management issues of concern for fire doors, as noted in NUREG-1801, are clearances, and holes in the skin. A review of our quarterly fire door walkdown operating experience indicates that these issues have not been of concern. It is thus considered that the quarterly frequency established for inspections of fire doors are adequate for aging management."

Personnel performing inspections of fire barriers, doors, and penetration seals are qualified to perform those inspections in accordance with plant procedures QC-INS-2 “Qualification of Inspection Personnel” and A-1102 “Qualification and Certification of Test Personnel,” but not necessarily in accordance with the requirements for VT-1 or VT-3 as defined in RG&E NDE Procedure NDE-102. The staff considers these qualifications to be adequate for the aging management inspections of fire barriers, doors, and penetration seals, on the basis that these inspections have clearly identified acceptance criteria and require no special tools.

As stated in Section 2.3.3.6 of this SER, the applicant was asked to clarify the aging management for the buried underground piping portions of the fire water system in RAI 2.3.3.6-2. As discussed in that SER section, the applicant’s response described the testing and inspection efforts that provide the basis for this AMP. The AMP audit performed on June 23 – 25, 2003, also identified a discrepancy between the LRA and the applicant's Fire Water System Program basis document, LR-FWS-PROGPLAN. The LRA states the Fire Water

System Program is consistent with GALL, whereas the basis document states that the AMP is consistent with GALL with discrepancies. The applicant was asked to provide the basis for the discrepancies in GALL and LR-FWS-PROGPLAN identified during the AMP audit. The exceptions identified are as follows.

In the program basis document, the applicant stated that the parameters monitored/inspected attribute includes exceptions to the GALL AMP related to periodic flow testing of infrequently used loops. The audit team identified differences in the detection of aging effects attribute. The sprinkler system components are not examined for evidence of microbiological fouling as indicated by GALL. In addition, the GALL recommends visual inspections of yard fire hydrants to be performed every six months, whereas the basis document specifies during windows of opportunities during maintenance activities. The GALL also specifies that fire hydrant flow tests are performed annually and the basis document specifies on a periodic basis. The applicant was requested to provide the basis for these exceptions to GALL. In a response dated September 16, 2003, the applicant stated that:

a) Sprinkler system components at Ginna Station are examined for evidence of biological fouling. As indicated in the revised Fire Water System Program Basis Document, these inspections are performed by radiography (RT) and ultrasonic testing (UT). Radiographic inspections are capable of detecting biological fouling, wall thinning, and sedimentation in fire water system piping.
b) As indicated in the revised Fire Water System Program Basis Document Section 4.0, visual inspections of yard fire hydrants are performed twice per year, which is reasonably consistent with NUREG-1801.
c) As indicated in the revised Fire Water System Program Basis Document Section 4.0, fire hydrants are flushed annually at Ginna Station by opening each hydrant fully and verifying (qualitatively) adequate flow. Flow test and performance trending data are collected every three years. The three-year frequency is supported by plant-specific operating experience, (DA-ME-97-081) and industry practice.

Various sections of fire protection system piping are selected annually for NDE inspection and verification of wall thickness requirements. Inspections of various headers will be performed each operating cycle using UT or RT techniques. These inspections are driven by a "Repetitive (Rep) Task" in the Periodic Surveillance and Preventive Maintenance Program. The selection criteria, sample size and periodicity of these inspections during the period of extended operation, including the expansion criteria in the event that age-related degradation is found, will be defined prior to the end of the current license period (reference item #30 Appendix A of this SER). Testing of individual fire systems verifies that piping up to deluge valves is free of obstructions.

The exterior condition of the underground fire system piping is verified by inspections performed under the Buried Piping and Tanks Inspection Program, "LR-BTNK-PROGPLAN." Sprinkler systems are inspected and tested as defined in the procedures listed in section 4.0 to ensure that degradation is detected in a timely manner.

This element is consistent with, but contains an exception to, the corresponding aging management program attribute in NUREG-1801, Section XI.M27. NUREG-1801 requires that sprinkler systems are inspected once every refueling outage. Sprinkler system headers and spray heads are inspected every two years at Ginna Station in accordance with the Technical Requirements Manual (TRM). The two-year frequency is supported by plant-specific operating

experience and is based upon the analysis in DA-ME-97-081. In addition, NUREG-1801 requires that fire hydrant flow tests be performed annually. Fire hydrants are flushed annually at Ginna Station by opening each hydrant fully and verifying (qualitatively) adequate flow. Flow test and performance trending data is collected every three years. The three-year frequency is supported by plant-specific operating experience and industry practice. Therefore the intent of NUREG-1801, Section XI.M27, Paragraph 5.4 is met.

On the basis of the applicant's response, the staff concurs that the Fire Water System Program provides adequate aging management for the underground fire water piping.

The One-Time Inspection Program outlined in B2.1.21 is applied to the reactor coolant pump oil collection system. This program is adequate for controlling the potential aging effects on the oil collection system components.

3.3.2.3.2.3 Conclusions. On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.3.2.3.3 Fire Water System Program

See Fire Protection Program and Fire Water System Program (3.3.2.3.2).

3.3.2.3.4 Fuel Oil Chemistry Program

3.3.2.3.4.1 Summary of Technical Information in the Application. The applicant's Fuel Oil Chemistry Program is discussed in LRA Section B2.1.16, "Fuel Oil Chemistry." The applicant states that the program is consistent with GALL program XI.M30, "Fuel Oil Chemistry," with the exceptions that the applicant does not add biocides, stabilizers, or corrosion inhibitors to the fuel oil to mitigate corrosion and does not sample for particles in accordance with the modified ASTM D2276 test procedure.

This AMP is credited with managing aging of the components exposed to the fuel oil environment and ensuring fuel oil quality.

The applicant performs surveillance and maintenance in accordance with the plant Technical Specifications to mitigate aging effects such as loss of material due to corrosion and fouling buildup on internal surfaces of the fuel oil tanks and associated components in the systems that contain fuel oil. Periodic draining, cleaning, and visual inspection of the internal surfaces of the

storage tanks are performed and wall thickness, if needed, is measured at the locations where the contaminants might accumulate. Review of the plant-specific operating experience confirms effectiveness of these procedures.

In its LRA, the applicant concluded that the Fuel Oil Chemistry Program provides reasonable assurance that aging effects due to the presence of fuel oil will be adequately managed.

3.3.2.3.4.2 Staff Evaluation. In LRA Section B2.1.16, "Fuel Oil Chemistry," the applicant describes its AMP to manage aging of the components exposed to the fuel oil environment. The LRA states that this AMP is consistent with GALL AMP XI.M30, "Fuel Oil Chemistry," with exceptions regarding not adding biocides, stabilizers, or corrosion inhibitors to the fuel oil and not sampling for particles in accordance with the modified ASTM D2276 test procedure. In letters dated May 13 and June 10, 2003, the applicant, responding to the staff's request for additional information RAI B2.1.16-1, stated that in a review of plant-specific operating experience no evidence of oil degradation or MIC has ever been observed. Therefore, addition of biocides, stabilizers, or corrosion inhibitors has not been needed to date. Effectiveness of using fuel oil without additives will be verified by the results of periodic inspections of the fuel storage tanks. In its letter, the applicant also modified its position regarding measuring particles and applying the "clear and bright" method for determining water and particulate contamination in the diesel fuel oil. The applicant made a commitment (reference item #21 Appendix A of this SER) to change its technical specifications by incorporating specific particulate testing requirements for diesel generator fuel oil in accordance with the ASTM D2276 standard or its successor, and eliminating the need for the "clear and bright" method of the ASTM D4176 standard. This is confirmatory item 3.3.2.3.4-1.

During the AMP audit, the staff confirmed the applicant's claim of consistency with the GALL program and determined that the program was properly applied to the Ginna facility. Furthermore, since the applicant committed to include in its Fuel Oil Chemistry Program a particle testing requirement, the only remaining deviation from the GALL program consists of not adding biocides and corrosion stabilizers to the fuel oil. The staff reviewed the deviation and its justification to determine whether the AMP, with this deviation, could manage the aging effects for which it is credited. The staff's review has indicated that the AMP could adequately mange these effects.   In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the revised program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.3.2.3.4.3 Conclusions. On the basis of its review and audit of the applicant's program, the staff finds, pending satisfaction resolution of 3.3.2.34-1, that those portions of the program for which the applicant claims consistency with the GALL program are consistent with the GALL program. In addition, the staff has reviewed the exceptions to the GALL program and, pending satisfactory resolution of confirmatory item 3.3.2.3.4-1, finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by

a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.3.2.3.5 Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program

3.3.2.3.5.1 Summary of Technical Information in the Application. The applicant's inspection of overhead heavy loads and light load handling systems is discussed in LRA Section B.2.18 "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems." The applicant states that the program is consistent with GALL Program XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems."

The testing and monitoring programs are implemented to ensure that cranes are capable of sustaining their rated loads. Many components of a crane system perform their intended functions with moving parts or with a change in configuration, or are subject to replacement based on qualified life. These components are screened out of the license renewal aging management process. This program is primarily concerned with structural components that make up the bridge, trolley, rails, stops, and lifting devices.

NUREG-1774, "A Survey of Crane Operating Experience at U.S. Nuclear Power Plants from 1968 through 2002," dated July 2003 – provides a comprehensive assessment of crane issues. There have been numerous crane incidents, some of which resulted in the publication of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." The applicant states that most crane failures are caused by human error (not following procedures, improper test) or design issues (poor engineering). Less than 10 percent of failures were due to improper maintenance, and most of these were due to electrical malfunctions. According to the applicant there is very little history of wear-related or corrosion-related degradation that has impaired the ability of cranes in the industry to perform their intended functions. A re-evaluation of crane operations by the applicant based on Bulletin 96-02, "Movement of Heavy Loads Over spent Fuel, Over Fuel in the Reactor Core, or Over Safety-Related Equipment," dated April 11, 1996, concluded that although there were some inconsistencies between crane operation and the licensing basis at some nuclear power plants, few changes were required by licensees in their operation of cranes (and none related to age-related degradation).

According to the applicant, only one major crane failure occurred at Ginna. During plant construction, a portion of the reactor vessel internals weighing 90 tons was dropped about 6 feet. The cause of failure was attributed to a crane brake failure (crane motor overheated and the electromagnetic brake failed). No experience with crane failures due to age-related degradation such as wear or corrosion has occurred at Ginna according to the applicant.

In the LRA, the applicant concluded that the inspection of Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program provide assurance that the intended functions of the cranes will be met during the period of extended operation.

3.3.2.3.5.2 Staff Evaluation. In LRA Section B. 2.18, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems," the applicant described its program to manage the aging of overhead heavy loads and light load handling systems within the scope of license renewal. The LRA states that this program is consistent with GALL Program XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems."

The staff confirmed the applicant's claim of consistency during the AMP audit. In addition, the staff determined whether the applicant properly applied the GALL program to its facility. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program.

LRA Section B2.1.18 states that some inconsistencies were identified between crane operation and crane licensing basis at some plants in Bulletin 96-02, "Movement of Heavy Loads Over Spent Fuel, Over Fuel in the Reactor Core, Over Safety-Related Equipment." In RAI B2.1.18-1 the staff requested the applicant to indicate whether or not any such inconsistencies have been identified at Ginna, either before or after the issuance of Bulletin 96-02. If inconsistencies were identified, it was requested that the applicant provide the corrective actions that were taken.

In its response dated May 28, 2003, the applicant stated that no inconsistencies were identified at Ginna. In its May 10, 1996 response to Bulletin 96-02, the applicant had stated that "...all potential heavy load movements are within the scope of the Ginna Station licensing basis and are covered by existing plant procedures and work control..." The NRC's SER of April 23, 1998, agreed with this assessment. The staff finds the applicant's response acceptable because it confirms the applicant's claim of consistency with Bulletin 96-02.

In RAI B2.1.18-2 the staff requested the applicant to clarify whether or not wire ropes are among the subcomponents that are managed for age-related degradation. The applicant was also requested to provide the inspection methods and acceptance criteria for the wire ropes.

In its response dated May 28, 2003, the applicant referred to Section 2.3.3.11 of the LRA which states that cables, hooks, and moving load-bearing elements used for transport of heavy loads are within the scope of license renewal. Inspection methods and acceptance criteria are provided in Ginna procedure MHE-201, "Overhead and Gantry Cranes." These are visual inspections for evidence of wear, discontinuities, and any other signs of aging conducted by personnel qualified in accordance with procedure MHE-101, "Classification and Training of Material Handling Equipment Personnel." The staff finds the applicant's response acceptable because it clarifies that wire ropes are managed for aging as required by the GALL Report.

3.3.2.3.5.3 Conclusions. On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.3.2.3.6 Open-Cycle Cooling Water System Program

3.3.2.3.6.1 Summary of Technical Information in the Application. The applicant's open-cycle cooling water system is discussed in LRA Section B2.1.22, "Open-Cycle Cooling (Service) Water System." The applicant states that the program is consistent with GALL Section XI.M20 Open-Cycle Cooling Water System with the following exceptions — 1) heat transfer tests are not performed on selected small heat exchangers that are periodically cleaned and inspected in accordance with the Periodic Surveillance and Preventative Maintenance Program, and 2) the Service Water System Reliability Optimization Program does not address protective coatings.

This AMP is credited with managing the following aging effects — (1) loss of material due to corrosion and/or build up of deposits due to biofouling in the ESF systems, and (2) loss of material due to general, pitting, crevice, galvanic, and MIC, and buildup of deposits due to biofouling in the auxiliary systems and SPCS.

The applicant developed the Service Water System Reliability and Optimization Program which implements the recommendations of GL 89-13, "Service Water System Problems Affecting Safety-Related Equipment," to ensure that the effects of aging on the service water system will be managed for the period of extended operation. The program includes surveillance and control techniques to manage aging effects caused by biofouling, corrosion, erosion, and silting in the service water system, or structures and components serviced by the service water system.

The applicant's operating experience indicates that implementation of the recommendations of GL 89-13, during the past 10 years, has been effective at managing and monitoring the effects of aging due to biofouling, corrosion, erosion, and silting in the service water system. The applicant has found Zebra mussels and has experienced corrosion, pitting, MIC, and sedimentation buildup in the Service Water System. These effects are controlled by flushing the chlorination system and inspections.

On the basis of the above discussion, the applicant concluded that the Service (Open-Cycle Cooling) Water System Program provides reasonable assurance that the aging effects of the service (open-cycle cooling) water system will be adequately managed for the period of extended operation.

3.3.2.3.6.2 Staff Evaluation. In LRA Section B2.1.22, "Open-Cycle Cooling (Service) Water System," the applicant described its AMP to manage aging in the service water system. The applicant's LRA stated that this AMP is consistent with GALL AMP XI.M20 Open-Cycle Cooling Water System with two exceptions — 1) heat transfer tests are not performed on selected small heat exchangers that are periodically cleaned and inspected in accordance with the Periodic Surveillance and Preventative Maintenance Program, and 2) the Service Water System Reliability and Optimization Program does not address protective coatings. The staff confirmed the applicant's claim of consistency during the AMP audit that was performed June 23–25, 2003. The staff reviewed the exceptions and their justification to determine whether the AMP, with the deviations, remains adequate to manage the aging effects for which it is credited and reviewed the UFSAR Supplement to determine whether it provides an adequate description of the revised program.

By letter dated March 21, 2003, the staff requested additional information regarding the applicant's exceptions to the program. The applicant responded to the RAIs in a letter dated May 13, 2003, and provided a clarifying response to one of the original RAIs in a letter dated July 11, 2003.

RAI B2.1.22-1 requested the applicant provide additional information regarding the first exception that heat transfer tests are not performed on selected small heat exchangers that are periodically cleaned and inspected in accordance with the Periodic Surveillance and Preventative Maintenance Program. The additional information requested regarded the criteria used to scope/identify these small heat exchangers, the parameters monitored/inspected during the preventive maintenance action and how aging is detected, how periodicity is established, trending of results, and what acceptance criteria are used. The staff also requested a discussion relative to if and how enhancements needed for the Periodic Surveillance and Preventative Maintenance Program (identified in the applicant's LRA Section B.2.1.23) to be consistent with the GALL would impact these heat exchangers.

The applicant indicated the guidance provided by GL 89-13 is used to identify small heat exchangers that will be periodically cleaned and inspected. Plant specific operating experience is used by the applicant to establish the periodicity of these maintenance activities which may employ visual inspection, eddy current testing, thermal performance testing, bench marking, and differential pressure testing to detect the effects of aging. Eddy current testing is performed in accordance with plant procedures and the results are compared to previous inspections in order to identify fretting at tube support locations, pitting, SCC, and erosion. The acceptance criteria for eddy current testing are a function of wall thinning, defect size, and tube plugging limits. When thermal performance testing is employed, the results are analyzed by engineering personnel to determine the level of fouling. The applicant indicated that enhancements will be incorporated into plant procedures implementing the visual inspections and will include specific guidance on detection of aging effects. Inspection data from eddy current testing and visual examinations are trended by the applicant under the Periodic Surveillance and Preventive Maintenance Program.

The staff found the applicant's response acceptable based on the applicant's use of guidance provided by GL 89-13 regarding the management of aging mechanisms for small heat exchangers.

The other exception identified by the applicant was that the Service (Open-Cycle Cooling) Water System Program does not address protective coatings. The staff noted that failed internal protective coatings could lead to a loss of heat transfer or to corrosion. RAI B2.1.22-2 requested information regarding how the applicant ensures internal coating failure (if any coatings are used) will not adversely impact heat transfer capability or corrosion of system components and to provide operating experience supporting the applicant's position. The applicant responded that essentially there are no internal coatings in the service (open-cycle cooling) water system. Only the interior surfaces of the service water pump bowls are coated with an abrasion resistant coating. These pumps were first internally coated in 1999. The first internal inspection is planned for the fall of 2003. The plant has no operating experience indicative of pump bowl coating failure.

The staff finds the applicant's exception relative to management of internal coatings within the service (open-cycle cooling) water system is acceptable based on the limited amount of internal coatings at the time of the review.

The applicant's service water system operating experience discussion indicated that a number of plant heat exchangers had been replaced or retubed. The staff requested additional information in RAI B2.1.22-3 regarding the degradation mechanisms, means of identification, if loss of

pressure boundary occurred, and if changes to the program resulted from this operating experience.

The applicant indicated that a number of heat exchangers with admiralty brass tubes, which fell within the scope of license renewal, had been retubed. Periodic eddy current testing under the Periodic Surveillance and Preventive Maintenance Program as implemented by the Open Cycle Cooling Water System program is used to detect degradation. The degradation mechanisms identified by eddy current testing and verified by destructive metallurgical examination have included thinning due to erosion/corrosion, pitting and under-deposit corrosion, and limited outside diameter fretting due to flow-induced vibration. Tubes were removed from service by plugging based on conservative criteria and no loss of pressure boundary integrity has occurred in any of these heat exchangers. The heat exchangers were retubed with admiralty brass when the number of tubes plugged approached tube plugging limits. The applicant indicated that in some cases the inspection frequency has been increased based on the program's operating experience.

The applicant also identified that certain heat exchangers within the scope of license renewal are periodically replaced/refurbished. These coolers are removed from service on a fixed frequency, cleaned, eddy current inspected, and replaced in stock for reuse. The periodicity of the refurbishment activity is based on plant-specific operating experience related to tube-side fouling. The tubes are stainless steel and no corrosion-related tube-wall degradation has ever been detected.

The staff finds the applicant's additional operating experience for heat exchangers, which have been retubed or are periodically removed from the system and refurbished, provides objective evidence that the program will adequately manage aging during the period of extended operation.

3.3.2.3.6.3 Conclusions. On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.3.2.3.7 Spent Fuel Pool Neutron Absorber Monitoring Program

3.3.2.3.7.1 Summary of Technical Information in the Application. The applicant's Spent Fuel Pool Neutron Absorber Monitoring Program is discussed in LRA Section B2.1.30, "Spent Fuel Pool Neutron Absorber Monitoring." The applicant states that the program does not have a corresponding AMP in the GALL Report because in Ginna, the active neutron absorber material

consisted of borated stainless steel instead of Boraflex. The applicant described, therefore, the program in terms of 10 program elements.

This AMP is credited with managing aging of the neutron absorber in the spent fuel pool. The aging effect this AMP is intended to manage is loss of boron from the borated steel panels.

The applicant performed an inspection of the absorber material under the Ginna Spent Fuel Pool Neutron Absorber Monitoring Program. Borated steel panels were monitored using surveillance coupons comprised of the same material. These coupons underwent periodic examinations consisting of visual inspections, thickness and weight measurements, and comparing the resultant data to the reference samples that have not been exposed to the spent fuel pool environment. These examinations provide timely information on the condition of the neutron-absorbing panels. The applicant's review of the monitoring results indicates that the stainless steel neutron absorber panels exhibit good corrosion resistence in the fuel pool environment and will perform its function over the remaining life of the spent fuel racks.

In its LRA, the applicant concluded that the Spent Fuel Pool Neutron Absorber Monitoring Program ensures that aging effects of the borated stainless steel panels will be adequately managed.

3.3.2.3.7.2 Staff Evaluation. In LRA B2.1.30, "Spent Fuel Pool Neutron Absorber Monitoring," the applicant described its AMP to manage aging of the spent fuel pool neutron absorber. Since there was no corresponding AMP in the GALL Report, the staff reviewed this AMP against the 10 program elements using the guidance in Branch Technical Position RLSB-1 in Appendix A.1 of the SRP-LR. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program.

The staff evaluation of the Spent Fuel Pool Neutron Absorber Monitoring Program focuses on how the activities manage aging effects through the effective incorporation of the 10 program elements.

The applicant indicated that the corrective actions, confirmation process, and administrative controls for license renewal are in accordance with the site-controlled Quality Assurance Program pursuant to CFR Part 59, Appendix B, and cover all structures and components subject to AMR. The staff evaluation of the applicant's Quality Assurance Program is provided separately in Section 3.0.4 of this SER. This program satisfies the elements of corrective actions, confirmation process, and administrative controls. The remaining seven elements are discussed below.

Program Scope. The program monitors long-term performance of the borated stainless steel panels used to control reactivity in the spent fuel pool by absorbing neutrons. The panels are monitored by using surveillance coupons made of the same material. The staff finds that including this type of surveillance into the scope of the Spent Fuel Pool Neutron Absorber Monitoring Program will satisfy the objectives of the program.

Preventive Actions. The applicant states that the Spent Fuel Pool Neutron Absorber Monitoring Program is a monitoring program and does not specify preventive actions. The staff concurs with the applicant's statement.

Parameters Monitored/Inspected. The aging effects of the borated stainless steel neutron absorbers are monitored by examining coupons made from the same materials and placed in the spent fuel pool. The examination consists of visual inspection, thickness measurement, and weighing. The staff concurs with the applicant that this type of inspection of the coupons will provide meaningful information regarding aging of the spent fuel pool neutron absorbers.

Detection of Aging Effects. The aging effect of neutron absorbers in the spent fuel pool consists of a loss of boron from the borated steel panels which could be predicted by a change of boron content in the coupons. The staff finds the applicant's procedure for measuring boron content provides a valid method for detection of the aging effect in the spent fuel pool neutron absorber.

Monitoring and Trending. The coupons are evaluated at different time intervals and the results are recorded as directed by the site specific procedures. According to the schedule, the first evaluation is performed after completion of the first operating cycle following installation of the racks. The subsequent evaluations are performed after completion of every third additional cycle. The staff finds that this procedure will allow the applicant to adequately monitor and trend the aging effects in the spent fuel pool neutron absorbers.

Acceptance Criteria. The acceptance criteria consist of comparing the data determined during the coupons inspections to the reference values. The staff finds that this procedure will allow the applicant to determine if the borated stainless steel panels have enough boron to control reactivity in the spent fuel pool.

Operating Experience. The applicant stated that the examination of the first set of coupons showed no evidence of signs of degradation. This indicated to the staff that borated stainless steel neutron absorber panels exhibited good corrosion resistance and its neutron absorbing capability is not impaired.

3.3.2.3.7.3 Conclusions. On the basis of its review of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.3.2.3.8 Aboveground Carbon Steel Tanks Program

3.3.2.3.8.1 Summary of Technical Information in the Application. The applicant describes its AMP for aboveground carbon steel tanks in Section B2.1.1 of the LRA. Periodic system walkdowns will be performed to monitor the condition of above-ground carbon steel storage tanks. For tanks supported on earthen or concrete foundations, the tank bottom is inaccessible

for inspection. For such tanks, one-time thickness measurements of the tank bottom will be performed from inside of the tank to assess the tank bottom condition.

The applicant reported the following operating experience of the above-ground carbon steel tanks;

(1) Isolated areas of degradation (flaking and peeling of paint) were discovered on tanks inside the containment, but the quantity was small and would not cause plugging of the sump screens.

(2) For tanks outside the containment, no significant corrosion of the tank outside surfaces was reported.

The applicant concludes that with the implementation of one-time inspection and continued inspection and surveillance activities through the Systems Monitoring Program, there is assurance that age-related degradation of external surfaces of aboveground carbon steel tanks will be adequately managed during the period of extended operation.

3.3.2.3.8.2 Staff Evaluation. In response to the staff's RAI (RAI B2.1.1-1-a), the applicant stated that the Aboveground Carbon Steel Tanks Program implemented at Ginna is consistent with the guidelines provided in NUREG-1801, AMP XI.M29, with one exception. The exception is that the protective coatings, although used on carbon steel tanks, are not credited for mitigating the effects of aging. The staff confirmed the applicant's claim of consistency during the AMP audit for those attributes that were claimed to be consistent with GALL.

In its response to the staff's RAI (C-RAI B2.1.1-1), the applicant stated that all tanks in the scope of this program are protectively coated at exterior surfaces. Therefore, the staff finds that the applicant's exception to the GALL program in not crediting the protective coatings as a preventive measure is a moot point because the applied coating will provide a mitigation effect in reducing the rate of corrosion of the tank exterior surface, irrespective of whether the applicant takes credit for the protective coatings or not. In addition, the coatings are inspected during the systems engineer's walkdowns. If degradation is noted, the condition of the coatings including its effect on tank surface, will be evaluated and the condition will be corrected when considered necessary. Therefore, the staff finds that the applicant's exception to the GALL program is acceptable because it would not have any impact on the mitigating effect of the coatings already applied.

The staff finds that the bottom thickness measurement of the aboveground carbon steel tanks with inaccessible tank bottoms are not identified in the scope of the One-Time Inspection Program. In its response to the staff's RAI (RAI B2.1.1-1-c), the applicant stated that ultrasonic thickness measurements of the bottom surfaces of aboveground carbon steel tanks are now included in the scope of the One-Time Inspection program.

In RAI (RAI B2.1.1-1-d), the staff recommends that appropriate guidance be provided in the program for selecting locations with the highest likelihood of corrosion problems for thickness measurements, such as the locations where there is observed degradation of sealant or caulking at the interface edge between the tank and foundation, which would allow penetration of water and moisture and cause corrosion of the bottom surface. In its response to the staff's RAI, the

applicant stated that such guidance is now provided in the Aboveground Carbon Steel Tanks Program.

In RAI (RAI B2.1.1-1-e), the staff recommends that the guidance for sample expansion and increasing frequency of inspection be provided in this program when surface degradation is observed. In its response to the staff's RAI, the applicant stated that guidance for additional measurements and inspections in the event that degradation is detected is now provided in the Aboveground Carbon Steel Tanks Program. In addition, the guidance for corrective action would include additional inspections to assess the rate of degradation, repair to the inside coating if needed, repair to the tank wall if minimum wall thickness requirements are not met, or other measures as determined by an engineering evaluation.

In its response to the staff's RAI (RAI B 2.1.1-1.b), the applicant provided the following information regarding the inspection results and the scheduled inspection for the aboveground carbon steel tanks that are in scope of the LRA.

(1) In 2001, a thorough inspection of the reactor makeup water storage tank was performed. The flat bottom head of the tank rests directly on the concrete floor. The inspection consisted of visual examination of the interior surfaces of the tank and ultrasonic thickness measurements of the tank bottom. The inspection results showed that the interior coating was in excellent condition and there was no loss of material at the tank bottom.

(2) The flat-bottomed "A" and "B" emergency diesel generator (EDG) fuel oil day tanks and the technical support center (TSC) diesel generator fuel oil day tank are flat-bottomed tanks, mounted on pedestals. These tanks, including the exterior surface of the tank bottoms, will be inspected during the 2003 refueling outage.

(3) The flat-bottomed "A" and "B" condensate storage tanks are mounted on the concrete floor. These tanks will be drained and inspected including ultrasonic thickness measurements of the tank bottoms during Cycle 31 (2003-2004).

(4) The exterior surfaces of "A" and "B" accumulator vessels and the diesel fire pump fuel oil storage tank are accessible for visual inspection during system engineer walkdowns. The interior of the accumulator vessels is clad with stainless steel.

In its response to the staff's RAI (C-RAI B2.1.1-1-d), the applicant stated that the ultrasonic testing (UT) thickness measurements of the bottom of the reactor makeup water tank will not be repeated prior to the period of extended operation because there is no evidence of degradation after more than 30 years of operation. Similarly for the condensate storage tanks, if no degradation is found during the 2003-2004 inspection, reinspection of the tank bottom will not be performed prior to the period of extended operation. The staff finds that the applicant's inspection plan is acceptable because the inspection results have provided reasonable assurance that the integrity of the tank bottoms will be maintained during the current term of operation (40 years).

The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program. The staff finds the subject supplement acceptable.

3.3.2.3.8.3 Conclusions. On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.3.2.4 Aging Management Reviews of Plant-Specific Components

The following sections provide the results of the staff's evaluation of the adequacy of aging management for components in each of the auxiliary systems.

3.3.2.4.1 Chemical and Volume Control System

3.3.2.4.1.1 Summary of Technical Information in the Application. The description of the CVCS system can be found in Section 2.3.3.1 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3-1. The components, aging effects, and AMPs are provided in LRA Tables 3.4-1 and 3.4-2.

Aging Effects

Components of the CVCS are described in Section 2.3.3.1 of the submittal as being within the scope of license renewal, and subject to an AMR. Table 2.3.3-1, on pages 2-96 through 2-99, of the LRA lists individual components of the system including condenser, cooler, containment spray components, fastener (bolting), pipe, pulsation damper, pump casing, tank, temperature element, transmitter, and valve body.

For the internal environments, the LRA identifies the stainless steel and CASS exposed to treated water–borated or treated water–primary greater than 140 °F are subject to loss of material and cracking due to SCC. Carbon/low-alloy steel, stainless steel, and CASS in treated water–borated or treated water–primary less than 140 °F or treated water–other are subject to loss of material. The LRA also identifies stainless steel and copper alloy (Zn < 15%) exposed to oil and fuel oil are subject to loss of material aging effects. No aging effects were identified for stainless steel, aluminum, carbon/low-alloy steel, and copper alloy (Zn <15%) exposed to air and gas.

For the external environments, the LRA identifies carbon/low-alloy steel exposed to borated water leaks or indoor not-air-conditioned environments is subject to loss of material aging effects. The LRA also identifies carbon/low-alloy steel in indoor not-air-conditioned environment is subject to loss of preload due to stress relaxation and cracking due to SCC. The LRA does not identify any aging effects for stainless steel, aluminum, cast austenitic steel, and copper

alloy (Zn <15%) exposed to indoor not-air-conditioned or containment environment. The LRA identifies that stainless steel in borated water leaks environment has no aging effects.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the CVCS.

- Bolting Integrity Program (B2.1.5)
- Water Chemistry Program (B2.1.37)
- Boric Acid Corrosion Program (B2.1.6)
- Periodic Surveillance and Preventive Maintenance Program (B2.1.23)
- One-Time Inspection Program(B2.1.21)
- System Monitoring Program (B2.1.33)
- Closed-Cycle (Component) Cooling Water System Program (B2.1.9)

A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the CVCS will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.1.2 Staff Evaluation

Aging Effects

The staff reviewed the information in Tables 2.3.3-1, 3.4-1, and 3.4-2. for the CVCS. During its review, the staff determined that additional information was needed to complete its review.

In LRA Table 2.3.3-1, the AMR results indicated that line number (5) of Table 3.4-1 is applicable to tanks, heat exchangers, and transmitters in the CVCS. However, the “Discussion” column of Table 3.4-1, line number (5), does not include the CVCS components. By letter dated March 21, 2003, the staff requested, in RAI 3.4.1-2, the applicant to clarify whether Table 3.4-1, line number (5) is applicable to the tanks, heat exchangers, and transmitters in the CVCS.

In its response dated May 13, 2003, the applicant stated that Table 3.4-1, line number (5), is applicable to external surfaces of tanks, heat exchangers, and valve bodies in the CVCS. The applicant also noted that Table 3.4-1, line number (5), is not applicable to transmitters.

On the basis of its review, the staff finds that the applicant’s response is acceptable because the applicant has clarified the scope of the components for which line number (5) is applicable. The staff considers the issue related to RAI 3.4.1-2 to be resolved.

In LRA Table 3.4-2, line number (81), for stainless steel fasteners (bolting) in the environment of borated water leaks, the applicant identified no aging effects requiring management. By letter dated March 21, 2003, the staff requested, in RAI 3.3-3x2, the applicant to provide the basis for this determination.

In its response dated May 23, 2003, the applicant stated that the technical basis for identifying no aging effects requiring management for stainless steel fasteners exposed to borated water leaks is found in EPRI TR-101108, “Boric Acid Corrosion Evaluation Program, Phase 1 - Task 1 Report,” and in EPRI TR-104748, “Boric Acid Corrosion Guidebook.” These documents contain

compilations of pertinent industry experience and summaries of corrosion test data which identify stainless steel and nickel-based alloys as alternative fastener materials which display excellent resistance to corrosion from borated water leaks.

On the basis of its review, the staff finds that the applicant's response is acceptable because the applicant's basis for determining no applicable aging effects is consistent with the industry experience. The staff considers the issue related to RAI 3.3-3x2 to be resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the CVCS SSCs to the environments described in Tables 2.3.3-1, 3.4-1, and 3.4-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the CVCS.

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the CVCS.

- Water Chemistry Program
- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed-Cycle (Component) Cooling Water System Program
- One-Time Inspection Program
- Periodic Surveillance and Preventive Maintenance Program
- System Monitoring Program

These AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these common AMPs is documented in Sections 3.0.3.1, 3.0.3.3, 3.0.3.4, 3.0.3.7, 3.0.3.8, 3.0.3.11, and 3.0.3.5 of this SER, respectively.

After evaluating the applicant's AMR for each of the components in the CVCS, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects for this system. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMPs recommended by the GALL Report. For the components identified in LRA Table 3.4-2, the staff verified that the applicant credited AMPs that are appropriate for the identified aging effects.

In LRA Table 3.4-2, line numbers (16) and (32), the applicant credited the Closed-Cycle (Component) Cooling Water System Program for managing the aging effect of loss of material for stainless steel under treated water and other environments for various components in the auxiliary systems (e.g., boric acid evaporator condensers and coolers). However, the Closed-Cycle (Component) Cooling Water System Program does not reference EPRI TR-10736 and takes many exceptions from the GALL recommendations. By letter dated March 21, 2003, the staff requested, in RAI 3.4.1-1, the applicant to clarify how the aging effects due to corrosion product buildup, calcium deposits, and other parameters will be managed for these components.

In its May 13, 2003, response to RAI 3.4.1-1, the applicant stated that the Ginna Closed-Cycle (Component) Cooling Water System Program employs various methods to ensure that the components in the component cooling system will continue to perform their intended function. Periodic maintenance activities provide opportunities for visual inspections of the internal (wetted) and external surfaces of components in the system. Thermal performance testing of selected heat exchangers is used to verify that these components are capable of performing the heat removal intended function. The makeup water to CCW at Ginna Station is supplied from the reactor makeup water storage tank, and, as such, is demineralized. Therefore, the applicant concluded that calcium and other mineral deposits are not an issue in the Ginna CCW system. The applicant stated that corrosion is controlled in the CCW system at Ginna by maintaining chromate-based inhibitors (potassium dichromate) in solution. Potassium dichromate is used because it is an excellent corrosion inhibitor and, in addition, is toxic to microbiological organisms. Monitoring of the CCW chemistry and maintaining parameters within the specified limits ensures that the system is maintained free of corrosion and biofouling.

The applicant further stated that, in addition to the activities described above, routine surveillance of system operating parameters are performed by operators during normal rounds. These include monitoring flows through heat exchangers, monitoring system pressures at various locations, monitoring pump suction and discharge pressures, and monitoring CCW temperature and fluid temperatures in systems served by CCW. The combination of these activities ensures early detection of CCW system problems that require corrective actions.

Moreover, the applicant stated that plant-specific operating experience indicates that the CCW system performance has been very satisfactory. No evidence of corrosion product build-up or corrosion-induced through-wall cracking in CCW piping has ever been identified at Ginna. Confirmation of the effectiveness of the CCW chemistry control was obtained during remote visual inspection of the internal surfaces of the carbon steel heat exchanger shell, tubesheet, and tube supports, as well as piping connections during retubing of both CCW heat exchangers in 1999. All surfaces were clean, free of deposits and corrosion products, and in excellent condition. The applicant also indicated that additional information is provided in the response to RAI B2.1.9-1.

On the basis of its review, the staff finds that the applicant's response is acceptable because the applicant's activities as described above will ensure early detection of CCW system problems that require corrective actions, and the plant-specific operating experience shows that the CCW system performance has been satisfactory. The staff considers the issue related to RAI 3.4.1-1 to be resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-3 pertaining to the use of the Periodic Surveillance Preventive Maintenance Program for internal surfaces of components, and the use of the Systems Monitoring Program for external surfaces of the carbon steel components in several of the auxiliary systems in the LRA. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.3 of this SER, and is characterized as resolved.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the CVCS.

In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.3.2.4.1.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and AMPs credited for managing the aging effects, for components in the CVCS, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable UFSAR supplement program descriptions and concludes that the UFSAR supplement provides an adequate program description of the AMPs credited for managing aging in the CVCS to satisfy 10 CFR 54.21(d).

3.3.2.4.2 Component Cooling Water

3.3.2.4.2.1 Summary of Technical Information in the Application. The description of the CCW system can be found in Section 2.3.3.2 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3-2. The components, aging effects, and AMPs are provided in LRA Tables 3.4-1 and 3.4-2.

Aging Effects

Components of the CCW system are described in Section 2.3.3.2 of the submittal as being within the scope of license renewal, and subject to an AMR. Table 2.3.3-2, on pages 2-102, 2-103, and 2-104, of the LRA lists individual components of the system including cooler, containment spray components, fasteners (bolting), flow element, heat exchanger, indicator, orifice, pipe, pump casing, switch, tank, temperature element, transmitter, and valve body.

For the internal environments, the LRA identifies the stainless steel, carbon/low alloy steel, copper alloy, cast iron, and CASS exposed to treated water–other, or stainless steel exposed to treated water–primary less than 140 °F, or treated water–secondary greater than 120 °F are subject to loss of material. Carbon/low-alloy steel and copper alloy exposed to raw water are subject to loss of material aging effects. Stainless steel exposed to treated water–secondary greater than 120 °F is subject to cracking due to SCC. The applicant also identified HX-stainless steel or HX-copper alloy (stainless steel or copper alloy used for heat transfer purpose) in raw water, treated water–other, treated water–primary less than 140 °F, or treated water–secondary greater than 120 °F are subject to loss of heat transfer. No aging effects were identified for stainless steel, carbon/low-alloy steel, or copper alloy (Zn <15%) exposed to air and gas, or neoprene exposed to treated water–other.

For the external environments in Ginna, the LRA identifies that carbon/low-alloy steel exposed to borated water leaks is subject to loss of material aging effects. Carbon/low-alloy steel in indoor not-air-conditioned environments, is subject to loss of material, loss of preload due to stress relaxation, and cracking due to SCC. Neoprene in containment is subject to change in material properties and cracking. The applicant also identified carbon/low-alloy steel in containment or indoor not-air-conditioned environments, or cast iron exposed to indoor not-air-conditioned environments, is subject to loss of material aging effects. No aging effects were identified for stainless steel in concrete, containment, indoor not-air-conditioned environments, or exposed to

borated water leaks. No aging effects were also identified for CASS or copper alloy (Zn <15%) in indoor not-air-conditioned environments.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the CCW system.

- Bolting Integrity Program (B2.1.5)
- Water Chemistry Program (B2.1.37)
- Boric Acid Corrosion Program (B2.1.6)
- Periodic Surveillance and Preventive Maintenance Program (B2.1.23)
- System Monitoring Program (B2.1.33)
- Open-Cycle (Component) Cooling Water System Program (B2.1.22)
- Closed-Cycle (Component) Cooling Water System Program (B2.1.9)

A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the CCW system will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.2.2 Staff Evaluation

Aging Effects

The staff reviewed the information in Tables 2.3.3-2, 3.4-1, and 3.4-2 for the CCW system. During its review, the staff determined that additional information was needed to complete its review.

In LRA Table 2.3.3-2, the AMR results indicate that Table 3.4-1, line numbers (5) and (14), and Table 3.4-2, line numbers (120), (130), (132), (133), (151), (152), (153), and (154) are applicable to heat exchangers in the CCW system. The applicant credited the Periodic Surveillance and Preventive Maintenance Program, One-Time Inspection Program, Closed-Cycle (Component) Cooling Water System Program, and Water Chemistry Control Program for managing loss of material due to various aging mechanisms, and cracking due to SCC. However, the GALL Report recommends that the Open-Cycle Cooling Water System Program and the Selective Leaching of Materials AMP be used to detect occurrence of selective leaching for components that are exposed to raw water, treated water, and ground water environments by hardness measurement. By letter dated March 21, 2003, the staff requested, in RAI 3.4.2-1, the applicant to confirm that parameters monitored/inspected as recommended by the GALL Report are adequately covered in the applicant’s AMPs identified above.

In its response dated May 13, 2003, the applicant stated that Table 3.4-1, line numbers (5) and (14), include the EDG lube oil and jacket water heat exchangers. The tubes in these heat exchangers are arsenical (inhibited) admiralty brass. The presence of arsenic acts to inhibit the selective leaching mechanism (i.e., dezincification) in the admiralty brasses. The tubeside environment in both of these heat exchangers is service (raw) water. The tubes are periodically inspected by eddy current testing under the Periodic Surveillance and Preventive Maintenance Program. The eddy current inspections provide a very effective means of detecting any tube degradation resulting from dezincification. The shell and channel heads of these units are gray cast iron. The shellside environment of the lubricating oil heat exchanger is lubricating oil, which

would not support the selective leaching mechanism (graphitic corrosion of gray iron). The shellside environment of the jacket water heat exchanger is chromated water. Potassium dichromate is an effective and reliable corrosion inhibitor and would also suppress the selective leaching mechanism. The concentration of potassium dichromate is controlled and maintained under the Water Chemistry Control Program at Ginna. The applicant also stated that the channel heads are removed and inspected when the tubes are inspected. The channel heads are fitted with sacrificial zinc anodes which are periodically replaced under the Periodic Surveillance and Preventive Maintenance Program. The zinc anodes effectively suppress the selective leaching mechanism. The applicant further stated that a sample of components potentially susceptible to selective leaching in raw water environments will be inspected under the One-Time Inspection Program. The sample will include the EDG jacket water and lube oil heat exchanger channel heads. This inspection will be performed prior to the end of the current license period. The inspection will be conducted using an eddy current technique (pancake probe). The applicant stated that hardness tests may also be used if component configuration and geometry allows as described in response to RAI B2.1.29-1.

The applicant also stated that LRA Table 3.4-2, line numbers (120), (130), (132), (133), and (151) through (154) identify heat exchangers that are exposed to a variety of environments, including raw and treated water. Line number (120) includes carbon steel components which are not susceptible to selective leaching. Line numbers (130), (132), and (133) refer to admiralty brass tubes which are inspected by eddy current testing under the Periodic Surveillance and Preventive Maintenance Program and therefore any degradation due to selective leaching (dezincification) would be readily detected. Line numbers (151), (152), (153) and (154) include stainless steel heat exchanger components which are not susceptible to selective leaching.

On the basis of its review, the staff finds that the applicant's response is acceptable because the applicant has demonstrated that the use of the above AMPs will adequately manage the aging effect of selective leaching for these components. The staff considers the issue related to RAI 3.4.2-1 to be resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-3 pertaining to the use of the Periodic Surveillance and Preventive Maintenance Program for internal surfaces of components, and the use of the System Monitoring Program for external surfaces of the carbon steel components in several of the auxiliary systems in the LRA. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.3 of this SER, and is characterized as resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-6 pertaining to the aging effects of the neoprene pipes that are exposed to oil and fuel oil, raw water, and treated water–other environments in several of the auxiliary systems in the LRA. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.6 of this SER, and is characterized as resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the CCW system SSCs to the environments described in Tables 2.3.3-2, 3.4-1, and 3.4-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the CCW system.

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the CCW system.

- Bolting Integrity Program
- Water Chemistry Program
- Boric Acid Corrosion Program
- Periodic Surveillance and Preventive Maintenance Program
- System Monitoring Program
- Open-Cycle (Component) Cooling Water System Program (3.3.2.3.6)
- Closed-Cycle (Component) Cooling Water System Program (3.0.3.5)

With the exception of Open-Cycle (Component) Cooling Water System Program, these AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these common AMPs is documented in Sections 3.0.3.3, 3.0.3.1, 3.0.3.4, 3.0.3.8, 3.0.3.11, and 3.0.3.5 of this SER, respectively. The Open-Cycle (Component) Cooling Water System Program has been evaluated and found to be appropriate for this system. The staff's evaluation of the Open-Cycle (Component) Cooling Water System Program is documented in Section 3.3.2.3.6 of this SER

After evaluating the applicant's AMR for each of the components in the CCW system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects for this system. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMPs recommended by the GALL Report. For the components identified in LRA Table 3.4-2, the staff verified that the applicant credited AMPs that are appropriate for the identified aging effects.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the CCW system. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.3.2.4.2.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and AMPs credited for managing the aging effects, for components in the CCW system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable UFSAR supplement program descriptions and concludes that the UFSAR supplement provides an adequate program description of the AMPs credited for managing aging in the CCW system to satisfy 10 CFR 54.21(d).

3.3.2.4.3 Spent Fuel Cooling and Fuel Storage

3.3.2.4.3.1 Summary of Technical Information in the Application. The description of the Spent Fuel Cooling and Fuel Storage system can be found in Section 2.3.3.3 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3-3. The components, aging effects, and AMPs are provided in LRA Tables 3.4-1 and 3.4-2.

Aging Effects

Components of the SFC&FS system are described in Section 2.3.3.3 of the submittal as being within the scope of license renewal and subject to an AMR. Table 2.3.3-3, on pages 2-109 through 2-111, of the LRA lists individual components of the system including containment spray components, demineralizer, diaphragm seal, fasteners (bolting), filter housing, flow element, heat exchanger, indicator, pipe, pulsation damper, pump casing, spectacle flange, strainer housing, structures, tank, temperature element, and valve body.

For the internal environments, the LRA identifies the stainless steel, CASS, and copper alloy (Zn <15%) exposed to treated water–borated <140 °F are subject to loss of material. Neoprene exposed to treated water–borated <140 °F is subject to change in material properties and cracking. The applicant also identified stainless steel and carbon/low alloy steel in raw water are subject to loss of material, and stainless steel in raw water and in treated water–borated < 140 °F are subject to loss of heat transfer. No aging effects were identified for neoprene exposed to air and gas.

For the external environments, the LRA identifies carbon/low-alloy steel exposed to borated water leaks is subject to loss of material aging effects. The LRA also identifies carbon/low-alloy steel in indoor not-air-conditioned environment is subject to loss of material, loss of preload due to stress relaxation, and cracking due to SCC. The LRA does not identify any aging effects for stainless steel, cast austenitic steel, and copper alloy (Zn <15%) exposed to indoor not-air-conditioned, or stainless steel exposed to borated water leaks or buried environments.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the SFC&FS system.

- Bolting Integrity Program (B2.1.5)
- Water Chemistry Control Program (B2.1.37)
- Boric Acid Corrosion Program (B2.1.6)
- Periodic Surveillance and Preventive Maintenance Program (B2.1.23)
- One-Time Inspection Program(B2.1.21)
- System Monitoring Program (B2.1.33)
- Open-Cycle (Component) Cooling Water System Program (B2.1.22)
- Structures Monitoring Program (B2.1.32)
- Spent Fuel Pool Neutron Absorber (Boraflex) Monitoring Program (B2.1.30)

A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the SFC&FS system will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.3.2 Staff Evaluation.

Aging Effects

The staff reviewed the information in Tables 2.3.3-3, 3.4-1, and 3.4-2 for the SFC&FS system. During its review, the staff determined that additional information was needed to complete its review.

LRA Table 3.4-2, line number (430), indicates that, for valve body (copper alloy) in the SFC&FS system, under the indoor not-air-conditioned environment, there is no aging effect. However, the Periodic Surveillance and Preventive Maintenance Program was identified as the AMP. By letter dated March 21, 2003, the staff requested, in RAI 3.4.3-1, the applicant to clarify this apparent inconsistency.

In its response dated May 13, 2003, the applicant stated that, as denoted in LRA Table 3.4-2, line number (430), the subject valves are in the SFC&FS system. The Preventive Maintenance Program was properly applied to the internal environment of treated water–borated (<140 °F), but was mistakenly applied for the same valves to the external environment.

On the basis of its review, the staff finds that the applicant's response is acceptable because the applicant clarified that the Preventive Maintenance Program was mistakenly applied to the external environment of the subject valve and this explanation. The staff considers the issue related to RAI 3.4.3-1 to be resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-3 pertaining to the use of the Periodic Surveillance and Preventive Maintenance Program for internal surfaces of components, and the use of the Systems Monitoring Program for external surfaces of the carbon steel components in several of the auxiliary systems in the LRA. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.3 of this SER, and is characterized as resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the SFC&FS system SSCs to the environments described in Tables 2.3.3-3, 3.4-1, and 3.4-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the SFC&FS system.

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the SFC&FS system.

- Bolting Integrity Program (3.0.3.3)
- Water Chemistry Control Program (3.0.3.1)
- Boric Acid Corrosion Program (3.0.3.4)
- Periodic Surveillance and Preventive Maintenance Program (3.0.3.8)
- One-Time Inspection Program (3.0.3.7)
- Systems Monitoring Program (3.0.3.11)
- Open-Cycle (Component) Cooling Water System Program (3.3.2.3.6)

- Structures Monitoring Program (3.0.3.10)
- Spent Fuel Pool Neutron Absorber (Boraflex) Monitoring Program (3.3.2.3.7)

With the exception of the Open-Cycle (Component) Cooling Water System Program and the Spent Fuel Pool Neutron Absorber (Boraflex) Monitoring Program, these AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these common AMPs is documented in Sections 3.0.3.3, 3.0.3.1, 3.0.3.4, 3.0.3.8, 3.0.3.7, 3.0.3.11, and 3.0.3.10 of this SER, respectively. The Open-Cycle (Component) Cooling Water System Program and the Spent Fuel Pool Neutron Absorber (Boraflex) Monitoring Program have been evaluated and found to be appropriate for this system. The staff's evaluation of the Open-Cycle (Component) Cooling Water System Program and the Spent Fuel Pool Neutron Absorber (Boraflex) Monitoring Program is documented in Sections 3.3.2.3.6 and 3.3.2.3.7 of this SER, respectively.

After evaluating the applicant's AMR for each of the components in the SFC&FS system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects for this system. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMPs recommended by the GALL Report. For the components identified in LRA Table 3.4-2, the staff verified that the applicant credited AMP that are appropriate for the identified aging effects.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the SFC&FS system. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.3.2.4.3.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and AMPs credited for managing the aging effects, for components in the SFC&FS system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable UFSAR supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the SFC&FS system to satisfy 10 CFR 54.21(d).

3.3.2.4.4 Waste Disposal

3.3.2.4.4.1 Summary of Technical Information in the Application. The description of the waste disposal system can be found in Section 2.3.3.4 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3-4. The components, aging effects, and AMPs are provided in LRA Tables 3.4-1 and 3.4-2.

Aging Effects

Components of the waste disposal system are described in Section 2.3.3.4 of the submittal as being within the scope of license renewal, and subject to an AMR. Table 2.3.3-4 of the LRA lists individual components of the system including bolting, heat exchanger, orifice, pipes and fittings, pump casings, tanks, and valve bodies. Fasteners bolting and external surfaces of carbon steel and low-alloy steel components are identified as being subject to loss of material due to boric acid corrosion from exposure to borated water spillage.

The LRA identifies that carbon steel, galvanized steel, and copper in air are subjected to loss of material due to general external corrosion, and carbon steel and low-alloy steel in dripping boric acid are subjected to loss of material due to boric acid corrosion. The LRA also identifies that stainless steel in borated treated water was subjected to cracking due to SCC. The LRA does not identify any aging effects for aluminum and stainless steel in air or concrete, for carbon steel or cast iron in concrete.

Aging Management Programs

The following AMPs are utilized to manage aging effects for the waste disposal system:

- Closed-Cycle (Component) Cooling Water System Program (B.2.1.9)
- One-Time Inspection Program (B2.1.21)
- Periodic Surveillance and Preventive Maintenance Program (B2.1.23)
- Water Chemistry Program (B2.1.37)
- Boric Acid Corrosion Program (B2.1.6)
- Bolting Integrity Program (B2.1.5)
- Systems Monitoring Program (B2.1.33)

The applicant concluded that the effects of aging associated with the components of the waste disposal system will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.4.2 Staff Evaluation.

Aging Effects

The staff reviewed the information in Tables 2.3.3-4, 3.4-1, and 3.4-2 for the waste disposal system. During its review, the staff determined that additional information was needed to complete its review.

In LRA Table 3.4.-1, line number (14), and Table 3.4-2, line number (132), the applicant credited the Closed-Cycle (Component) Cooling Water System Program to manage the aging effect of loss of material due to general, pitting, and crevice corrosion, as well as MIC for heat exchangers in the waste disposal system. However, the staff noted that the program description in LRA Appendix B2.19 for the Closed-Cycle (Component) Cooling Water System Program does not include the waste disposal system. By letter dated March 21, 2003, the staff requested, in RAI 3.3.4-1, the applicant to clarify this discrepancy between Table 2.3.3-4 and Appendix B2.1.9. In its response dated May 13, 2003, the applicant stated that the scope of the Closed-Cycle (Component) Cooling Water System Program includes all components exposed to component cooling water and therefore includes components in the waste disposal system serviced by the

CCW system. The staff's evaluation of the applicant's response is documented in Section 3.0.3.5 of this SER and is characterized as resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff finds that the aging effects that result from contact of the waste disposal system SSCs to the environments described in Tables 2.3.3-4, 3.4-1, and 3.4-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the waste disposal system.

Aging Management Programs

The applicant credited the following AMPs to manage the aging effects in the waste disposal system.

- Closed-Cycle (Component) Cooling Water System Program (3.0.3.5)
- One-Time Inspection Program (3.0.3.7)
- Periodic Surveillance and Preventive Maintenance Program (3.0.3.8)
- Water Chemistry Program (3.0.3.1)
- Boric Acid Corrosion Program (3.0.3.4)
- Bolting Integrity Program (3.0.3.3)
- Systems Monitoring Program (3.0.3.11)

These AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these common AMPs is documented in Sections 3.0.3.5, 3.0.3.7, 3.0.3.8, 3.0.3.1, 3.0.3.4, 3.0.3.3, and 3.0.3.11 of this SER, respectively. The Closed-Cycle (Component) Cooling Water System Program has been evaluated and found to be appropriate for this system. The staff's evaluation of the Closed-Cycle (Component) Cooling Water System Program is documented in Sections 3.0.3.5 of this SER.

After evaluating the applicant's AMR for each of the components in the waste disposal system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects for this system. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMPs recommended by the GALL Report. For the components identified in LRA Table 3.4-2, the staff verified that the applicant credited AMPs aging management programs that are appropriate for the identified aging effects.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the waste disposal system. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.3.2.4.4.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and AMPs credited for managing the aging effects, for

components in the waste disposal system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the waste disposal system to satisfy 10 CFR 54.21(d).

3.3.2.4.5 Service Water

3.3.2.4.5.1 Summary of Technical Information in the Application. The description of the service water system can be found in Section 2.3.3.5 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3-5. The components, aging effects, and AMPs are provided in LRA Tables 3.4-1 and 3.4-2.

Aging Effects

Components of the service water system are described in Section 2.3.3.5 of the submittal as being within the scope of license renewal, and subject to an AMR. Table 2.3.3-5 of the LRA lists individual components of the system including expansion joint, fasteners (bolting), flow elements, indicator, pipe, pump casing, strainer housing, structure, switch, temperature element, and valve body. Fasteners bolting and external surfaces of carbon steel and low-alloy steel components are identified as being subject to loss of material due to boric acid corrosion from exposure to borated water leaking from adjacent system or component containing borated treated water. The applicant identified stainless steel, carbon steel, cast steel, cast iron, and copper alloy components exposed to raw water as being subjected to loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling.

The LRA identifies that carbon steel, low-alloy steel, and cast iron in air are subject to loss of material due to general external corrosion, and carbon steel and low-alloy steel in dripping boric acid are subject to loss of material due to boric acid corrosion. The LRA also identifies that stainless steel in oil and fuel oil and buried cast iron are subject to loss of material. The applicant identified Neoprene in the containment or indoor not-air-conditioned environment as being subject to change in material properties and cracking aging effects. The applicant also identified carbon/low alloy steel in containment or indoor not-air-conditioned environments, or cast iron exposed to indoor not-air-conditioned environments, is subject to loss of material aging effects. The LRA does not identify any aging effects for stainless steel in concrete, containment, indoor not-air-conditioned environments, or exposed to borated water leaks. No aging effects were identified for buried concrete or for CASS or copper alloy (Zn <15%) in indoor not-air-conditioned environments, or for neoprene in raw water environment.

Aging Management Programs

The LRA credited the following AMPs with managing the identified aging effects for the service water system.

- Open-Cycle Cooling (Service) Water Program (B2.1.22)
- Boric Acid Corrosion Program (B2.1.6)
- Systems Monitoring Program (B2.1.33)

- Bolting Integrity Program (B2.1.5)
- Fire Water System Program (B2.1.14)
- One-Time Inspection Program (B2.1.21)
- Periodic Surveillance and Preventive Maintenance Program (B2.1.23)

A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the service water system will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.5.2 Staff Evaluation.

Aging Effects

The staff reviewed the information in Tables 2.3-5, 3.4-1, and 3.4-2 for the service water system. During its review, the staff determined that additional information was needed to complete its review.

By letter dated March 21, 2003, the staff issued RAI 3.3-4 pertaining to the aging effect/mechanism for copper alloy components in the service water systems that are exposed to indoor not-air-conditioned environment. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.7 of this SER and is characterized as resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-6 pertaining to the aging effects of the neoprene pipes that are exposed to oil and fuel oil, raw water, and treated water–other environments in several of the auxiliary systems in the LRA. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.6 of this SER, and is characterized as resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the service water system SSCs to the environments described in Tables 2.3.3-5, 3.4-1, and 3.4-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the service water system.

Aging Management Programs

The applicant has credited the following AMPs to manage the aging effects in the service water system.

- Open-Cycle Cooling (Service) Water Program (3.3.2.3.6)
- Boric Acid Corrosion Program (3.0.3.4)
- Systems Monitoring Program (3.0.3.11)
- Bolting Integrity Program (3.0.3.3)
- Fire Water System Program (3.3.2.3.3)
- One-Time Inspection Program (3.0.3.7)
- Periodic Surveillance and Preventive Maintenance Program (3.0.3.8)

With the exception of the Open-Cycle Cooling (Service) Water Program and the Fire Water System Program, these AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these common AMPs is documented in Sections 3.0.3.3, 3.0.3.4, 3.0.3.8, 3.0.3.7, and 3.0.3.11 of this SER, respectively. The Open-Cycle Cooling (Service) Water Program and the Fire Water System Program have been evaluated and found to be appropriated for this system. The staff's evaluation of Open-Cycle Cooling (Service) Water Program and the Fire Water System Program is documented in Sections 3.3.2.3.6 and 3.3.2.3.3 of this SER, respectively.

After evaluating the applicant's AMR for each of the components in the service water system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects for this system. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMPs recommended by the GALL Report. For the components identified in LRA Table 3.4-2, the staff verified that the applicant credited AMPs that are appropriate for the identified aging effects.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the service water system. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

<u>3.3.2.4.5.3 Conclusions</u>. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and AMPs credited for managing the aging effects, for components in the service water system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the service water system to satisfy 10 CFR 54.21(d).

3.3.2.4.6 Fire Protection System

3.3.2.4.6.1 Summary of Technical Information in the Application

The description of the FP system can be found in Section 2.3.3.6 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3-6. The components, aging effects, and AMPs are provided in LRA Tables 3.4-1 and 3.4-2.

<u>Aging Effects</u>

LRA Table 2.3.3-6, lists individual components that are within the scope of LR and subject to an AMR. The components include bolting, pump casings, gas cylinders, nozzles, coolers, fittings, sprinklers, valves, piping, tubings, and filter housings. Table 2.3.3-6 also addresses fire barriers.

The LRA, in Section 3.4, identifies that aluminum, stainless steel (SS), carbon steel, cast iron, concrete, copper, and flame retardant coatings are subject to loss of material due to general exterior corrosion, and carbon steel, low-alloy steel, and aluminum are subject to loss of material due to boric acid corrosion. Buried piping is subject to loss of material due to general pitting, crevice corrosion, and MIC. Doors, fire barrier penetration seals, and concrete are subject to a loss of material due to wear, hardening, and shrinkage due to weathering. Carbon steel and aluminum are subject to a loss of material due to general pitting, crevice, and galvanic corrosion, MIC, and biofouling. Aluminum, bronze, brass, cast iron, and cast steel are subject to loss of material due to selective leaching.

The LRA, in Table 3.4-2, identifies no aging effects for carbon steel in areas protected from the weather, not subject to condensation, and not subjected to aggressive chemical attack. Table 3.4.2 also identifies no aging effects for copper alloys, SS, and glass in air.

<u>Aging Management Programs</u>

The following AMPs are utilized to manage aging effects in the FP system.

- Fire Protection (B2.1.13)
- Boric Acid Corrosion (B2.1.6)
- Fire Water System (B2.1.14)
- Structures Monitoring (B2.1.32)
- Periodic Surveillance and Preventive Maintenance (B2.1.23)
- One-Time Inspection (B2.1.21)
- Fuel Oil Chemistry (B2.1.16)
- Systems Monitoring (B2.1.33)
- Bolting Integrity (B2.1.5)

A description of these AMPs is provided in Appendix B of the LRA.

3.3.2.4.6.2 Staff Evaluation

The staff reviewed the information in LRA Tables 2.3.3.6, 3.4-1, and 3.4-2 for the FP system. During its review, the staff requested additional information in order to complete its review of the fire protection program (FPP).

In RAIs 2.3.3.6-1, 2.3.3.6-3, and 2.3.3.6-4, the staff requested information concerning various portions of the FP system were not included within the scope of LR. In RAI 2.3.3.6-2, the staff requested additional information concerning the AMP for underground fire water piping. The staff's evaluation of the scope of the FP system is in Section 2.3.3.6 of this SER, and includes Open Item 2.3.3.6-1, relating to the jockey pump being in scope as part of the pressure maintenance system for the fire water system.

On the basis of its review of the information provided in the LRA, and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects identified for the FP SCs described in LRA Tables 2.3.3-6, 3.4-1, and 3.4-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds, pending satisfactory resolution of Open Item 2.3.3.6-1, that the applicant has identified

the appropriate aging effects for the material and environments associated with the components in the FP system.

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the FP system.

- Fire Protection Program
- Boric Acid Corrosion Program
- Fire Water System Program
- Structures Monitoring Program
- Periodic Surveillance and Preventive Maintenance Program
- One-Time Inspection Program
- Fuel Oil Chemistry Program
- Systems Monitoring Program
- Bolting Integrity

These AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system, pending satisfactory resolution of Open Items 3.3.2.3.2-1, 3.3.2.3.2-2, and 3.3.2.3.2-3. These AMPs are evaluated in sections as indicated above in this SER.

On the basis of its review of the information provided in the LRA, the staff concludes that the above identified AMPs will effectively manage the aging effects of the FPP.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects from the materials and environments associated with the FP system.

3.3.2.4.6.3 Conclusions

On the basis of its review, pending satisfactory resolution of Open Item 2.3.3.6-1, the staff concludes that the applicant has adequately identified the aging effects, and AMPs credited for managing the aging effects for components in the FP system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(d).

3.3.2.4.7 Heating Steam

3.3.2.4.7.1 Summary of Technical Information in the Application. The description of the heating steam system can be found in Section 2.3.3.7 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3-7. The components, aging effects, and AMPs are provided in LRA Tables 3.4-1 and 3.4-2.

Aging Effects

Components of the heating steam system are described in Section 2.3.3.7 of the submittal as being within the scope of license renewal, and subject to an AMR. Table 2.3.3-7, on page 2-136 of the LRA, and the applicant's letter dated June 10, 2003, Attachment 2, list individual

components of the system including heater, pipe, strainer housing, trap housing, valve body, and boiler package.

For the internal environments, the LRA identifies copper alloy (Zn <15%) and carbon/low-alloy steel exposed to treated water–secondary >120 °F are subject to loss of material aging effect. No aging effects were identified for copper alloy (Zn <15%) and carbon/low-alloy steel exposed to air and gas.

For the external environments, the LRA identifies carbon/low alloy steel exposed to indoor not-air-conditioned environment is subject to loss of material aging effect. The LRA does not identify any aging effects for copper alloy (Zn <15%) exposed to indoor not-air-conditioned environment.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the heating steam system.

- Water Chemistry Control Program (B2.1.37)
- Periodic Surveillance and Preventive Maintenance Program (B2.1.23)
- Systems Monitoring Program (B2.1.33)

A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the heating steam system will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.7.2 Staff Evaluation.

Aging Effects

The staff reviewed the information in Tables 2.3.3-7, 3.4-1, and 3.4-2. for the heating steam system. During its review, the staff determined that additional information was needed to complete its review.

LRA Table 3.4-2, line number (430), indicates that, for valve body (copper alloy) in the SFC & FS system and the heating steam system, exposed to indoor not-air-conditioned environment, there is no aging effect. However, the Periodic Surveillance and Preventive Maintenance Program was identified as the AMP. By letter dated March 21, 2003, the staff requested, in F-RAI 3.4.3-1, the applicant to clarify this apparent inconsistency.

In its response dated May 13, 2003, the applicant stated that, as denoted in LRA Table 3.4-2, line number (430), the subject valves are in the SFC & FS system and the heating steam system. The Preventive Maintenance Program was properly applied to the internal environment of treated water–borated <140 °F, but was mistakenly applied for the same valves to the external environment.

On the basis of its review, the staff finds that the applicant's response is acceptable because the applicant clarified that the Preventive Maintenance Program was properly applied to the internal environment of treated water–borated <140 °F, but was mistakenly applied for the same valves to the external environment. The staff considers the issue related to RAI 3.4.3-1 to be resolved.

As a result of the scoping and screening, and AMRs associated with RAI 2.1-4, in its response supplementary information dated June 10 and July 11, 2003, the applicant had added the boiler package, pipe, and valve body to the heating steam system component group in Table 2.3.3-7. The staff has reviewed the aging effects and aging management for those components, and found them to be acceptable.

By letter dated March 21, 2003, the staff issued RAI 3.4-3 pertaining to the use of the Periodic Surveillance and Preventive Maintenance Program for internal surfaces of components, and the use of the System Monitoring Program for external surfaces of the carbon steel components in several of the auxiliary systems in the LRA. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.3 of this SER, and is characterized as resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the heating steam system SSCs to the environments described in Tables 2.3.3-7, 3.4-1, and 3.4-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the heating steam system.

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the heating steam system.

- Water Chemistry Control Program (3.0.3.1)
- Periodic Surveillance and Preventive Maintenance Program (3.0.3.8)
- Systems Monitoring Program (3.0.3.11)

These AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these common AMPs is documented in Sections 3.0.3.1, 3.0.3.8, and 3.0.3.11 of this SER, respectively.

After evaluating the applicant's AMR for each of the components in the heating steam system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects for this system. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMPs recommended by the GALL Report. For the components identified in LRA Table 3.4-2, the staff verified that the applicant credited AMPs that are appropriate for the identified aging effects.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the heating steam system. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.3.2.4.7.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and AMPs credited for managing the aging effects, for components in the heating steam system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable UFSAR supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the heating steam system to satisfy 10 CFR 54.21(d).

3.3.2.4.8 Emergency Power

3.3.2.4.8.1 Summary of Technical Information in the Application. The description of the emergency power system can be found in Section 2.3.3.8 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3-8. The components, aging effects, and AMPs are provided in LRA Tables 3.4-1 and 3.4-2.

Aging Effects

Components of the emergency power system are described in Section 2.3.3.8 of the submittal as being within the scope of license renewal, and subject to an AMR. Table 2.3.3-8, on pages 2-139 through 2-142 of the LRA, lists individual components of the system including accumulator, cooler, engine casing, expansion joint, fan casing, fasteners (bolting), filter housing, governer, heat exchanger, heating element, indicator, level glass, lubricator, muffler, orifice, pipe, pump casing, strainer housing, tank, temperature elements, and valve body.

For the internal environments, the LRA identifies carbon/low alloy steel, cast iron, aluminum, stainless steel, and copper alloy (Zn <15%) exposed to oil and fuel oil are subject to loss of material aging effects. Carbon/low-alloy steel, stainless steel, cast iron, and copper alloy exposed to air and gas (wetted) <140 °F are subject to loss of material aging effects. Cast iron and copper alloy (Zn >15%) in raw water are subject to loss of material aging effects. Copper alloy, cast iron, stainless steel, and carbon/low-alloy steel exposed to treated water-other are subject to loss of material aging effects. The LRA also identifies copper alloy (Zn >15%) exposed to air and gas (wetted) >140 °F, raw water and treated water–other are subject to loss of heat transfer. No aging effects were identified for galvanized carbon steel in air and gas (wetted) >140 °F, aluminum in air and gas, stainless steel in air and gas (wetted) <140 °F, glass in oil and fuel oil, and neoprene exposed to air and gas, oil and fuel oil, and treated water–other environments.

For the external environments in Ginna, the LRA identifies carbon/low-alloy steel and cast iron exposed to indoor not-air-conditioned environments are subject to loss of material aging effects. Carbon/low alloy steel in buried environments is subject to loss of material. The LRA also identifies carbon/low alloy steel in indoor not-air-conditioned environments is subject to loss of preload due to stress relaxation, and cracking due to SCC. Neoprene exposed to indoor not-air-conditioned environments is subject to change in material properties and cracking. No aging effects were identified for galvanized carbon steel, stainless steel, aluminum, copper alloy (Zn <15%) and glass exposed to indoor not-air-conditioned environments. Stainless steel in buried environments has no aging effects.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the emergency power system.

- Bolting Integrity Program (B2.1.5)
- Periodic Surveillance and Preventive Maintenance Program (B2.1.23)
- One-Time Inspection Program (B2.1.21)
- Systems Monitoring Program (B2.1.33)
- Open-Cycle Cooling (Service) Water System Program (B2.1.22)
- Fuel Oil Chemistry Program (B2.1.16)

A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the emergency power system will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.8.2 Staff Evaluation

Aging Effects

The staff reviewed the information in Tables 2.3.3-8, 3.4-1, and 3.4-2 for the emergency power system. During its review, the staff determined that additional information was needed to complete its review.

In LRA Table 3.4-1, line number (16), the applicant credited the Open-Cycle Cooling (Service) Water System Program for managing the aging effects of loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling for the components within the emergency power system. However, in Table 2.3.3-8, under aging management reference, line number (16) is not listed as a link to the AMR for any components (including heat exchanger) included in the emergency power system. By letter dated March 21, 2003, the staff requested, in RAI 3.4.8-1, the applicant to explain the above discrepancy.

In its response dated May 23, 2003, the applicant clarified that the line number (16) in Table 3.4-1 should be included as an aging management reference in Table 2.3.3-8 for the component group "Heat Exchanger" for both the pressure boundary and heat transfer functions.

On the basis of its review, the staff finds that the applicant's response is acceptable because the applicant clarified that the line number (16) in Table 3.4-1 should be included as an aging management reference for the heat exchanger in Table 2.3.3-8. The staff considers the issue related to RAI 3.4.8-1 to be resolved.

LRA Table 3.4-1, line number (17), states that for buried piping and fittings, the Buried Piping and Tank Inspection Program is implemented by the Periodic Surveillance and Preventive Maintenance Program, and that tanks in the emergency power system are periodically inspected for signs of applicable aging effects. However, in Table 2.3.3-8, under aging management, line number (17) is not listed as a link to the AMR for pipe or tank covered in the emergency power system. By letter dated March 21, 2003, the staff requested, in F-RAI 3.4.8-2, the applicant to explain the above discrepancy and to discuss how potential aging effects due to corrosion at tank bottom will be managed.

In its May 23, 2003, response to RAI 3.4.8-2 and its July 11, 2003, clarifications to C-RAI 3.4.8-2, the applicant clarified that the line number (17) in Table 3.4-1 should be included as an aging management reference in Table 2.3.3-8 for the component groups “Tank” and “Pipe.” The applicant stated that the responses to RAIs B2.1.7-1, B2.1.8-1, and B2.1.21-3 provide a discussion related to the management of potential aging effects due to corrosion at the tank bottoms.

On the basis of its review, the staff finds that the applicant’s response is acceptable because the applicant clarified that the line number (17) in Table 3.4-1 should be included as an aging management reference for the tank and pipe in Table 2.3.3-8. The staff considers the issue related to RAI 3.4.8-2 to be resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-3 pertaining to the use of the Periodic Surveillance and Preventive Maintenance Program for internal surfaces of components, and the use of the System Monitoring Program for external surfaces of the carbon steel components in several of the auxiliary systems in the LRA. The staff’s evaluation of the applicant’s response is documented in Section 3.3.2.5.3 of this SER, and is characterized as resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-4 pertaining to the aging effects for numerous galvanized components that are exposed to various environments in several of the auxiliary systems in the LRA. The staff’s evaluation of the applicant’s response is documented in Section 3.3.2.5.4 of this SER, and is characterized as resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-6 pertaining to the aging effects of the neoprene pipes that are exposed to oil and fuel oil, raw water, and treated water–other environments in several of the auxiliary systems in the LRA. The staff’s evaluation of the applicant’s response is documented in Section 3.3.2.5.6 of this SER, and is characterized as resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant’s response to the above RAIs, the staff finds that the aging effects that result from contact of the emergency power system SSCs to the environments described in Tables 2.3.3-8, 3.4-1, and 3.4-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the emergency power system.

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the emergency power system.

- Bolting Integrity Program (3.0.3.3)
- Periodic Surveillance and Preventive Maintenance Program (3.0.3.8)
- One-Time Inspection Program (3.0.3.7)
- Systems Monitoring Program (3.0.3.11)
- Open-Cycle Cooling (Service) Water System Program (3.3.2.3.6)
- Fuel Oil Chemistry Program (3.3.2.3.4)

With the exception of the Fuel Oil Chemistry Program and the Open-Cycle Cooling (Service) Water System Program, these AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these common AMPs is documented in Sections 3.0.3.3, 3.0.3.8, 3.0.3.7, and 3.0.3.11 of this SER, respectively. The Open-Cycle Cooling (Service) Water System Program and the Fuel Oil Chemistry Program have been evaluated and found to be appropriate for this system. The staff's evaluation of the Fuel Oil Chemistry Program and the Open-Cycle Cooling (Service) Water System Program is documented in Sections 3.3.2.3.4 and 3.3.2.3.6 of this SER, respectively.

After evaluating the applicant's AMR for each of the components in the emergency power system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects for this system. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMPs recommended by the GALL Report. For the components identified in LRA Table 3.4-2, the staff verified that the applicant credited AMPs that are appropriate for the identified aging effects.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the emergency power system. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

<u>3.3.2.4.8.3 Conclusions</u>. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and AMPs credited for managing the aging effects, for components in the emergency power system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the emergency power system to satisfy 10 CFR 54.21(d).

3.3.2.4.9 Containment Ventilation

<u>3.3.2.4.9.1 Summary of Technical Information in the Application</u>. The description of the containment ventilation system can be found in Section 2.3.3.9 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3-9. The components, aging effects, and AMPs are provided in LRA Tables 3.4-1 and 3.4-2.

<u>Aging Effects</u>

Components of the containment ventilation system are described in Section 2.3.3.9 of the submittal as being within the scope of license renewal, and subject to an AMR. Table 2.3.3-9, on pages 2-148 through 2-150 of the LRA, lists individual components of the system including air-operated damper housing, cooling coil, carbon steels components, damper housing/frame,

expansion joint, fan casing, fasteners (bolting), filter housing, flange, heat exchanger, heating, ventilation, and air conditioning (HVAC) equipment package, pipe, valve body, and ventilation duct work.

For the internal environments, the LRA identifies carbon/low-alloy steel, cast iron, and copper alloy (Zn <15%) exposed to air and gas (wetted) <140 °F are subject to loss of material aging effect. Copper alloy (Zn <15%) and stainless steel exposed to raw water are subject to loss of material aging effect. The LRA also identifies HX-copper alloy (ZN <15%) and HX-stainless steel exposed to air and gas (wetted) <140 °F or raw water are subject to loss of heat transfer. Neoprene exposed to air and gas (wetted) <140 °F is subject to change in material properties due to elevated temperature. No aging effects were identified for galvanized carbon steel, stainless steel, flexible asbestos cloth, fiberglass reinforced plastic (FRP), and CASS exposed to air and gas (wetted) <140 °F. No aging effects were also identified for carbon/low alloy steel, copper alloy (Zn <15%), and stainless steel exposed to air and gas.

For the external environments, the LRA identifies carbon/low alloy steel and cast iron exposed to containment, indoor not-air-conditioned, or outdoor environments are subject to loss of material aging effect. Carbon/low-alloy steel exposed to borated water leaks is subject to loss of material aging effect. The LRA also identifies rubber coated asbestos exposed to containment environment, or neoprene exposed to indoor not-air-conditioned or outdoor environments, is subject to change in material properties and cracking. Carbon/low-alloy steel exposed to indoor not-air-conditioned is subject to loss of preload due to stress relaxation. The LRA does not identify any aging effects for galvanized carbon steel, copper alloy (Zn <15%), stainless steel, flexible asbestos cloth, and fiberglass reinforced plastic (FRP) exposed to containment environments. Also, no aging effects were identified for galvanized carbon steel, copper alloy (Zn <15%), stainless steel, and cast austenitic steel exposed to indoor not-air-conditioned environments. Stainless steel exposed to borated water leaks has no aging effects.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the containment ventilation system.

- Bolting Integrity Program (B2.1.5)
- Boric Acid Corrosion Program (B2.1.6)
- Periodic Surveillance and Preventive Maintenance Program (B2.1.23)
- One-Time Inspection Program (B2.1.21)
- Systems Monitoring Program (B2.1.33)
- Open-Cycle (Component) Cooling Water System Program (B2.1.22)

A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the containment ventilation system will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.9.2 Staff Evaluation.

Aging Effects

The staff reviewed the information in Tables 2.3.3-9, 3.4-1, and 3.4-2 for the containment ventilation system. During its review, the staff determined that additional information was needed to complete its review.

LRA Table 3.4-2, line number (1), identifies loss of material as aging effect for cast iron air operated damper housing that are exposed to air and gas (wetted) <140 °F and credits the One-Time Inspection Program for managing the aging effect. However, the staff noted that the scope of the One-Time Inspection Program as described on pages B-38 and B-39 of the LRA does not include components that are exposed to air and gas. By letter dated March 21, 2003, the staff requested, in RAI 3.4.9-1, the applicant to (1) clarify this discrepancy, (2) provide technical basis to justify why the one-time inspection alone is adequate to manage the aging effect, including a discussion of the plant-specific operating experience related to the component of concern to support its conclusion, and (3) address the above staff's concerns for the HVAC equipment package (Table 3.4-2, line number (162)), and valve body (Table 3.4-2, line numbers (386), (413), and (426)).

In its response dated May 13, 2003, the applicant clarified that the scope of the One-Time Inspection Program description now includes components exposed to air and gas (wetted) <140 °F environments.

The applicant also stated that copper alloys and gray cast irons exhibit excellent resistance to atmospheric environments, including moist air. For a discussion of the atmospheric resistance of copper alloys, the applicant referred to the response to RAI 3.3-4. Gray cast irons are considerably more resistant to atmospheric corrosion and corrosion by natural waters than carbon and low-alloy steels. This is primarily a consequence of the elevated silicon content (typically on the order to 2 – 2.5 percent) in gray irons. A very dramatic example of this resistance was observed when the gray cast iron end bells on the circulating water pumps were removed and inspected in 1996. The end bells had been immersed in fresh, raw Lake Ontario water in the screen house bay for 26 years, and were found to be in excellent condition. This inspection was documented photographically. Therefore, the applicant concluded that, since it would be expected that gray cast irons and copper alloys should display very good resistance to moist air and gas environments at temperatures <140 °F, a one-time inspection of the components identified in Table 3.4-2, line numbers (1), (413), and (426) should be sufficient to confirm the absence of potential aging effects, or to verify that age-related degradation is proceeding so slowly as to be negligible.

The applicant further clarified that line number (386) refers to carbon or low-alloy steel components that are exposed to an internal "air and gas" environment that is moisture free. Therefore no aging effects would be expected from exposure of carbon or low-alloy steel to this environment. In addition, the applicant stated that line number (162) (HVAC equipment package) refers to the carbon steel containment recirculation fan cooler housing. The temperature of the housing would be expected to be the same as that of the ambient containment air on either side. Consequently, no condensation would be expected to occur on the housing. Therefore, aging effects, if any, from exposure of carbon steel to this environment would be expected to occur very slowly.

On the basis of its review, the staff finds that the applicant's response is acceptable because the applicant has included the components that are exposed to air and gas in the scope of the One-Time Inspection Program and the applicant has provided adequate justifications and

pertinent operating experience to support its conclusion that the one-time inspection alone is adequate to manage the aging effects for cast iron air operated damper housing, the HVAC equipment package, and valve body. The staff considers the issue related to RAI 3.4.9-1 to be resolved.

LRA Table 3.4-2, line number (34), identifies loss of material as the aging effect for copper alloy (Zn <15%) cooling coil that are exposed to air and gas (wetted) <140 °F and credited the One-Time Inspection Program for managing the aging effect. However, the staff noted that the scope of the One-Time Inspection Program, as described on pages B-38 and B-39 of the LRA does not include components that are exposed to air and gas. By letter dated March 21, 2003, the staff requested, in RAI 3.4.9-2, the applicant to clarify this discrepancy.

In its response dated May 13, 2003, the applicant stated that, as indicated in the response to RAI 3.4.9-1, the scope of the One-Time Inspection Program description now includes components exposed to air and gas (wetted) <140 °F environments. The applicant further stated that the justification for including copper alloys exposed to air and gas (wetted) <140 °F environments in the scope of the One-Time Inspection Program is also provided in the response to RAI 3.4.9-1.

On the basis of its review, the staff finds that the applicant's response is acceptable because the applicant has clarified that the components exposed to air and gas (wetted) <140 °F environments are now included in the scope of the One-Time Inspection Program. The staff considers the issue related to RAI 3.4.9-2 to be resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-1(a) pertaining to the aging effects of the neoprene (elastomer) components in the containment ventilation system and essential ventilation system, and RAI 3.4-1(b) pertaining to the use of the Periodic Surveillance Preventive Maintenance Program for the neoprene components. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.1 of this SER, and is characterized as resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-2 pertaining to the use of the One-Time Inspection Program for managing the aging effects for components in the containment ventilation system and essential ventilation system that are included in Table 3.4-1, line number (5). The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.2 of this SER, and is characterized as resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-3 pertaining to the use of the Periodic Surveillance and Preventive Maintenance Program for internal surfaces of components, and the use of the System Monitoring Program for external surfaces of the carbon steel components in several of the auxiliary systems in the LRA. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.3 of this SER, and is characterized as resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-4 pertaining to the aging effects for numerous galvanized carbon steel components that are exposed to various environments in several of the auxiliary systems in the LRA. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.4 of this SER, and is characterized as resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-5 pertaining to the aging effects of cracking due to SCC for carbon/low-alloy steel fasteners (bolting) in several of the auxiliary systems in the LRA. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.5 of this SER, and is characterized as resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the containment ventilation system SSCs to the environments described in Tables 2.3.3-9, 3.4-1, and 3.4-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the containment ventilation system.

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the containment ventilation system.

- Bolting Integrity Program (3.0.3.3)
- Boric Acid Corrosion Program (3.0.3.4)
- Periodic Surveillance and Preventive Maintenance Program (3.0.3.8)
  One-Time Inspection Program (3.0.3.7)
- Systems Monitoring Program (3.0.3.11)
- Open-Cycle (Component) Cooling Water System Program (3.3.2.3.6)

With the exception of the Open-Cycle (Component) Cooling Water System Program, these AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these common AMPs is documented in Sections 3.0.3.3, 3.0.3.4, 3.0.3.8, 3.0.3.7, and 3.0.3.11 of this SER, respectively. The Open-Cycle (Component) Cooling Water System Program has been evaluated and found to be appropriate for this system. The staff's evaluation of the Open-Cycle (Component) Cooling Water System Program is documented in Section 3.3.2.3.6 of this SER.

After evaluating the applicant's AMR for each of the components in the containment ventilation system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects for this system. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMPs recommended by the GALL Report. For the components identified in LRA Table 3.4-2, the staff verified that the applicant credited AMPs that are appropriate for the identified aging effects.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the containment ventilation system. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.3.2.4.9.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and AMPs credited for managing the aging effects, for components in the containment ventilation system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the containment ventilation system to satisfy 10 CFR 54.21(d).

3.3.2.4.10 Essential Ventilation

3.3.2.4.10.1 Summary of Technical Information in the Application. The description of the essential ventilation system can be found in Section 2.3.3.10 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3-10. The components, aging effects, and AMPs are provided in LRA Tables 3.4-1 and 3.4-2.

Aging Effects

Components of the essential ventilation system are described in Section 2.3.3.10 of the submittal as being within the scope of license renewal, and subject to an AMR. Table 2.3.3-10, on pages 2-157 Through 2-159 of the LRA, lists individual components of the system including damper housing/frame, expansion joint, fan casing, fasteners (bolting), filter housing, heat exchanger, heating coil, HVAC equipment package, motor operated damper, and ventilation ductwork.

The applicant identified the component types subject to aging effects review based on the materials exposed to either the internal environments or the external environments (see the definitions of the environments in Tables 3.1-1 and 3.1-2 of the LRA) of the essential ventilation system. For the internal environments, the LRA identifies carbon/low-alloy steel and copper alloy (Zn <15%) exposed to air and gas (wetted) <140 °F, and copper alloy (Zn <15%) exposed to raw water, are subject to loss of material aging effect. The LRA also identifies HX-copper alloy (ZN <15%) exposed to air and gas (wetted) <140 °F and raw water environments are subject to loss of heat transfer. Neoprene exposed to air and gas (wetted) <140 °F is subject to change in material properties due to elevated temperature. No aging effects were identified for galvanized carbon steel, stainless steel, and aluminum exposed to air and gas (wetted) <140 °F environment.

For the external environments, the LRA identifies carbon/low-alloy steel exposed to indoor not-air-conditioned is subject to loss of material and loss of preload due to stress relaxation. Carbon/low- alloy steel exposed to borated water leaks is subject to loss of material aging effect. The LRA also identifies neoprene exposed to indoor not-air-conditioned is subject to change in material properties and cracking. The LRA does not identify any aging effects for galvanized carbon steel, neoprene, aluminum, and carbon/low alloy steel exposed to indoor air-conditioned environment. No aging effects were also identified for galvanized carbon steel and stainless steel exposed to indoor not-air-conditioned, and galvanized carbon steel and aluminum exposed to outdoor environment. Stainless steel exposed to either indoor not-air-conditioned or borated water leaks has no aging effects.

Aging Management Programs

The following AMPs are utilized to manage aging effects in the essential ventilation system.

- Bolting Integrity Program (B2.1.5)
- Boric Acid Corrosion Program (B2.1.6)
- Periodic Surveillance and Preventive Maintenance Program (B2.1.23)
- One-Time Inspection Program (B2.1.21)
- Systems Monitoring Program (B2.1.33)

A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the essential ventilation system will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.10.2 Staff Evaluation.

Aging Effects

The staff reviewed the information in Tables 2.3.3-10, 3.4-1, and 3.4-2 for the essential ventilation system. During its review, the staff determined that additional information was needed to complete its review.

LRA Table 3.4-2, line number (9), identifies the material for blower (fan) casing component as galvanized carbon steel. However, in the "Discussion" column of the same row, it refers to stainless steel. In addition, the LRA states that stainless steel exposed to ventilation air (T<140 °F) would not be expected to exhibit loss of material due to pitting and crevice corrosion. By letter dated March 21, 2003, the staff requested, in RAI 3.4.10-1, the applicant to clarify the discrepancy concerning the material of the component.

In its response dated May 13, 2003, the applicant stated that LRA Table 3.4-2, line number (9), correctly identifies galvanized carbon steel. In the "Discussion" column of the same row, it should have read galvanized carbon steel rather than stainless steel exposed to ventilation air (T<140 °F). Galvanized carbon steel would also not be expected to exhibit loss of material due to pitting and crevice corrosion. Therefore no aging effects are applicable and no AMP is required. This was a typographical error.

On the basis of its review, the staff finds that the applicant's response is acceptable because the applicant has clarified that it was a typographical error and the material should be galvanized carbon steel as indicated in LRA Table 3.4-2, line number (9). The staff considers the issue related to RAI 3.4.10-1 to be resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-1(a) pertaining to the aging effects of the neoprene (elastomer) components in containment ventilation system and essential ventilation system, and RAI 3.4-1(b) pertaining to the use of the Periodic Surveillance Preventive Maintenance Program for the neoprene components. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.1 of this SER, and is characterized as resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-2 pertaining to the use of the One-Time Inspection Program for managing the aging effects for components in the containment ventilation system and the essential ventilation system that are included in Table 3.4-1, line number (5). The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.2 of this SER, and is characterized as resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-3 pertaining to the use of the Periodic Surveillance and Preventive Maintenance Program for internal surfaces of the components and the use of the System Monitoring Program for external surfaces of the carbon steel components in several of the auxiliary systems in the LRA. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.3 of this SER, and is characterized as resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-4 pertaining to the aging effects for numerous galvanized carbon steel components that are exposed to various environments in several of the auxiliary systems in the LRA. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.4 of this SER, and is characterized as resolved.

By letter dated March 21, 2003, the staff issued RAI 3.4-5 pertaining to the aging effects of cracking due to SCC for carbon/low-alloy steel fasteners (bolting) in several of the auxiliary systems. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.5 of this SER, and is characterized as resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the essential ventilation system SSCs to the environments described in Tables 2.3.3-9, 3.4-1, and 3.4-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the essential ventilation system.

Aging Management Programs

The applicant credited the following AMPs for managing the aging effects in the essential ventilation system.

- Bolting Integrity Program (3.0.3.3)
- Boric Acid Corrosion Program (3.0.3.4)
- Periodic Surveillance and Preventive Maintenance Program (3.0.3.8)
  One-Time Inspection Program (3.0.3.7)
- Systems Monitoring Program (3.0.3.11)

These AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these common AMPs is documented in Sections 3.0.3.3, 3.0.3.4, 3.0.3.8, 3.0.3.7, and 3.0.3.11 of this SER, respectively.

After evaluating the applicant's AMR for each of the components in the essential ventilation system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects for this system. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMPs recommended by the GALL Report. For the components identified in LRA Table 3.4-2, the staff verified that the applicant credited AMPs that are appropriate for the identified aging effects.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the essential ventilation system. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.3.2.4.10.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and AMPs credited for managing the aging effects, for components in the essential ventilation system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable UFSAR supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the essential ventilation system to satisfy 10 CFR 54.21(d).

3.3.2.4.11 Cranes, Hoists, and Lifting Devices

3.3.2.4.11.1 Summary of Technical Information in the Application. The description of the cranes, hoists, and lifting devices system can be found in Section 2.3.3.11 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3-11. The components, aging effects, and AMPs are provided in LRA Tables 3.4-1 and 3.4-2.

Aging Effects

Components of the cranes, hoists, and lifting devices are described in Section 2.3.3.11 of the submittal as being within the scope of license renewal, and subject to an AMR. Table 2.3.3-11 of the LRA lists individual components of the system including cranes and fasteners (bolting). Fasteners bolting and external surfaces of carbon steel and low-alloy steel components are identified as being subject to loss of material due to boric acid corrosion from exposure to borated water spillage. The cranes include bridge and trolleys and rail systems in load handling system and are subjected to loss of material due to general corrosion and wear. The applicant also identified fasteners bolting of carbon steel and low-alloy steel components as being subject to cracking due to SCC and loss of preload due to stress relaxation.

Aging Management Programs

The following AMPs are utilized to manage aging effects for the cranes, hoists, and lifting devices system.

- Bolting Integrity Program (B2.1.5)

- Boric Acid Corrosion Program (B2.1.6)
- Periodic Surveillance and Preventive Maintenance Program (B2.1.23)
- Heavy and Light Load (Related to Refueling) Handling Systems Program (B2.1.18)

A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the cranes, hoists, and lifting devices will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.11.2 Staff Evaluation.

Aging Effects

The staff reviewed the information in Tables 2.3-11, 3.4-1, and 3.4-2 for cranes, hoists, and lifting devices system. During its review, the staff determined that additional information was needed to complete its review.

In LRA Table 3.4-1, line number (13), under the “Discussion” column, the applicant indicated that the component of the cranes, hoists, and lifting devices has the potential for exposure to boric acid spillage and may be subject to the aging effect of loss of material due to boric acid corrosion. However, the AMR results of the cranes, hoists, and lifting devices as listed in Table 2.3.3-11 of the LRA does not refer to Table 3.4-1, line number (13). By letter dated March 21, 2003, the staff requested, in RAI 3.4.11-1, the applicant to clarify this discrepancy.

In its response dated May 13, 2003, the applicant stated that this is a typographical error. Table 2.3.3-11 should include under component group “fasteners (bolting),” aging management reference Table 3.4-1, line number (13). On the basis of its review, the staff finds that the applicant’s response is acceptable because the applicant clarified that line number (13) in Table 3.4-1 should be included as an aging management reference for the fasteners (bolting) in Table 2.3.3-11. The staff considers the issue related to RAI 3.4.11-1 to be resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant’s response to the above RAI, the staff finds that the aging effects that result from contact of the cranes, hoists, and lifting devices to the environments described in Tables 2.3.3-9, 3.4-1, and 3.4-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the cranes, hoists, and lifting devices.

Aging Management Programs

The applicant has credited the following AMPs to manage the aging effects for cranes, hoists, and lifting devices.

- Bolting Integrity Program (3.0.3.3)
- Boric Acid Corrosion Prevention Program (3.0.3.4)
- Periodic Surveillance and Preventive Maintenance Program (3.0.3.8)
- Heavy and Light Load (Related to Refueling) Handling Systems Program (3.3.2.3.5)

With the exception of the Heavy and Light Load (Related to Refueling) Handling Systems Program, these AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. These common AMPs are evaluated in Sections 3.0.3.3, 3.0.3.4, and 3.0.3.8 of this SER. The Heavy and Light Load (Related to Refueling) Handling Systems Program has been evaluated and found to be appropriate for this system. The staff's evaluation of Heavy and Light Load (Related to Refueling) Handling Systems Program is documented in Section 3.3.2.3.5 of this SER.

After evaluating the applicant's AMR for each of the components in the cranes, hoists, and lifting devices system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects for this system. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMPs recommended by the GALL Report. For the components identified in LRA Table 3.4-2 , the staff verified that the applicant credited AMPs that are appropriate for the identified aging effects.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with cranes, hoists, and lifting devices. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

<u>3.3.2.4.11.3 Conclusions</u>. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and AMPs credited for managing the aging effects, for components associated with cranes, hoists, and lifting devices, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging of cranes, hoists, and lifting devices to satisfy 10 CFR 54.21(d).

3.3.2.4.12 Treated Water

<u>3.3.2.4.12.1 Summary of Technical Information in the Application</u>. The description of the treated water system can be found in Section 2.3.3.12 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3-12. The components, aging effects, and AMPs s are provided in LRA Tables 3.4-1 and 3.4-2.

<u>Aging Effects</u>

Components of the treated water system are described in Section 2.3.3.12 of the submittal. Table 2.3.3-12 of the LRA listed individual components in the treated water system that are within the scope of license renewal and subject to AMR. The components include closure bolting, penetration seal, pump casing, valves, piping, and fittings.

Carbon/low-alloy and stainless steel components in treated water–other environments are identified as being subject to loss of material from general, crevice, and pitting corrosion, and MIC. Stainless

steel components in containment air and borated water leakage environments have no aging effects requiring management. Copper alloy (Zn <15%) was identified as being subject to loss of material aging effects in the raw water drainage environment. Carbon/low-alloy steel components were identified as being subject to loss of material aging effects in the treated water leakage environment. Carbon/low-alloy steel fasteners (bolting) were identified to be subject to aging effects due to loss of preload and stress relaxation in the indoor not-air-conditioned environment. The applicant does not identify any aging effects for copper alloy, aluminum, and cast iron in indoor air-conditioned, and carbon/low-alloy steel components in indoor not-air-conditioned environment.

Aging Management Programs

The LRA credited the following AMPs with managing the identified aging effects for the treated water system.

- Boric Acid Corrosion Program (B2.1.6)
- Bolting Integrity Program (B2.1.5)
- System Monitoring Program (B2.1.33)
- Water Chemistry Program (B2.1.37)
- One-Time Inspection Program (B2.1.21)
- Periodic Surveillance and Preventive Maintenance Program (B2.1.23)

A description of these AMPs is provided in Appendix B of the LRA. The applicant concludes that the effects of aging associated with the components of the treated water system will be adequately managed by these AMPs during the period of extended operation.

3.3.2.4.12.2 Staff Evaluation.

Aging Effects

The staff reviewed the information in Tables 2.3.3-12, 3.4-1, and 3.4-2 for the treated water system. During its review, the staff determined that additional information was needed to complete its review.

In LRA Table 3.4-2, line numbers (265) and (434), the applicant identified the loss of material as aging effect/mechanism for aluminum, cast iron, or copper alloy components in raw water drainage environment in the treated water system. The applicant further credited the One-Time Inspection Program as the applicable AMP. By letter dated March 21, 2003, the staff requested, in F-RAI 3.4.12-1, the applicant to justify why the one-time inspection alone is adequate to manage the aging effects for any of the auxiliary systems' components.

In its response dated May 13, 2003, the applicant stated that LRA Table 3.4-2, line number (265), identifies loss of material as an aging effect for cast iron, and line number (434) for copper alloy (Zn <15 percent) in raw water drainage environment, with the One-Time Inspection Program as the applicable program. A discussion of cast iron and copper alloys in treated water environments is provided in the response to RAI 3.4-4 and 3.4.9-1. The scope of the One Time Inspection Program is described in LRA section B2.1.21.1. The program includes managing the loss of material and/or loss of structural integrity due to selective leaching on the internal surfaces of piping and components made of gray cast iron, bronze, or brass exposed to treated water or raw water environments. The one-time inspection is performed to verify the presence or absence of aging

effects. If the results indicate a potential for loss of intended function during the period of extended operation, the corrective action program will be used to identify and implement any additional corrective actions, which may include further inspection. On the basis of its review, the staff finds the applicant's response is acceptable because that the applicant has clarified the scope of the one-time inspection. The staff considers the issue related to RAI 3.4.12-1 to be resolved.

In LRA Table 3.4-2, line number (443), the applicant identified no aging effect for the plastic valve body exposed to raw water drainage environment and therefore, no AMP is required. By letter dated March 21, 2003, the staff requested, in RAI 3.4.12-2, the applicant to clarify the type of plastic material of the valve body and provide the technical basis for not considering any aging effect for that specific material from exposure to raw water drainage environment including a discussion of the plant-specific operating experience related to the component of concern to support its conclusion.

In its response dated May 13, 2003, the applicant stated that as a result of recent plant initiatives to verify the functionality of back flow prevention devices, there are no longer any plastic valve bodies within the scope of license renewal. The applicant also stated that the valves evaluated in Table 3.4-2, line numbers (441), (442), and (443), and shown on drawing 33013-2681-LR, are now included in Table 3.4-2, line numbers (429) and (434), which are now the appropriate aging management references for the valves. Line numbers (429) and (434) are valves made of copper alloy (Zn <15%) for which the staff's evaluation is discussed in Section 3.3.2.5.7 of this SER. On the basis of its review, the staff finds that the applicant's response is acceptable because the applicant has clarified that those plastic valves no longer exist at Ginna and the replacement valves are made of copper alloy (Zn <15%). In addition, the staff has reviewed the aging management for copper alloy (Zn <15%) component and found it to be acceptable as discussed in Section 3.3.2.5.7 of this SER. The staff considers the issue related to RAI 3.4.12-2 to be resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff finds that the aging effects that result from contact of the treated water system SSCs environments described in Tables 2.3-12, 3.4-1, and 3.4-2 of the LRA, are consistent with industry experience to address the combination of the listed materials and environments. Therefore, the staff finds the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the treated water system.

Aging Management Programs

The applicant has credited the following AMPs to manage the aging effects in treated water system.

- Boric Acid Corrosion Program (3.0.3.4)
- Bolting Integrity Program (3.0.3.3)
- Water Chemistry Program (3.0.3.1)
- One-Time Inspection Program (3.0.3.7)
- Systems Monitoring Program (3.0.3.11)
- Periodic Surveillance and Preventive Maintenance Program (3.0.3.8)

These AMPs are credited for managing the aging effects of several components in other structures and systems and are, therefore, considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these common AMPs is documented in Sections 3.0.3.4, 3.0.3.3, 3.0.3.1, 3.0.3.7, 3.0.3.11, and 3.0.3.8 of this SER, respectively.

After evaluating the applicant's AMR for each of the components in the treated water system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects for this system. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMPs recommended by the GALL Report. For the components identified in LRA Table 3.4-2, the staff verified that the applicant credited AMPs that are appropriate for the identified aging effects.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the treated water system. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.3.2.4.12.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and AMPs credited for managing the aging effects, for components in the treated water system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the treated water system to satisfy 10 CFR 54.21(d).

3.3.2.4.13 Radiation Monitoring

3.3.2.4.13.1 Summary of Technical Information in the Application. The description of the radiation monitoring system can be found in Section 2.3.3.13 of this SER. The passive, long-lived components in this system that are subject to an AMR are identified in LRA Table 2.3.3-13. The components, aging effects, and AMPs s are provided in LRA Tables 3.4-1 and 3.4-2.

Aging Effects

Components of the radiation monitoring system are described in Section 2.3.3.4 of the submittal as being within the scope of license renewal, and subject to an AMR. Table 2.3.3-13 of the LRA lists individual components of the system including fasteners (bolting), filter housing, flow element, flow meter, pipes and fittings, pump casings, radiation detector housing, radiation monitor skid, and valve bodies.

Fasteners (bolting) and external surfaces of carbon steel and low-alloy steel components are identified as being subject to loss of material due to boric acid corrosion from exposure to borated water spillage. Stainless steel monitor components are identified as being subject to loss of material due to general corrosion in the raw water environment. Copper alloy is identified as being

subject to loss of material due to general corrosion in the air and gas (wetted) <140 °F environment. Closure bolting components are identified as being subject to loss of material due to general corrosion, loss of preload due to stress relaxation, and crack initiation and growth due to cyclic loading and SCC. The LRA also states that, at Ginna, there are no bolts with a specified minimum yield strength >150 ksi in the auxiliary systems and, therefore, SCC is not an applicable aging mechanism. Carbon/low-alloy steel components are identified as being subject to loss of material due to general corrosion in indoor not-air-conditioned environment.

The LRA states that exposure of the components constructed of stainless steel, CASS, and aluminum to indoor not-air-conditioned, air and gas (wetted) <140 °F environments does not result in any aging effects requiring management. No aging effects are identified for copper alloy (Zn <15%) exposed to indoor not-air-conditioned environment.

<u>Aging Management Programs</u>

The following AMPs are utilized to manage aging effects for the radiation monitoring system.

- Bolting Integrity Program (B2.1.5)
- Boric Acid Corrosion Program (B2.1.6)
- One-Time Inspection Program (B2.1.21)
- Periodic Surveillance and Preventive Maintenance Program (B2.1.23)

The applicant concluded that the effects of aging associated with the components of the radiation monitoring system will be adequately managed by these AMPs during the period of extended operation.

<u>3.3.2.4.13.2 Staff Evaluation</u>.

<u>Aging Effects</u>

The staff reviewed the information in Tables 2.3.3-13, 3.4-1, and 3.4-2 for the radiation monitoring system. During its review, the staff determined that additional information was needed to complete its review.

By letter dated March 21, 2003, the staff issued RAI 3.3-4 pertaining to the aging effect/mechanism for the copper alloy components in the service water systems that are exposed to indoor not-air-conditioned environment. The staff's evaluation of the applicant's response is documented in Section 3.3.2.5.7 of this SER and is characterized as resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff finds that the aging effects that result from contact of the radiation monitoring system SSCs to the environments described in Tables 2.3.3-13, 3.4-1, and 3.4-2 are consistent with industry experience for these combinations of materials and environments. Therefore, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the components in the radiation monitoring system.

<u>Aging Management Programs</u>

The applicant has credited the following AMPs to manage the aging effects in the radiation monitoring system.

- Bolting Integrity Program (3.0.3.3)
- Boric Acid Corrosion Program (3.0.3.4)
- One-Time Inspection Program (3.0.3.7)
- Periodic Surveillance and Preventive Maintenance Program (3.0.3.8)

These AMPs are credited for managing the aging effects of components in several structures and systems and, therefore, are considered common AMPs. The staff has evaluated these common AMPs and found them to be acceptable for managing the aging effects identified for this system. The staff's evaluation of these common AMPs is documented in Sections 3.0.3.3, 3.0.3.4, 3.0.3.7, and 3.0.3.8 of this SER, respectively.

After evaluating the applicant's AMR for each of the components in the radiation monitoring system, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects for this system. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMPs recommended by the GALL Report. For the components identified in LRA Table 3.4-2, the staff verified that the applicant credited AMPs that are appropriate for the identified aging effects.

On the basis of its review, the staff finds the applicant has credited the appropriate AMPs to manage the aging effects for the materials and environments associated with the radiation monitoring system. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.3.2.4.13.3 Conclusions. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and AMPs credited for managing the aging effects, for components in the radiation monitoring system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the radiation monitoring system to satisfy 10 CFR 54.21(d).

3.3.2.4.14 Circulating Water

As described in Section 2.3.3.14 of the LRA, the applicant's scoping and screening review concluded that within the system evaluation boundary for the circulating water system, there are no components that perform license renewal intended functions; therefore, none of the circulating water system components are subject to an AMR.

The staff review of the scoping and screening process in LRA Section 2.3.3.14 concluded that no circulating water system components are within the scope of license renewal. Therefore, none of the circulating water system components are subject to an AMR.

3.3.2.4.15 Chilled Water

As described in Section 2.3.3.15 of the LRA, the applicant's scoping and screening review concluded that within the system evaluation boundary for the chilled water system, there are no components that perform license renewal intended functions; therefore, none of the chilled water system components are subject to an AMR.

The staff review of the scoping and screening process in LRA Section 2.3.3.15 concluded that no chilled water system components are within the scope of license renewal. Therefore, none of the chilled water system components are subject to an AMR.

3.3.2.4.16 Fuel Handling

As described in Section 2.3.3.16 of the LRA, the applicant's scoping and screening review concluded that within the system evaluation boundary for the fuel handling system, there are no components that perform license renewal intended functions; therefore, none of the fuel handling system components are subject to an AMR.

The staff review of the scoping and screening process in LRA Section 2.3.3.16 concluded that no fuel handling system components are within the scope of license renewal. Therefore, none of the fuel handling system components are subject to an AMR.

3.3.2.4.17 Plant Sampling

As described in Section 2.3.3.17 of the LRA, the applicant's scoping and screening review concluded that within the system evaluation boundary for the plant sampling, there are no components that perform license renewal intended functions; therefore, none of the plant sampling components are subject to an AMR.

The staff review of the scoping and screening process in LRA Section 2.3.3.17 concluded that no plant sampling components are within the scope of license renewal. Therefore, none of the plant sampling components are subject to an AMR.

3.3.2.4.18 Plant Air

As described in Section 2.3.3.18 of the LRA, the applicant's scoping and screening review concluded that within the system evaluation boundary for the plant air system, there are no components that perform license renewal intended functions; therefore, none of the plant air system components are subject to an AMR.

The staff review of the scoping and screening process in LRA Section 2.3.3.18 concluded that no plant air system components are within the scope of license renewal. Therefore, none of the plant air system components are subject to an AMR.

3.3.2.4.19 Nonessential Ventilation

As described in Section 2.3.3.19 of the LRA, the applicant's scoping and screening review concluded that within the system evaluation boundary for the nonessential ventilation system,

there are no components that perform license renewal intended functions; therefore, none of the nonessential ventilation system components are subject to an AMR.

The staff review of the scoping and screening process in LRA Section 2.3.3.19 concluded that no non-essential ventilation system components are within the scope of license renewal. Therefore, none of the nonessential ventilation system components are subject to an AMR.

3.3.2.4.20 Site Service and Facility Support

As described in Section 2.3.3.20 of the LRA, the applicant's scoping and screening review concluded that within the system evaluation boundary for the site service and facility support system, there are no components that perform license renewal intended functions; therefore, none of the site service and facility support system components are subject to an AMR.

The staff review of the scoping and screening process in LRA Section 2.3.3.20 concluded that no site service and facility support system components are within the scope of license renewal. Therefore, none of the site service and facility support system components are subject to an AMR.

3.3.2.5 General AMR Issues

3.3.2.5.1 Neoprene (Elastomer) Components

a) The containment ventilation and essential ventilation systems discussed in Section 2.3 of the LRA include neoprene (elastomer) components in the systems. Normally these systems contain elastomer materials in duct seals, flexible collars between ducts and fans, rubber boots, etc. For some plant designs, elastomer components are used as vibration isolators to prevent transmission of vibration and dynamic loading to the rest of the system. In LRA Table 3.4-1, line number (2), the applicant identified the aging effects of hardening, cracks, loss of strength due to elastomer degradation and loss of material due to wear. In the "Discussion" column of that row, the applicant credits the One-Time Inspection Program and the Periodic Surveillance and Preventive Maintenance Program for managing the hardening, cracking, and loss of strength aging effects. The applicant also credited the Systems Monitoring Program for managing the aging effect of loss of material due to wear. The staff noted that the scope of the One-Time Inspection Program as described on pages B-38 and -39 of the LRA does not include hardening, cracking and loss of strength as the aging effects of concern, and does not include components that are exposed to air and gas.

By letter dated March 21, 2003, the staff issued RAI 3.4-1(a) to request the applicant to (1) clarify how the one-time inspection is utilized to manage aging effects for components included in Table 3.4-1, line number (2); (2) clarify whether both the One-Time Inspection Program and the Periodic Surveillance and Preventive Maintenance Program are used for managing these aging effects; and (3) if only one of these two programs is credited for any single component, justify why one-time inspection alone is adequate to manage the aging effects, including a discussion of the plant specific operating experience related to the components of concern to support its conclusion.

In its June 10, 2003, response to RAI 3.4-1(a), the applicant stated that the Periodic Surveillance and Preventive Maintenance Program is credited for managing aging effects such as hardening, cracking, and loss of strength for elastomeric materials in ventilation systems such as duct seals,

flexible collars, rubber boots, etc. The applicant further stated that the scope of the Periodic Surveillance and Preventive Maintenance Program now includes inspections of these components. Vibration dampeners were evaluated under the Component Support commodity group and are included in Table 2.4.2-12 under Component Group “CSUPP-ELAST-INT”.

In its July 11, 2003, response to C-RAI 3.4-1, the applicant provided further clarifications on operating experience related to this issue. The applicant stated that a review of plant-specific operating experience has revealed that a number of maintenance work orders were released during the period 2001 to 2003 for repair of cracks, tears, splits, and other degraded conditions in elastomeric components in ventilation ductwork such as flexible collars, expansion joints, rubber boots, etc. The recent identification of these conditions led to the conclusion that these components be included in the scope of the Periodic Surveillance and Preventive Maintenance Program. However, operating experience indicates there are other elastomeric components in ventilation systems such as gasket seals that have not exhibited degradation. These components are appropriately included under the scope of the One-Time Inspection Program.

On the basis of its review, the staff finds that the applicant’s response is acceptable because the applicable elastomeric components in the ventilation systems are now included in the scope of the Periodic Surveillance and Preventive Maintenance Program. The staff considers the issue related to RAI 3.4-1(a) to be resolved.

b) The staff also noted that the program description of the Periodic Surveillance and Preventive Maintenance Program on pages B-42 and -43 of the LRA includes loss of seal and not hardening and loss of strength as the aging effects of concern. By letter dated March 21, 2003, the staff issued RAI 3.4-1(b) to request the applicant to (1) clarify whether loss of seal includes hardening and loss of strength, and (2) provide the frequency of the subject inspection described in LRA Sections B2.1.23 and B2.2.33 for the applicable neoprene components, including a discussion of the operating history to demonstrate that the applicable aging degradations will be detected prior to the loss of their intended function.

In its June 10, 2003, response to RAI 3.4-1(b), the applicant stated that the loss of seal aging effect is identified in NUREG-1801 as applicable to elastomeric components. Loss of seal may occur as a result of changes in properties of elastomers. Changes in properties may be due to hardening and cracking mechanisms which result from prolonged exposure of elastomers to elevated temperatures (greater than 95 °F) and ionizing radiation fields (greater than 1E6 rads). Therefore loss of seal is a result of changes in properties which include hardening and loss of strength. The applicant further stated that, as discussed in (a) above, the inspections are now included in the scope of the Periodic Surveillance and Preventive Maintenance Program and are to be performed on a 6-year frequency. Moreover, the applicant stated that this frequency will be evaluated and adjusted as necessary based upon the inspection results.

On the basis of its review, the staff finds that the applicant’s response is acceptable because the applicant has adequately clarified why one-time inspection alone is adequate to manage the aging effects of certain elastomeric components in ventilation systems and the applicant’s conclusion is supported by the operating experience. The staff considers the issue related to RAI 3.4-1(b) to be resolved.

3.3.2.5.2 One-Time Inspection Program Used for Components Exposed to Air and Gas

In LRA Tables 2.3.3-9 and 2.3.3-10, the AMR results for numerous components in the containment ventilation and essential ventilation systems refer to LRA Table 3.4-1, line number (5). These components include carbon/low-alloy steel that are exposed to air and gas (wetted) <140 °F. Table 3.4-1, line number (5), credits the One-Time Inspection Program, among others, for managing aging effects of loss of material due to general, pitting, and crevice corrosion, and MIC for the internal environments of ventilation systems, the diesel fuel oil systems, and the EDG systems, and credited the System Monitoring Program for managing the aging effect of loss of material for external surfaces of carbon steel components.

The staff noted that the scope of the One-Time Inspection Program, as described on pages B-38 and B-39 of the LRA, does not include components that are exposed to air and gas. In addition, LRA Section B2.1.21, "One Time Inspection," states that the Ginna One-Time Inspection Program will include measures to verify the effectiveness of an existing AMP and confirm the absence of an aging effect. By letter dated March 21, 2003, the staff issued RAI 3.4-2 to request the applicant to (1) clarify how the One-Time Inspection Program is utilized to manage aging effects for the components in these two ventilation systems that are included in Table 3.4-1, line number (5); (2) clarify whether both the One-Time Inspection Program and the other AMPs are used for managing these aging effects and (3) if only one of these AMPs is credited for any single component, justify why the One-Time Inspection Program alone is adequate to manage the aging effects, including a discussion of the plant-specific operating experience related to the components of concern, to support its conclusion.

In its June 10, 2003, response to RAI 3.4-2, the applicant stated that Table 3.4-1, line number (5), "Components in ventilation systems," includes carbon steel fan housings, damper housings, filter housings, etc., in the containment and essential ventilation systems. The temperature of these housings would be expected to be the same as that of the ambient air on either side. Therefore no condensation would be expected to occur on the housing surfaces. Therefore, the applicant concluded that aging effects, if any, from exposure of carbon steel to this environment would be expected to occur very slowly. A one-time inspection will be performed on these components and the results evaluated. The applicant further stated that, if these inspections reveal evidence of age-related degradation, appropriate corrective actions will be taken and the specific components will be included within the scope of the Periodic Surveillance and Preventive Maintenance Program.

In its July 11, 2003, response to C-RAI 3.4-2, the applicant provided further clarifications as discussed below.

(1) The applicant stated that the One-Time Inspection Program is credited for managing the effects of aging only for the components in the two ventilation systems that are included in Table 3.4-1. These components include carbon steel fan housings, damper housings, and filter housings in the containment and essential ventilation systems. The internal environment of these components is "air and gas (wetted) <140°F," and the external environment is "containment air," which is the same as the internal environment. The temperature of these housings would be expected to be the same as that of the ambient air on either side. Therefore no condensation would be expected to occur on the housing surfaces. Therefore aging effects, if any, from exposure of carbon steel to this environment would be expected to occur very slowly. The applicant also stated that a commitment (reference item #7 Appendix A of this SER) was made to perform a one-time inspection of the internal surfaces of these components and evaluate the inspection results. If no

evidence of age-related degradation is found, no further inspections are planned. Moreover, the applicant stated that a further commitment was made to take appropriate corrective action and include these components in the scope of the Periodic Surveillance and Preventive Maintenance Program only if evidence of age-related degradation was found.

In addition, the applicant stated that for components in the diesel fuel oil system, the Fuel Oil Chemistry Program and the Periodic Surveillance and Preventive Maintenance Program are credited for managing the effects of aging for components exposed to the fuel oil environment.

The applicant also stated that for components exposed to service water and lubricating oil in the EDG system, the Periodic Surveillance and Preventive Maintenance Program is credited for managing the effects of aging. For components in the EDG system that are exposed to component cooling water, the Periodic Surveillance and Preventive Maintenance Program and the Closed-Cycle (Component) Cooling Water System Program are credited for managing the effects of aging.

(2) The applicant stated that for external surfaces of all components, the Systems Monitoring Program is credited for managing the aging effect "loss of material."

(3) The applicant stated that a review of plant-specific operating experience revealed that no evidence of age-related degradation has ever been reported for carbon steel components such as fan housings, damper housings, and filter housings in the containment and essential ventilation systems.

On the basis of its review, the staff finds that the applicant's response is acceptable because the applicant has provided adequate technical basis for not considering the aging effects of carbon steel components exposed to air and gas and the plant-specific operating experience supported that conclusion. The staff considers the issue related to RAI 3.4-2 to be resolved.

3.3.2.5.3 Leakage Monitoring in AMPs

Table 3.4-1, line number (5) of the LRA, credits the Periodic Surveillance and Preventive Maintenance Program, among others, for managing aging effects for the internal surfaces of components in ventilation systems, diesel fuel oil systems, and the EDG system; and credits the System Monitoring Program for managing the aging effect of loss of material for external surfaces of carbon steel components. The staff notes that in Appendix B2.1.23 and B2.1.33, under "Parameters Monitored/Inspected," it includes leakage as an example of parameters monitored/inspected. The staff is of an opinion that the presence of leakage from a component would indicate that the component's ability to perform its intended function as a pressure boundary may have been compromised. By letter dated March 21, 2003, the staff requested, in RAI 3.4-3, the applicant to (1) clarify whether any of the auxiliary systems components for which the Periodic Surveillance and Preventive Maintenance Program and System Monitoring Program are credited rely on the monitoring of leakage, (2) discuss why visual inspection technique alone is sufficient in detecting the aging effects described in Appendix B2.1.23 and B2.1.33, without including other NDE procedures, such as volumetric and/or surface techniques, and (3) discuss the operating history of the above components to demonstrate that the applicable aging effects will be adequately managed prior to the loss of their intended functions.

In its response dated May 13, 2003, the applicant stated that the Periodic Surveillance and Preventive Maintenance Program initiated leakage inspections are just one of several methods used for detecting and monitoring the effects of aging. Other techniques include visual examinations, supplemental surface and volumetric examinations deemed necessary by engineering evaluation, volumetric (eddy current) examinations of heat exchanger tubing, and other periodic volumetric examinations including radiography and ultrasonic testing to verify wall thickness as required by the Open-Cycle Cooling Water System Program. The applicant further stated that the identification of leaks and the evaluation of the consequences of those leaks are the condition where leakage monitoring is an important technique utilized for component aging management.

In its July 11, 2003 response to C-RAI 3.4-1, the applicant provided further clarifications on operating experience related to this issue. The applicant stated that a review of plant-specific operating experience was performed during the AMR process and was documented in Aging Management Review Reports and in Aging Management Program Basis Documents. This review indicated that evidence of minor leakage at bolted closures has been identified by inspections performed during system engineer walkdowns under the Systems Monitoring Program, during maintenance activities performed under the Periodic Surveillance and Preventive Maintenance Program, and during leakage examinations performed under the ASME Section XI Inservice Inspection Program. The applicant further stated that the identification of these leaks and the evaluation of the consequences of those leaks under the Corrective Action Program have been an effective element of component aging management and, therefore, in maintaining component integrity before loss of intended function occurred.

On the basis of its review, the staff finds that the applicant's response is acceptable because leakage detection is just one of several methods used by the applicant for detecting and monitoring the effects of aging and the applicant's discussions for using leakage monitoring for component aging management are reasonable and are supported by the plant-specific operating experience. The staff considers the issue related to RAI 3.4-3 to be resolved.

3.3.2.5.4 Aging Effects for Galvanized Carbon Steel

LRA Table 3.4-2, identifies no aging effects for numerous galvanized carbon steel components (e.g., line numbers (3), (4) ,(5), (6), (61), (62), (163), (164), ...etc.) that are exposed to the environments of air and gas, air and gas (wetted) <140 °F, containment, or indoor not-air-conditioned. The LRA states that no AMP is required and it cites site-specific review of standard industry guidance for aging evaluation of mechanical systems and components as the basis for making the conclusion. It indicates that galvanized carbon steel exposed to ventilation air (T<140 °F) would be expected to exhibit minimal deterioration of the zinc coating.

By letter dated March 21, 2003, the staff requested, in RAI 3.4-4, the applicant to (1) provide the documented evidence for the above stated site-specific reviews of the standard industry guidance, (2) clarify the discrepancy in line number (62), which, under "Discussion," the temperature criteria of "T<140 °F" is not consistent with "T>140 °F" as listed under "Environment," and (3) provide similar additional information for "Muffler" in line numbers (193) and (194).

In its response dated May 13, 2003, the applicant indicated that the ASM Metals Handbook, Volume 13, Corrosion, states that "The behavior of zinc coatings during atmospheric exposure has been closely examined in tests conducted throughout the world. Precise comparison of corrosion

behavior in atmospheres is complex because of many factors involved. It is generally accepted that the corrosion rate of zinc is low; it ranges from .005 mils/yr in dry rural atmospheres to 0.5 mils/yr in most industrial atmospheres. Zinc owes its high degree of resistance to atmospheric corrosion to the formation of insoluble basic carbonate films."

The applicant also stated that zinc is used as a protective coating for carbon steels because of its corrosion resistance in external environments and because it provides galvanic protection of the carbon steel base metal at discontinuities or areas of coating damage. The corrosion products of zinc tend to be alkaline and thereby neutralize normal acidic moisture that occurs in outdoor or industrial environments. In the pH range 6–12, zinc undergoes negligible corrosion under most environmental conditions. When exposed to water, the corrosion resistance of zinc is maintained in this pH range. Temperature also affects the corrosion rate of galvanized steel. Between 140 °F and 200 °F, the corrosion products are significantly more conductive than at temperatures outside this range, and therefore, degradation of the zinc coating can occur on wetted surfaces in this temperature range. However, below 140 °F, and certainly at normal ambient temperatures in air and gas, Containment and indoor not-air-conditioned environments, where typical temperatures range from 75–90 °F, minimal deterioration of the zinc coating would be expected on galvanized carbon steel components.

The applicant further stated that a review of plant-specific operating experience revealed no evidence of age-related degradation of galvanized steel components exposed to air and gas, air and gas wetted <140 °F, containment and indoor not-air-conditioned environments. The applicant also indicated that there is a typographical error in the environment description for line numbers (62) "Expansion Joint" and (193) "Muffler" in Table 3.4-2. The correct environment is "Air and Gas (wetted) < 140 °F."

On the basis of its review, the staff finds that the applicant's response is acceptable because the basis for not considering the aging effects of galvanized carbon steel components exposed to air and gas, air and gas wetted <140 °F, and containment and indoor (no air conditioning) environments is consistent with the industry's experience. Furthermore, the applicant's conclusion is supported by the plant-specific operating experience. The staff considers the issue related to RAI 3.4-4 to be resolved.

3.3.2.5.5 Cracking Due To SCC for Fasteners (Bolting)

LRA Table 3.4-2, line number (79), identifies aging effect of cracking due to SCC for carbon/low alloy steel fasteners (bolting) in the containment ventilation, essential ventilation, and radiation monitoring systems from exposure to indoor not-air-conditioned environment and identified the Bolting Integrity Program for managing this aging effect. However, in the "Discussion" column of that row, it indicates that SCC is not an applicable aging effect/mechanism. By letter dated March 21, 2003, the staff requested, in RAI 3.4-5, the applicant to clarify this discrepancy.

In its May 13, 2003, response to RAI 3.4-5, the applicant stated that LRA Table 3.4-2, line number (79), identifies cracking due to SCC as an aging effect requiring management for carbon/low alloy steel fasteners (bolting) in the containment ventilation, essential ventilation and radiation monitoring systems exposed to an indoor not-air-conditioned environment. The basis for this identification lies in NUREG 1801, Chapter VII, Item I.2-b, "Closure Bolting in High Pressure or High Temperature Systems." The applicant indicated that LRA Table 3.4-2, line number (79), is incorrectly associated with bolting in Tables 2.3.3-9, 2.3.3-10 and 2.3.3-13. These systems are not high pressure or high

temperature systems.

On the basis of its review, the staff finds that the applicant's response is acceptable because that the applicant has adequately clarified that LRA Table 3.4-2, line number (79), is incorrectly associated with bolting in Tables 2.3.3-9, 2.3.3-10, and 2.3.3-13. The staff considers the issue related to RAI 3.4-5 to be resolved.

3.3.2.5.6 Neoprene Pipes

LRA Table 3.4-2, line numbers (65) and (225) through (228), do not identify aging effects for neoprene pipes exposed to oil and fuel oil, raw water, and treated water–other environments that require management. This determination may not be supported by industry experiences. Similar to being exposed to containment or indoor not-air-conditioned environment, as in line numbers (220) through (224), the neoprene material, when exposed to the above environments, may be susceptible to changes in material properties and cracking as well. By letter dated March 21, 2003, the staff requested, in RAI 3.4-6, the applicant to provide the basis for not considering change in material properties and cracking as applicable aging effects for the neoprene piping components included in Table 3.4-2, line numbers (65) and (225) through (228).

In its response dated May 13, 2003, the applicant stated that line numbers (65) and (225) through (228) address aging effects due to exposure of neoprene to internal environments of oil and fuel oil, raw water, and treated water–other. Standard industry guidance indicates that neoprene exhibits excellent resistance to oils, raw and treated waters, chemicals, sunlight, and ozone. The applicant further stated that changes in material properties of neoprene rubber occur as a result of exposure to elevated temperatures and ionizing radiation. The threshold temperature for aging mechanisms which cause changes in material properties of neoprene is conservatively taken to be 95 °F. The threshold fluence value for changes in material properties of neoprene due to exposure to ionizing radiation is conservatively taken to be 10E6 rads. Therefore, the applicant concluded that there are no aging effects requiring management for neoprene exposed to internal environments of oil and fuel oil and raw and treated waters at temperatures below 95 °F and exposed to ionizing radiation fluence less than 10E6 rads. Furthermore, a review of plant-specific operating experience revealed no evidence of age-related degradation of neoprene exposed to these environments.

On the basis of its review, the staff finds that the applicant's response is acceptable because the applicant has provided adequate basis for not considering aging effects due to exposure of neoprene to internal environments of oil and fuel oil, raw water, and treated water–other, and the applicant's conclusion is supported by the plant-specific operating experience. The staff considers the issue related to RAI 3.4-6 to be resolved.

3.3.2.5.7 Copper Alloy (Zn <15%) Components

In LRA Table 3.4-2, line numbers (114), (118), (155), (167), (180), (195), (212), and (266), as well as Table 3.3-2, line numbers (44), (45), (67), (88), and (89), the applicant identified no aging effects for copper alloy (Zn <15%) pipe, thermowell, pump casing, strainer housing, and valve body exposed to containment or indoor not-air-conditioned environments, that require management. However, this determination may not be supported by industry experience, as the copper alloy material may be susceptible to corrosion in a sheltered, moisture environment. By letter dated March 21, 2003, the staff requested, in RAI 3.3-4, the applicant to provide the basis for this determination.

In its response dated May 13, 2003, the applicant stated that copper and copper alloy materials (brasses and bronzes) with Zn <15% display excellent resistance to atmospheric corrosion in a variety of environments, including industrial, marine, and rural atmospheres. The ASM Metals Handbook, Volume 13, Corrosion, states that "Comprehensive tests conducted over a 20-year period under the supervision of ASTM, as well as many service records, have confirmed the suitability of copper and copper alloys for atmospheric exposure." The applicant also stated that the corrosion rate data published in Volume 13 of the ASM Metals Handbook indicates that corrosion rates range from .002 mils/yr in rural environments to approximately 0.1 mils/yr in industrial/marine environments. These rates are essentially negligible. Plant-specific operating experience at Ginna has revealed no evidence of corrosion-related degradation of copper alloy components exposed to indoor not-air-conditioned and containment environments. In addition, the applicant further stated that atmospheric conditions at Ginna are benign, and certainly less severe than industrial or marine environments where these materials display excellent resistance to corrosion, including pitting and crevice corrosion. Therefore, plant-specific operating experience confirms the absence of aging effects for copper and copper alloys exposed to ambient atmospheric conditions at Ginna.

On the basis of its review, the staff finds that the applicant's response is acceptable because the applicant has provided adequate technical basis for not identifying aging effect for copper alloy material exposed to ambient atmospheric conditions at Ginna and the applicant's conclusion was supported by the plant-specific operational experience. The staff considers the issue related to F-RAI 3.3-4 is closed.

3.3.3 Evaluation Findings

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the auxiliary system, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation. The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement for Ginna provides an adequate program description of the AMPs credited for managing aging effects, as required by 10 CFR 54.21(d).

3.4 Steam and Power Conversion Systems

This section addresses the aging management of the components of the steam and power conversion systems group. The systems that make up the steam and power conversion systems group are described in the following SER sections:

- Main and Auxiliary System (2.3.4.1)
- Feedwater and Condensate System (2.3.4.2)
- Auxiliary Feedwater (2.3.4.3)
- Turbine Generator and Supporting Systems (2.3.4.4)

As discussed in Section 3.0.1 of this SER, the components in each of these steam and power conversion systems are included in one of two LRA tables. LRA Table 3.5-1 consists of steam and power conversion systems components that are evaluated in the GALL Report and steam and power conversion systems components that are not evaluated in the GALL Report, but the

applicant has determined can be managed using a GALL Report AMR and associated AMP. LRA Table 3.5-2 consists of steam and power conversion system components that are not evaluated in the GALL Report.

3.4.1 Summary of Technical Information in the Application

In LRA Section 3.5, the applicant described its AMRs for the group at Ginna Station. The description of the systems that comprise the steam and power conversion systems group can be found in LRA Section 2.3.4. The passive, long-lived components in the steam and power conversion systems that are subject to an AMR are identified in LRA Tables 2.3.4-1, 2.3.4-2, 2.3.4-3, and 2.3.4-4.

The applicant's AMRs included an evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of inservice inspection reports and corrective action reports to identify aging effects that require management. These reviews concluded that the aging effects requiring management, based on Ginna Station operating experience, were consistent with aging effects identified in GALL. The applicant's review of industry operating experience included a review of operating experience through 2002. The results of this review concluded that the aging effects requiring management, based on industry operating experience, were consistent with the aging effects identified in GALL. The applicant's ongoing review of plant-specific and industry-wide operating experience is conducted in accordance with the Ginna Station Operating Experience Program.

3.4.2 Staff Evaluation

In Section 3.5 of the LRA, the applicant describes its AMR for the SPC systems at Ginna Station. The staff reviewed Section 3.5 to determine whether the applicant has provided sufficient information to demonstrate that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB throughout the period of extended operation, in accordance with the requirements of 10 CFR 54.21(a)(3), for the SPC systems components that are determined to be within the scope of license renewal and subject to an AMR.

The applicant referenced the GALL Report in its AMR. The staff has previously evaluated the adequacy of the aging management of SPC systems components for license renewal, as documented in the GALL Report. Thus, the staff did not repeat its review of the matters described in the GALL Report, except to ensure that the material presented in the LRA was applicable, and to verify that the applicant had identified the appropriate programs as described and evaluated in the GALL Report. The staff evaluated those aging management issues recommended for further evaluation in the GALL Report. The staff also reviewed aging management information submitted by the applicant that was different from that in the GALL Report or was not addressed in the GALL Report. Finally, the staff reviewed the UFSAR Supplement to ensure that it provided an adequate description of the programs credited with managing aging for the SPC system components.

In LRA Section 3.5, the applicant summarized the results of its AMR of the SPC systems at Ginna Station. Table 3.4-1, below, provides a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.5 that are addressed in the GALL Report.

Table 3.4-1

Staff Evaluation Table for Ginna Station Steam and Power Conversion System Components Evaluated in the GALL Report

Component Group	Aging Effect/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
(1) Piping and fittings in main feedwater line, steam line and AFW piping (PWR only)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA in LRA Section 4.3	Consistent with GALL. GALL recommends further evaluation (see staff evaluation in Section 3.4.2.2.1 below).
(2) Piping and fittings, valve bodies and bonnets, pump casings, tanks, tubes, tubesheets, channel head and shell (except main steam system)	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control and Periodic Surveillance and Preventive Maintenance	GALL recommends further evaluation (see staff evaluation in Section 3.4.2.2.2 below).
(3) AFW piping	Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling	Plant-specific	Not applicable	See staff evaluation in Section 3.4.2.2.3
(4) Oil coolers in AFW system (lubricating oil side possibly contaminated with water)	Loss of material due to general (carbon steel only), pitting, and crevice corrosion, and MIC	Plant-specific	Periodic Surveillance and Preventive Maintenance	Consistent with GALL. GALL recommends further evaluation (see staff evaluation in Section 3.4.2.2.5 below.)
(5) External surface of carbon steel components	Loss of material due to general corrosion	Plant-specific	Systems Monitoring	Consistent with GALL. GALL recommends further evaluation (see staff evaluation in Section 3.4.2.2.4 below).
(6) Carbon steel piping and valve bodies	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion	Consistent with GALL (see staff evaluation in Section 3.4.2.1 below).
(7) Carbon steel piping and valve bodies in main steam system	Loss of material due to pitting and crevice corrosion	Water Chemistry	Water Chemistry	Consistent with GALL (see staff evaluation in Section 3.4.2.1 below).

Component Group	Aging Effects/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
(8) Closure bolting in high-pressure or high-temperature systems	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and/or SCC	Bolting Integrity	Bolting Integrity	Consistent with GALL (see staff evaluation in Section 3.4.2.1 below).
(9) Heat exchangers and coolers/condensers serviced by open-cycle cooling water	Loss of material due to general (carbon steel only), pitting, and crevice corrosion, MIC, and biofouling; buildup of deposit due to biofouling	Open-Cycle Cooling Water System	Periodic Surveillance and Preventive Maintenance and Open-Cycle Cooling (Service) Water System	See staff evaluation in Sections 3.4.2.4.5.2 and 3.4.2.4.5.7 below).
(10) Heat exchangers and coolers/condensers serviced by closed-cycle cooling water	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Closed-Cycle Cooling System	Not applicable	There are no heat exchangers in the SPCS that are serviced by closed-cycle cooling water at Ginna Station
(11) External surface of above-ground condensate storage tank	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Above-Ground Carbon Steel Tanks	Not applicable	The above ground CST at Ginna Station is not in scope of license renewal
(12) External surface of buried condensate storage tank and AFW piping	Loss of material due to general, pitting, and crevice corrosion, and MIC	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	Not applicable	There are no buried tanks or piping in the SPCS at Ginna Station
(13) External surface of carbon steel components	Loss of material due to boric acid corrosion	Boric Acid Corrosion	Boric Acid Corrosion	Consistent with GALL (see staff evaluation in Section 3.4.2.1 below).

3.4.2.1 Aging Management Evaluations in the GALL Report That Are Relied on for License Renewal, Which Do Not Require Further Evaluation

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with GALL, and for which the GALL Report does not recommend further evaluation, the staff sampled components in these groups to determine whether the plant-specific components contained in these GALL component groups were bounded by the GALL evaluation. The staff also sampled component groups to determine whether the applicant had properly identified those component groups in the GALL Report that were not applicable to its plant. The staff identified several areas where additional information or clarification was needed. The staff's evaluation of the applicants responses to those RAIs is included in Section 3.4.2.4 of this SER.

On the basis of its review, the staff has verified the applicant's claim of consistency with the GALL report. The staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 50.21(a)(3).

3.4.2.2 Aging Management Evaluations in the GALL Report That Are Relied on for License Renewal, For Which GALL Recommends Further Evaluation

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with GALL, and for which the GALL Report recommends further evaluation, the staff reviewed the applicant's evaluation to determine whether it adequately addressed the issues for which GALL recommended further evaluation. In addition, the staff sampled components in these groups to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The GALL Report indicates that further evaluation should be performed for the following:

3.4.2.2.1 Cumulative Fatigue Damage

Fatigue is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). The staff's evaluation of this TLAA is documented in Section 4.3 of this SER, following the guidance in Section 4.3 of the SRP-LR.

Table 3.5-1, Item 1 of the LRA identifies components in the main feedwater, steam line, and AFW piping as requiring aging management for cumulative fatigue damage and states that evaluations of these components are consistent with the GALL Report. Since the GALL Report recommends aging management of cumulative fatigue for the main steam, feedwater, and AFW components and the LRA states it is consistent with the GALL Report, Tables 2.3.4-1 through 2.3.4-4 of the LRA should identify these components as being managed for cumulative fatigue. However, Tables 2.3.4-1 through 2.3.4-4, do not identify any SPC systems components that are managed for cumulative fatigue. The staff issued RAI 3.5-1 requesting the applicant to explain why Tables 2.3.4-1 through 2.3.4-4 do not identify any SPC systems components that are managed for cumulative fatigue and to also explain if the main steam, main feed, and AFW system piping are evaluated for thermal fatigue using the method described in Section 4.3.2 of the LRA.

In its response by letter dated May 13, 2003, the applicant stated:

> Links to Table 3.5-1, item 1 of the LRA were inadvertently omitted in Tables 2.3.4-1 through 2.3.4-4 to identify cumulative fatigue damage as an aging effect requiring management for piping and fittings in the main feedwater, main steam, and AFW steam and power conversion systems components. Section 4.3.2 of the LRA entitled "ANSI B31.1 Piping" states that the balance-of-plant piping was originally designed to the requirements of USAS B31.1, Power Piping Code. Balance-of-plant piping includes main steam, main feedwater, and AFW steam and power conversion components. Components in these systems were evaluated for thermal fatigue using the method described in Section 4.3.2, and the results of the evaluation demonstrate that the number of design thermal cycles (7000) will not be exceeded in 60 years of plant operation. Therefore, the analyses associated with ANSI B31.1 piping fatigue have been evaluated and determined to remain valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

The staff finds the applicant's response to RAI 3.5-1 reasonable and acceptable because it

provides an explanation that the main steam, feedwater, and AFW components in the SPC systems are adequately managed for cumulative fatigue damage.

3.4.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

The GALL Report recommends further evaluation of programs to manage loss of material due to general, pitting, and crevice corrosion of carbon steel piping and fittings, valve bodies and bonnets, pump casings, pump suction and discharge lines, tanks, tubesheets, channel heads, and shells (except for main steam system components), and for loss of material due to crevice and pitting corrosion for stainless steel tanks and heat exchanger/cooler tubes. The GALL Report Water Chemistry Program relies on monitoring and control of water chemistry, based on the guidelines in EPRI TR-102134, "PWR Secondary Water Chemistry Guideline—Revision 3," May 1993, for secondary water chemistry in PWRs, to manage the effect of loss of material due to general (carbon steel only), pitting, or crevice corrosion. However, corrosion may occur at locations of stagnant flow conditions. Therefore, the GALL Report recommends that the effectiveness of the Water Chemistry Control Program be verified to ensure that corrosion is not occurring.

The applicant proposed a one-time inspection of select components and susceptible locations to ensure that corrosion is not occurring. The staff reviewed the applicant's proposed program to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation. The staff verified that the applicant's selection of susceptible locations is based on severity of conditions, time of service, and lowest design margin. The staff also verified that the proposed inspection would be performed using techniques similar to ASME Code and ASTM standards.

In Table 3.5-1, Item 2 of the LRA, the applicant states that piping and fitting, valve bodies and bonnets, pump casings, tanks, tubes, tubesheets, channel head and shell (except in main steam system) shall be managed for the aging effect of loss of material due to general (carbon steel only), pitting, and crevice corrosion using the Water Chemistry Control Program, but the Periodic Surveillance and Preventive Maintenance program will be used to verify corrosion is not occurring in lieu of the One-Time Inspection Program. The staff's position is that corrosion may occur at locations of stagnation flow conditions and that 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 Periodic Surveillance and Preventive Maintenance Program does not contain specific details of how this inspection will be performed. The staff issued RAI 3.5-2 requesting the applicant to explain, for the components listed in Table 3.5-1, Item 2 of the LRA, how the applicant's periodic surveillance and preventive maintenance program inspects the piping internals 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 should also describe if the selection of susceptible locations for one-time inspection locations is based on severity of conditions, time of service, and lowest design margin as recommended by NUREG-1801, AMP XI-M32.

In its response by letter dated June 10, 2003, the applicant stated:

> Table 3.5-1, item 2 refers to components in secondary treated water environments in steam and power conversion systems, which at Ginna Station include main and auxiliary steam, feedwater and condensate, auxiliary feedwater and turbine-generator and supporting systems. The component types linked to item 2 include condensing chambers, pipe, valve bodies, flow elements,

pump casings, tanks, controllers, governors, and trap housings. Portions of the feedwater and condensate and auxiliary feedwater systems contain legs of piping and valves exposed to stagnant secondary treated water. Several check valves in these stagnant legs are periodically disassembled and inspected under the periodic surveillance and preventive maintenance program. Plant maintenance procedures which implement these inspections will be enhanced to provide explicit guidance for detection of aging effects. Any condition requiring engineering evaluation will be addressed in accordance with the Ginna Station Corrective Action program. In addition, an engineering review of piping and components in these stagnant legs will be performed to evaluate components inspected under the periodic surveillance and preventive maintenance program for severity of operating conditions, time of service and design margin. Components with the longest time in service, lowest design margin, and most severe operating condition will be included in the periodic surveillance and preventive maintenance program.

The staff finds the applicant's response to RAI 3.5-2 reasonable and acceptable because the periodic surveillance and preventive maintenance program provides adequate criteria to verify the effectiveness of the water chemistry program.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of loss of material due to general, pitting, and crevice corrosion for components in the SPC systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.3 Loss of Material Due to General, Pitting, and Crevice Corrosion, Microbiologically Influenced Corrosion, and Biofouling

The GALL Report recommends further evaluation of programs to manage loss of material due to general corrosion, pitting and crevice corrosion, MIC, and biofouling for carbon steel piping and fittings for untreated water from the backup water supply in the auxiliary feedwater system.

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 AFW system. In Table 3.5-1, Item 3 of the LRA, the applicant stated, "the combination of component, materials and environments identified in Item VIII.G.1-d [of the GALL Report] are evaluated in the service water system. The service water system components are reviewed under NUREG-1801, Chapter VII (Auxiliary Systems), Section C1." Based on this statement, staff could not make a reasonable assurance finding that aging effects in the auxiliary feedwater piping connected to the backup water supply are adequately managed. The staff issued RAI 3.5-3 requesting the applicant to describe any specific auxiliary feedwater system components exposed to untreated water from the backup water supply and to describe the plant specific aging management program used to manage the loss of material for these components.

In its response by letters dated May 13, 2003 and July 11, 2003, the applicant stated:

There are no carbon steel components within the auxiliary feedwater system evaluation boundary normally exposed to untreated water. Untreated water can be aligned to the auxiliary feedwater system during an emergency as a suction source, but those interface components are evaluated within the service water system. The potential interface between service water and auxiliary feedwater is shown on Ginna Station drawing 33013-1237-LR at closed valves 4027 and 4020B (location D-2) and 4013 (location I-1). There are no locations in the boundary between the two

systems where raw water could collect.

The staff finds the applicant's response to RAI 3.5-3 reasonable and acceptable to conclude that no carbon steel components within the auxiliary feedwater system are exposed to raw water. Therefore, no aging management is required.

On the basis of its review, the staff concludes that the applicant provided reasonable assurance that the AFW piping is not exposed to untreated water and this aging effect is not applicable to Ginna Station.

3.4.2.2.4 Loss of Material Due to General Corrosion

The GALL Report recommends further evaluation of programs to manage loss of material due to general corrosion for external surfaces of all carbon steel SCs, including closure bolting, exposed to operating temperatures less than 212°F. Such corrosion may be due to air, moisture, or humidity. The staff reviewed the applicant's proposed program to ensure that an adequate program will be in place for the management of this aging effect.

In Table 3.5-1, Item 5 of the LRA credits the systems monitoring program to manage the loss of material for the external surface of carbon steel components and states, "consistent with NUREG-1801 [GALL]." Since the GALL Report does not contain an approved aging management program for loss of material due to general corrosion on the external surfaces of carbon steel components, the staff issued RAI 3.5-5 requesting the applicant to explain how the Systems Monitoring program is considered to be consistent with the GALL Report.

In its response by letter dated May 13, 2003, the applicant stated:

> Table 3.5-1 is based on the table in the steam and power conversion section of NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants." The table indicates that a plant specific aging management program is appropriate and that program requires further evaluation. Section 3.5 of the LRA describes the criterion applied by the licensee in determining if a NUREG-1800 line number is considered consistent with the GALL Report. In the final step of that process the programs credited in the GALL Report for managing an aging effect are compared to the programs invoked in Ginna Station plant evaluations. If, using good engineering judgement, it could be reasonably concluded that the plant evaluation is in agreement with the GALL Report evaluation, a line number was considered consistent with the GALL Report. In this case, although the aging management program invoked is plant specific, that program will comprise the 10 elements of a program as required by appendix A of the GALL Report. Thus, because the program will detect loss of material on external surfaces of carbon steel components, and the program will be consistent with the required program elements, the applicant concluded that the systems monitoring program is consistent with the guidance of the GALL Report.

The staff finds the applicant's response to RAI 3.5-5 reasonable and acceptable because it explains the applicant's conclusion for stating the systems monitoring program is consistent with the GALL Report for managing loss of material due to general corrosion for external surfaces of steam and power conversion systems carbon steel structures and components.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of the loss of material due to general corrosion for components in the SPC systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of

aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.5 Loss of Material Due to General, Pitting, and Crevice Corrosion, and Microbiologically Induced Corrosion

The GALL Report recommends further evaluation of programs to manage the loss of material due to general corrosion (carbon steel only), pitting and crevice corrosion, and MIC, for stainless steel and carbon steel shells, tubes, and tubesheets within the bearing oil coolers (for steam turbine pumps) in the AFW system. Such corrosion may be due to water contamination that affects the quality of the lubricating oil in the bearing oil coolers. The staff reviewed the applicant's proposed program to ensure that an adequate program will be in place for the management of the aging effect.

See Section 3.4.2.4.5.1 for staff evaluation describing how the periodic surveillance and preventive maintenance program will manage the aging effects for the loss of material due to general corrosion (carbon steel only), pitting and crevice corrosion, and MIC in stainless steel and carbon steel shells, tubes, and tubesheets within the bearing oil coolers (for steam turbine pumps) in the AFW system.

In Table 3.5-1, Item 4 of the LRA, the applicant states that other components, such as accumulators, filter housing, orifices, piping, speed increasers, tanks, and valves bodies have been included in this line item at Ginna Station. Although these specific component types were not included in the GALL Report section, the applicant states that the material, environment, aging effect/mechanism, and aging management program for these components are consistent with the GALL Report. Staff considers it acceptable for the applicant to include these components in this line item and credit the periodic surveillance and preventive maintenance program with managing all applicable aging effects, since the material, environment, aging effect/mechanism, and aging management program for these components are similar to those components acceptable in the GALL Report.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of the loss of material due to general, pitting, and crevice corrosion, and MIC for components in the SPC systems, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.6 Conclusions

The staff has reviewed the applicant's evaluation of the issues for which GALL recommends further evaluation for components in the steam and power conversion systems. On the basis of its review, the staff finds that the applicant has provided sufficient information to demonstrate that the issues for which the GALL Report recommends further evaluation have been adequately addressed and that there is reasonable assurance that the subject aging effects will be adequately managed for the period of extended operation.

3.4.2.3 Aging Management Programs for Steam and Power Conversion Systems

In SER Section 3.4.2.1, the staff evaluated the applicant's conformance with the aging management recommended by the GALL Report for the SPC systems. In SER Section 3.4.2.2, the staff reviewed the applicant's evaluation of the issues for which GALL recommends further evaluation. In this SER section, the staff presents its evaluation of the programs used by the applicant to manage the aging of the components in the SPC systems.

The applicant credits seven AMPs to manage the aging effects associated with components in the SPC systems. All seven of the AMPs are credited with managing aging for components in other system groups (common AMPs). The staff's evaluation of the common AMPs credited with managing aging in SSC system components is provided in Section 3.0.3 of this SER. These common AMPs are listed below:

- Water Chemistry (3.0.3.1)
- Bolting Integrity (3.0.3.3)
- Boric Acid Corrosion (3.0.3.4)
- Flow-Accelerated Corrosion (3.0.3.6)
- One-Time Inspection (3.0.3.7)
- Periodic Surveillance and Preventive Maintenance (3.0.3.8)
- System Monitoring (3.0.3.11)

On the basis of its review, the staff finds that the applicant has properly identified the applicable aging effects and AMPs for the components in the SPC systems at Ginna Station, and that the components in the Ginna Station SPC systems were correctly evaluated in the applicant's AMR and will be adequately managed during the period of extended operation.

3.4.2.3.1 There are no plant specific aging management programs for the SPC systems.

3.4.2.4 Aging Management of Plant-Specific Components

The following sections provide the results of the staff's evaluation of the adequacy of aging management for SPC system components.

3.4.2.4.1 Main and Auxiliary Steam System

<u>3.4.2.4.1.1 Summary of Technical Information in the Application</u>. The aging management review results for the main and auxiliary steam system are presented in Tables 3.4-1 and 3.4-2 of the LRA. The applicant used the GALL Report format to present its AMR of main and auxiliary steam system components in LRA Table 3.4-1. In LRA Table 3.4-2, the applicant identified the component group designation along with its (1) material, (2) environment, (3) aging effect(s), and (4) aging management program(s).

As described in Section 2.3.4.1 of the LRA, the main and auxiliary steam system provides heat removal from the reactor coolant during normal, accident and post accident conditions. During off-normal conditions the system provides emergency heat removal from the RCS using secondary heat removal capabilities. Some non-safety related portions of piping in the system have failure modes which could prevent the satisfactory accomplishment of safety related functions (high energy line breaks). The system is also credited for safe shutdown following station blackout events, some fire events, and contains components that are part of the environmental qualification program. Selected safety valve discharge vent piping is considered non-safety equipment whose

failure could affect the safety function due to its importance in directing steam flow out of a safety related area. The conversion of the heat produced in the reactor to electrical energy is evaluated in the turbine generator system.

The principal components of the main steam portion of the system include the secondary side of two steam generators, where the main steam lines begin. Each steam line has a flow restrictor, four main steam safety valves, an atmospheric dump valve and a steam admission valve to the turbine-driven auxiliary feedwater pump (TDAFW). The two steam lines join together in the intermediate building prior to entering the turbine building. Each steam line is also equipped with a fast closing main steam isolation valve (MSIV) and a main steam non-return check valve. These valves prevent reverse flow in the steam lines that would result from an upstream steam line break, or they isolate any downstream steam line break at the common header. The atmospheric relief valves (ARVs) have two functions. They offer overpressure protection to the steam generator at a setpoint below the main steam safety valves (MSSVs) setpoints and can be used to maintain no-load T_{avg} or perform a plant cooldown in the event the steam dump to the condenser is not available.

The principal components of the auxiliary steam portion of the system include the piping valves and tanks in the extraction steam and steam generator blowdown sub-systems. In extraction steam, five stages of extraction are provided; two from the high-pressure turbine, one of which is the exhaust, and three stages from the low-pressure turbines. There are also two steam dump lines with four relief valves each to the condenser.

Continuous steam generator blowdown is used to reduce the quantities of solids that accumulate in the steam generators as a result of the boiling process. The blowdown recovery system is used to recover both the blowdown water and heat. Each steam generator has a blowdown header located at the bottom of the shell side just above the tubesheet. Both steam generators are equipped with independent blowdown piping from the connecting steam generator nozzles to a flash tank. The piping transports the removed fluid and entrapped debris away from the steam generator, through containment penetrations, to a common flash tank in the turbine building basement. Flashed steam is vented from the flash tank to low-pressure feedwater heater 3A for heat recovery. The vented steam condenses in the feedwater heater and returns to the condenser through the feedwater heater drain system. The remaining condensate in the blowdown flash tank is drained directly to condenser 1B through a level control valve.

Aging Effects

LRA Tables 3.4-1and 3.4-2 identify the following applicable aging effects for the main and auxiliary steam system:

- cumulative fatigue damage of carbon steel components in steam and treated water environment
- loss of material due to general, pitting, and crevice corrosion of carbon and stainless steel components in treated water and steam environment
- loss of material to general corrosion of carbon and low-alloy steel components (external surfaces) in air, moisture, and humidity environment
- wall thinning to flow accelerated corrosion of carbon steel components in steam and treated water environment
- loss of material due to general corrosion, crack initiation and grow due to cyclic loading, and

loss of preload due to stress relaxation of closure bolting

- loss of material to boric acid corrosion of carbon steel components (external surfaces) in air, leaking, and dripping chemically treated borated water environment
- loss of material and loss of heat transfer of cast iron heat exchangers in raw water environment
- loss of material of copper alloy, aluminum, and cast iron components in oil and fuel oil environment
- change in material properties and cracking of neoprene components in indoor air environment
- loss of material of carbon and low alloy components in air and gas (wetted) <140°F environment
- loss of material of copper alloy (Zn<15%) components in a treated water environment
- cracking due to stress cracking corrosion of stainless steel components in treated water environment

Aging Management Programs

The following aging management programs are utilized to manage aging effects to the main and auxiliary steam system:

- Periodic Surveillance and Preventive Maintenance
- Systems Monitoring
- Water Chemistry Control
- Flow-Accelerated Corrosion
- Bolting Integrity
- Boric Acid Corrosion
- One-Time Inspection

A description of these aging management programs is provided in Appendix B of the LRA. The applicant concludes that the effect of aging associated with the components of the main and auxiliary steam system will be adequately managed by these aging management programs such that the intended functions will be maintained consistent with the CLB during the period of extended operation.

3.4.2.4.1.2 Staff Evaluation. In addition to Section 3.4 of the LRA, the staff reviewed the pertinent information provided in Section 2.3.4, “Steam and Power Conversion Systems," and the applicable aging management program descriptions provided in Appendix B of the LRA to determine whether the aging effects for the main and auxiliary SSCs have been properly identified and will be adequately managed during the period of extended operation as required by 10 CFR 54.21(a)(3).

This section of the SER provides the staff’s evaluation of the applicant’s aging management review for the aging effects and the appropriateness of the programs credited for the aging management of the main and auxiliary steam system components at Ginna Station. The staff’s evaluation includes a review of the aging effects considered and the basis for the applicant’s elimination of certain aging effects. In addition, the staff has evaluated the appropriateness of the aging management programs that are credited for managing the identified aging effects for the main and auxiliary steam SSCs.

Aging Effects

The component groups identified in LRA Table 2.3.4-1 for the main and auxiliary steam system are (1) condensing chamber, (2) converter, (3) carbon steel components, (4) fasteners (bolting), (5) flow element, (6) operator, (7) pipe, (8) positioner, (9) pressure relay, (10) screen, and (11) valve body (includes bonnet).

Aging Management Programs

The following aging management programs are utilized to manage aging effects to the main and auxiliary steam system:

- Periodic Surveillance and Preventive Maintenance
- Systems Monitoring
- Flow-Accelerated Corrosion
- Water Chemistry
- Boric Acid Corrosion
- Bolting Integrity
- One-Time Inspection

Each of the above AMPs are credited with managing the aging of several components in different structures and systems and are, therefore, considered common AMPs. The staff review of the common AMPs is in Section 3.0.3 of this SER.

After evaluating the applicant's AMR for each of the main and auxiliary steam components, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMP(s) recommended by the GALL Report. For the components identified in Tables 3.4-2, the staff verified that the applicant credited an aging management program that is appropriate for the identified aging effect(s).

See the following generic RAI evaluations that are applicable to main and auxiliary steam system components: (1) Section 3.4.2.4.5.3 for evaluation of valve bonnets, and (2) Section 3.4.2.4.5.6 for evaluation of flow elements.

3.4.2.4.1.3 Conclusion. The staff has reviewed the information in Sections 2.3.4.1 and 3.4 of the LRA, as well as the applicable AMP descriptions in Appendix B of the LRA. On the basis of this review, the staff concludes that the applicant has demonstrated that the aging effects associated with the components in the main and auxiliary steam system will be adequately managed so that there is reasonable assurance that these components will perform their intended functions in accordance with the CLB during the period of extended operation.

3.4.2.4.2 Feedwater and Condensate System

3.4.2.4.2.1 Summary of Technical Information in the Application. The aging management review results for the feedwater and condensate system are presented in Tables 3.4-1 and 3.4-2 of the LRA. The applicant used the GALL Report format to present its AMR of feedwater and condensate system components in LRA Table 3.4-1. In LRA Table 3.4-2, the applicant identified the component group designation along with its (1) material, (2) environment, (3) aging effect(s), and

(4) aging management program(s).

As described in Section 2.3.4.2 of the LRA, the feedwater and condensate systems function to condense the steam exhausted from the low-pressure turbines, collect and store this condensate, and then send it back to the steam generator for reuse. Components within the system are used to provide emergency heat removal from the reactor coolant system using secondary heat removal capability. The engineered safety features actuation system (ESFAS) provides actuation signals for feedwater isolation. Portions of the main feedwater piping systems in the intermediate building the turbine building have failure modes and effects that could prevent the satisfactory accomplishment of a safety related function (high energy line breaks). The feedwater lines are equipped with a non-return valve and an isolation valve in each line. The non-return valve is the boundary between seismic category I and nonseismic feedwater piping and prevents the steam generator from blowing back through the feedwater line if damage occurs to the non-seismic portion. Components within the system perform functions used to mitigate anticipated transients without a scram (ATWS) and components that are part of the environmental qualification program.

The principal components of the feedwater and condensate system are the feedwater and condensate pumps, the feedwater regulating and bypass valves, feedwater heaters and the essential piping and valves. The steam that leaves the exhaust of the low-pressure turbines enters the main condenser as saturated steam with low moisture content. This steam is condensed by the circulating water, which passes through the tubes of the condenser. The condensed steam collects in the condenser hotel from which the condensate pumps take suction. The condensate pumps increase the pressure of the water and provide suction head for the condensate booster pumps. The condensate booster pumps in turn provide sufficient suction head for the main feedwater pumps. Between the condensate pumps and the condensate booster pumps is the condensate demineralizer system, which maintains condensate water purity. The condensate booster pumps flow condensate through the condensate cooler, hydrogen coolers, air ejector condensers, gland steam condenser, and low-pressure heaters to the suction of the feedwater pumps. The feedwater pumps send feedwater through the high-pressure heaters to the steam generators via the feedwater regulating valves.

Aging Effects

LRA Tables 3.4-1 and 3.4-2 identify the following applicable aging effects for the feedwater and condensate system:

- cumulative fatigue damage of carbon steel components in steam and treated water environment
- loss of material due to general, pitting, and crevice corrosion of carbon and stainless steel components in treated water and steam environment
- loss of material to general corrosion of carbon and low-alloy steel components (external surfaces) in air, moisture, and humidity environment
- wall thinning to flow accelerated corrosion of carbon steel components in steam and treated water environment
- loss of material due to general corrosion, crack initiation and grow due to cyclic loading, and loss of preload due to stress relaxation of closure bolting
- loss of material to boric acid corrosion of carbon steel components (external surfaces) in air, leaking, and dripping chemically treated borated water environment
- cracking due to stress cracking corrosion of stainless steel components in treated water

environment

Aging Management Programs

The following aging management programs are utilized to manage aging effects to the feedwater and condensate system:

- Periodic Surveillance and Preventive Maintenance
- Systems Monitoring
- Flow-Accelerated Corrosion
- Water Chemistry
- Boric Acid Corrosion
- Bolting Integrity
- One-Time Inspection

A description of these aging management programs is provided in Appendix B of the LRA. The applicant concludes that the effect of aging associated with the components of the feedwater and condensate steam system will be adequately managed by these aging management programs such that the intended functions will be maintained consistent with the CLB during the period of extended operation.

3.4.2.4.2.2 Staff Evaluation. In addition to Section 3.4 of the LRA, the staff reviewed the pertinent information provided in Section 2.3.4, "Steam and Power Conversion Systems," and the applicable aging management program descriptions provided in Appendix B of the LRA to determine whether the aging effects for the feedwater and condensate system components have been properly identified and will be adequately managed during the period of extended operation as required by 10 CFR 54.21(a)(3).

This section of the SER provides the staff's evaluation of the applicant's aging management review for the aging effects and the appropriateness of the programs credited for the aging management of the feedwater and condensate system components at Ginna Station. The staff's evaluation includes a review of the aging effects considered and the basis for the applicant's elimination of certain aging effects. In addition, the staff has evaluated the appropriateness of the aging management programs that are credited for managing the identified aging effects for the feedwater and condensate system components.

Aging Effects

The component groups identified in LRA Table 2.3.4-2 for the feedwater and condensate system are (1) condensing chamber, (2) carbon steel components, (3) fasteners (bolting), (4) flow elements, (5) pipe, (6) temperature element, and (7) valve body (includes bonnet).

Aging Management Programs

The following aging management programs are utilized to manage aging effects to the feedwater and condensate system:

- Periodic Surveillance and Preventive Maintenance
- Systems Monitoring

- Flow-Accelerated Corrosion
- Water Chemistry
- Boric Acid Corrosion
- Bolting Integrity
- One-Time Inspection

Each of the above AMPs are credited with managing the aging of several components in different structures and systems and are, therefore, considered common AMPs. The staff review of the common AMPs is in Section 3.0.3 of this SER.

After evaluating the applicant's AMR for each of the feedwater and condensate system components, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMP(s) recommended by the GALL Report. For the components identified in Tables 3.4-2, the staff verified that the applicant credited an aging management program that is appropriate for the identified aging effect(s).

See the following generic RAI evaluations that are applicable to feedwater and condensate system components: (1) Section 3.4.2.4.5.2 for evaluation of components in an open-cycle cooling water environment, and (2) Section 3.4.2.4.5.3 for evaluation of valve bonnets.

<u>3.4.2.4.2.3 Conclusion</u>. The staff has reviewed the information in Sections 2.3.4.2 and 3.4 of the LRA, as well as the applicable AMP descriptions in Appendix B of the LRA. On the basis of this review, the staff concludes that the applicant has demonstrated that the aging effects associated with the components in the feedwater and condensate system will be adequately managed so that there is reasonable assurance that these components will perform their intended functions in accordance with the CLB during the period of extended operation.

3.4.2.4.3 Auxiliary Feedwater (AFW)

<u>3.4.2.4.3.1 Summary of Technical Information in the Application</u>. The aging management review results for the auxiliary feedwater system are presented in Tables 3.4-1 and 3.4-2 of the LRA. The applicant used the GALL Report format to present its AMR of auxiliary feedwater system components in LRA Table 3.4-1. In LRA Table 3.4-2, the applicant identified the component group designation along with its (1) material, (2) environment, (3) aging effect(s), and (4) aging management program(s).

As described in Section 2.3.4.3 of the LRA, the auxiliary feedwater system is designed to maintain steam generator water inventory when the normal feedwater system is not available. During accident and post accident conditions the auxiliary feedwater system supplies feedwater to the steam generators in order to provide emergency heat removal from the reactor coolant system using secondary heat removal capability (atmosphere or main condenser). The auxiliary feedwater system is also credited for use in mitigating anticipated transients without a scram (ATWS), safe shutdown following station blackout event (SO), and some fires.

The principal components of the auxiliary feedwater system are electric motor-driven and steam turbine-driven feedwater pumps, the turbine-driven feedwater pump (TDAFW) oil system, and the essential piping and valves. The preferred auxiliary feedwater system is divided into two independent trains. There are two motor-driven pumps powered from separate redundant 480-V

safeguards emergency buses which can receive power from either onsite or offsite sources. Each motor-driven pump can provide 100% of the preferred auxiliary feedwater system flow required for decay heat removal and can be cross-connected to provide flow to either steam generator. There is also a turbine-driven pump which can receive motive steam from each steam line and provide flow to either or both steam generators. The turbine-driven pump provides 200% of the flow required for decay heat removal.

A standby auxiliary feedwater system (SAFW) provides flow in case the preferred auxiliary feedwater system pumps are inoperable (i.e., a high-energy line break event could render inoperable the three preferred auxiliary feedwater pumps). The SAFW uses two motor-driven pumps that can be aligned to separate service water (SW) system loops. The SAFW system has the same features as the preferred auxiliary feedwater system pumps with regard to functional capability and power supply separation. The system is manually actuated from the control room.

The condensate storage tanks are the normal (preferred) suction source for delivery of cooling water to the steam generators. The safety-related supply is from the plant service water system with the fire water system as a back-up source.

Aging Effects

LRA Tables 3.4-1and 3.4-2 identify the following applicable aging effects for the auxiliary feedwater system:

- cumulative fatigue damage of carbon steel components in steam and treated water environment
- loss of material due to general, pitting, and crevice corrosion of carbon and stainless steel components in treated water and steam environment
- loss of material due to general (carbon steel only), pitting, and crevice corrosion, and MIC of carbon and stainless steel components in lubricating oil environment (possibly contaminated with water)
- loss of material to general corrosion of carbon and low-alloy steel components (external surfaces) in air, moisture, and humidity environment
- wall thinning to flow accelerated corrosion of carbon steel components in steam and treated water environment
- loss of material due to general corrosion, crack initiation and grow due to cyclic loading, and loss of preload due to stress relaxation of closure bolting
- loss of material due to general pitting, and crevice corrosion, MIC, and biofouling; buildup of deposit due to biofouling of carbon steel components in raw water environment
- loss of material to boric acid corrosion of carbon steel components (external surfaces) in air, leaking, and dripping chemically treated borated water environment
- loss of material and loss of heat transfer of cast iron heat exchangers in raw water environment
- loss of material of copper alloy, aluminum, and cast iron components in oil and fuel oil environment
- loss of heat transfer of cast iron heat exchangers in oil and fuel oil environment
- change in material properties and cracking of neoprene components in indoor air environment
- loss of material of copper alloy (Zn<15%) components in a treated water environment
- loss of material of copper alloy (Zn<15%) components in oil and fuel oil environment

- cracking due to stress cracking corrosion of stainless steel components in treated water environment

Aging Management Programs

The following aging management programs are utilized to manage aging effects to the auxiliary feedwater system:

- Periodic Surveillance and Preventive Maintenance
- Systems Monitoring
- Flow-Accelerated Corrosion
- Water Chemistry
- Boric Acid Corrosion
- Bolting Integrity
- One-Time Inspection

A description of these aging management programs is provided in Appendix B of the LRA. The applicant concludes that the effect of aging associated with the components of the auxiliary feedwater system will be adequately managed by these aging management programs such that the intended functions will be maintained consistent with the CLB during the period of extended operation.

<u>3.4.2.4.3.2 Staff Evaluation</u>. In addition to Section 3.4 of the LRA, the staff reviewed the pertinent information provided in Section 2.3.4, “Steam and Power Conversion Systems,” and the applicable aging management program descriptions provided in Appendix B of the LRA to determine whether the aging effects for the auxiliary feedwater system components have been properly identified and will be adequately managed during the period of extended operation as required by 10 CFR 54.21(a)(3).

This section of the SER provides the staff’s evaluation of the applicant’s aging management review for the aging effects and the appropriateness of the programs credited for the aging management of the auxiliary feedwater system components at Ginna Station. The staff’s evaluation included a review of the aging effects considered and the basis for the applicant’s elimination of certain aging effects. In addition, the staff has evaluated the appropriateness of the aging management programs that are credited for managing the identified aging effects for the auxiliary feedwater system components.

Aging Effects

The component groups identified in LRA Table 2.3.4-3 for the auxiliary feedwater system are (1) accumulator, (2) controller, (3) cooler (4) carbon steel components, (5) fasteners (bolting), (6) filter housing, (7) flow element, (8) governor, (9) heat exchanger, (10) level glass, (11) orifice, (12) pipe, (13) pump casing, (14) speed increaser, (15) tank, (16) trap housing, and (17) valve body (includes bonnet).

Aging Management Programs

The following aging management programs are utilized to manage aging effects to the auxiliary feedwater system.

- Periodic Surveillance and Preventive Maintenance
- Systems Monitoring
- Flow-Accelerated Corrosion
- Water Chemistry
- Boric Acid Corrosion
- Bolting Integrity
- One-Time Inspection

Each of the above AMPs are credited with managing the aging of several components in different structures and systems and are, therefore, considered common AMPs. The staff review of the common AMPs is in Section 3.0.3 of this SER.

After evaluating the applicant's AMR for each of the auxiliary feedwater system components, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMP(s) recommended by the GALL Report. For the components identified in Tables 3.4-2, the staff verified that the applicant credited an aging management program that is appropriate for the identified aging effect(s).

See the following generic RAI evaluations that are applicable to auxiliary feedwater system components: (1) Section 3.4.2.4.5.1 for evaluation of components in an oil environment, (2) Sections 3.4.2.4.5.2 and 3.4.2.4.5.7 for evaluation of components in a open-cycle cooling water environment, (3) Section 3.4.2.4.5.3 for evaluation of valve bonnets, (4) Section 3.4.2.4.5.4 for evaluation of galvanic corrosion, and (5) Section 3.4.2.4.5.6 for evaluation of flow elements.

3.4.2.4.3.3 Conclusion. The staff has reviewed the information in Sections 2.3.4.3 and 3.4 of the LRA, as well as the applicable AMP descriptions in Appendix B of the LRA. On the basis of this review, the staff concludes that the applicant has demonstrated that the aging effects associated with the components in the auxiliary feedwater system will be adequately managed so that there is reasonable assurance that these components will perform their intended functions in accordance with the CLB during the period of extended operation.

3.4.2.4.4 Turbine-Generator and Supporting Systems

3.4.2.4.4.1 Summary of Technical Information in the Application. The aging management review results for the turbine-generator and supporting systems are presented in Tables 3.4-1 and 3.4-2 of the LRA. The applicant used the GALL Report format to present its AMR of turbine-generator and supporting systems components in LRA Table 3.4-1. In LRA Table 3.4-2, the applicant identified the component group designation along with its (1) material, (2) environment, (3) aging effect(s), and (4) aging management program(s).

As described in Section 2.3.4.4 of the LRA, the turbine-generator and supporting systems function to convert the energy of the heat contained in the main steam into mechanical energy for use in turning the electric generator. These systems have no safety related functions. Turbine first-stage pressure instruments provide a signal used in anticipated transients without a scram (ATWS) mitigation system actuation circuitry (AMSAC).

The plant subsystems with boundary of the turbine generator and supporting systems include: the

high and low pressure turbine generator and controls, the main electrical generator, the electro-hydraulic control system, the turbine lube oil system, condenser air ejector and vacuum priming, generator hydrogen cooling and generator seal oil systems.

The principal components of the turbine generator systems include; turbines, the main generator, pumps, tanks, heat exchangers, and the essential piping and valves. The main turbine is made up of one high-pressure and two low-pressure turbines, all mounted on a common shaft. The steam flow path is first through the high-pressure turbine, then in a parallel path to the two low-pressure units via the four moisture separator reheater. High-pressure steam is admitted to the high-pressure turbine through two stop and four governing control valves. These valves are controlled by the electro-hydraulic control system. Turbine supervisory instrumentation is provided to monitor turbine vibration, eccentricity, and differential thermal expansion and provide alarms in the control room in the case of abnormal conditions.

The main turbine is supported by a number of auxiliary systems that improve the efficiency and safety of its operation. First and second stage air ejectors remove air and noncondensible gases from the condenser and maintain it under a vacuum, improving efficiency of the main turbine by reducing the backpressure seen by the turbine exhaust. The gland sealing and exhaust applies steam to a labyrinth seal around the rotor shaft to preclude air inleakage into the turbine casings and condenser and to prevent steam leakage into the turbine building. The vacuum priming system uses mechanical vacuum pumps to prevent air buildup in the condenser water boxes or tubes - a condition that would reduce condenser efficiency. The exhaust hood spray prevent overheating of the last stage low-pressure blading under low steam flow conditions. The turbine lube-oil system provides lubrication and cooling of the turbine bearings and supples oil to the auto-stop header for turbine protection. It also provide backup oil to the seal-oil system to prevent hydrogen leakage in the turbine building. A purification system is an adjunct to the turbine lube-oil system to remove water and contaminates from the lube-oil, as well as to provide storage space for makeup oil. The generator auxiliary systems are required to ensure that the main generator will operate at its maximum rated output safely and efficiently. This is accomplished by cooling the generator rotor, stator, exciter, main output bushings, and the isophase bus ducts. Pressurized hydrogen is circulated by the internal ventilation of the generator to remove heat produced in the rotor and stator. The hydrogen then transfers this heat to the hydrogen coolers which are supplied with cooling water from the condensate system. To prevent the escape of hydrogen along the generator shaft and out of the casing, a seal-oil system is utilized. The air-side seal-oil pump and the hydrogen-side seal-oil pump provide oil for sealing at pressure higher than generator hydrogen pressure. The main turbine oil system can provide a backup source of pressurized seal oil.

Aging Effects

LRA Tables 3.4-1and 3.4-2 identify the following applicable aging effects for the turbine-generator and supporting systems:

- cumulative fatigue damage of carbon steel components in steam and treated water environment
- loss of material due to general, pitting, and crevice corrosion of carbon and stainless steel components in treated water and steam environment
- loss of material to general corrosion of carbon and low-alloy steel components (external surfaces) in air, moisture, and humidity environment
- wall thinning to flow accelerated corrosion of carbon steel components in steam and treated

water environment
- cracking due to stress cracking corrosion of stainless steel components in treated water environment

Aging Management Programs

The following aging management programs are utilized to manage aging effects to the turbine-generator and supporting systems:

- Periodic Surveillance and Preventive Maintenance
- Systems Monitoring
- Flow-Accelerated Corrosion
- Water Chemistry

A description of these aging management programs is provided in Appendix B of the LRA. The applicant concludes that the effect of aging associated with the components of the turbine-generator and supporting systems will be adequately managed by these aging management programs such that the intended functions will be maintained consistent with the CLB during the period of extended operation.

3.4.2.4.4.2 Staff Evaluation. In addition to Section 3.4 of the LRA, the staff reviewed the pertinent information provided in Section 2.3.4, "Steam and Power Conversion Systems," and the applicable aging management program descriptions provided in Appendix B of the LRA to determine whether the aging effects for the turbine-generator and supporting systems components have been properly identified and will be adequately managed during the period of extended operation as required by 10 CFR 54.21(a)(3).

This section of the SER provides the staff's evaluation of the applicant's aging management review for the aging effects and the appropriateness of the programs credited for the aging management of the turbine-generator and supporting systems components at Ginna Station. The staff's evaluation included a review of the aging effects considered and the basis for the applicant's elimination of certain aging effects. In addition, the staff has evaluated the appropriateness of the aging management programs that are credited for managing the identified aging effects for the turbine-generator and supporting systems components.

Aging Effects

The component groups identified in LRA Table 2.3.4-4 for the turbine-generator and supporting systems are (1) pipe, and (2) valve body (includes bonnet).

Aging Management Programs

The following aging management programs are utilized to manage aging effects to the turbine-generator and supporting systems:

- Periodic Surveillance and Preventive Maintenance
- Systems Monitoring
- Flow-Accelerated Corrosion
- Water Chemistry

Each of the above AMPs are credited with managing the aging of several components in different structures and systems and are, therefore considered common AMPs. The staff review of the common AMPs is in Section 3.0.3 of this SER.

After evaluating the applicant's AMR for each of the turbine-generator and supporting systems components, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects. For those components identified in Table 3.4-1 of the LRA, the staff verified that the applicant credited the AMP(s) recommended by the GALL Report. For the components identified in Tables 3.4-2, the staff verified that the applicant credited an aging management program that is appropriate for the identified aging effect(s).

See the following generic RAI evaluations which are applicable to turbine-generator and supporting systems components: (1) Section 3.4.2.4.5.3 for evaluation of valve bonnets, and 2) Section 3.4.2.4.5.5 for evaluation of fasteners.

3.4.2.4.4.3 Conclusion. The staff has reviewed the information in Sections 2.3.4.4 and 3.4 of the LRA, as well as the applicable AMP descriptions in Appendix B of the LRA. On the basis of this review, the staff concludes that the applicant has demonstrated that the aging effects associated with the components in the turbine-generator and supporting systems will be adequately managed so that there is reasonable assurance that these components will perform their intended functions in accordance with the CLB during the period of extended operation.

3.4.2.4.5 Generic RAI Issues

3.4.2.4.5.1 Use of the Periodic Surveillance and Preventive Maintenance Program to Manage Aging Effects for Components in an Oil Environment: For the steam and power conversion systems, the Periodic Surveillance and Preventive Maintenance Program is credited with managing several aging effects, although it does not contain details of how these aging effects will be managed. The staff issued RAI 3.5-4 requesting the applicant to explain how the Periodic Surveillance and Preventive Maintenance Program will manage the aging effects for the following components: 1) LRA Table 3.5-1, Item 4 for loss of material due to general corrosion (carbon steel only), pitting and crevice corrosion, and MIC could occur in stainless steel and carbon steel shells, tubes, and tubesheets within the bearing oil coolers (for steam turbine pumps) in the AFW system, 2) LRA Table 3.5.2, items 18 and 19 for loss of heat transfer and loss of material for heat exchangers in an oil and fuel environment, and 3) LRA Table 3.5-2, Items 23, 47, and 64 for loss of material level glass, pump casing, and valve body in an oil and fuel environment.

Also, in Table 3.5-1, Item 4 for loss of material within the bearing oil coolers, the LRA states in the discussion column, "consistent with NUREG-1801. The Periodic Surveillance and Preventive Maintenance Program is credited with managing all applicable aging effects." Since NUREG-1801 does not contain an approved AMP for loss of material within the bearing oil coolers, staff requested the applicant to explain why the periodic surveillance and preventive maintenance program is considered to be consistent with the GALL Report (NUREG-1801).

In its response by letter dated June 10, 2003, the applicant stated:

> 1) Table 3.5-1, item 4 refers to the stainless steel lube oil coolers for the motor-driven and turbine-driven auxiliary feedwater pumps. These coolers are shell and tube heat exchangers. The

coolers are periodically cleaned and inspected under the periodic surveillance and preventive maintenance program. Service water flows through the tube side of these units, and lubricating oil through the shell side. The tubes of these units are inspected by eddy current testing, which is a volumetric technique and is credited for managing aging effects such as loss of material due to pitting and crevice corrosion and MIC on both the ID and OD of the tubes.

2) Table 3.5-2, item 18 and 19 refer to the lubricating oil side of the outboard bearing lube oil coolers for the motor-driven and turbine-driven auxiliary feedwater pumps. It should be noted that the lubricating oil environment to which the cast iron housing is exposed is a benign environment and would not be expected to support corrosion of the bearing housing. The lubricating oil contained in these coolers is periodically sampled and analyzed as directed by the periodic surveillance and preventive maintenance program. The analysis includes a full spectrum of elements which has been monitored and trended over a 10 year period. Any adverse trend in the iron content could be attributed to wear particulate or corrosion products. Such a condition would be addressed under the Ginna Station Corrective Action program and would include a determination of the origin of the iron concentration.

3) Table 3.5-2, items 23, 47, and 64 refer to aluminum level glass housing, cast iron pump casing, and copper alloy valve body components exposed to a lubricating oil environment. As discussed in item 2 above, the periodic surveillance and preventive maintenance program includes analysis of the lubricating oil to which these components are exposed. The analytical results provide levels of aluminum, iron and copper present in the oil. Any adverse trend in the iron content could be attributed to wear particulate or corrosion products. Any adverse trend in aluminum or copper levels would be attributed to corrosion products. These conditions would be addressed under the Ginna Station Corrective Action program and would include a determination of the origin of the element exhibiting the adverse trend.

4) The aging management program referenced in Table 3.5-1 item 4 is plant specific. The periodic surveillance and preventive maintenance program is a plant specific program at Ginna Station and therefore the aging management program credited for managing the effects of aging for components included in item 4 is consistent with NUREG 1801. All of the program attributes have been compared with the program elements in NUREG 1800, Appendix A and found to be consistent with the requirements.

3.4.2.4.5.1.1 Staff Evaluation of RAI 3.5-4:

The staff finds the applicant's response to RAI 3.5-4 provides an acceptable explanation of how the Periodic Surveillance and Preventive Maintenance Program manages aging effects for components in an oil environment. Therefore, the staff finds that the aging effect for components in an oil environment will be managed by the Periodic Surveillance and Preventive Maintenance Program.

3.4.2.4.5.2 Use of the Periodic Surveillance and Preventive Maintenance Program to Manage Aging Effects for Components in an Open-Cycle Cooling Water Environment: Loss of material due to general corrosion (carbon steel only), pitting and crevice corrosion, MIC, and biofouling, and buildup of deposit due to biofouling, could occur in stainless steel and carbon steel heat exchangers and coolers/condensers serviced by open-cycle cooling water system. In Table 3.5-1, Item 9 for loss of material heat exchangers and coolers/condensers serviced by open-cycle cooling water, the LRA states in the discussion column, "the periodic surveillance and preventive maintenance program will be credited with managing the applicable aging effects in lieu of the open-cycle cooling (service) water system program." The applicant's Periodic Surveillance and Preventive Maintenance Program does not specifically identify inspection of these heat exchangers and coolers/condensers serviced by open-cycle cooling water system. The staff issued RAI 3.5-6 requesting the applicant to identify how the Periodic Surveillance and Preventive Maintenance Program will be used to manage loss of material due to general corrosion (carbon steel only), pitting and crevice corrosion, MIC, and biofouling, and buildup of deposit due to biofouling in

stainless steel and carbon steel heat exchangers and coolers/condensers serviced by open-cycle cooling water system. The staff also requested the applicant discuss if the aging management program relies on the recommendations of NRC GL 89-13 to ensure that the effects of aging on the open-cycle cooling water system will be managed for the extended period of operation.

In its response by letter dated May 23, 2003, the applicant stated:

> The periodic surveillance and preventive maintenance program implements the inspections of heat exchangers at Ginna Station that are serviced by open cycle (service) water. The scope of the program now explicitly includes heat exchangers and the program attributes include appropriate references to eddy current inspections of tubing and visual inspections of channel heads. The open-cycle cooling water system program references the periodic surveillance and preventive maintenance program as the implementing program for these inspections. The open-cycle cooling water system program directs many other activities as well as periodic inspections, and is consistent with the recommendations of Generic Letter 89-13. Therefore, the effects of aging on the open-cycle cooling water system will be managed for the period of extended operation.

3.4.2.4.5.2.1 Staff Evaluation of RAI 3.5-6:

The staff finds the applicant’s response to RAI 3.5-6 provides an acceptable explanation of how the periodic surveillance and preventive maintenance program implements the open-cycle cooling water program to manage aging effects for components in an open-cycle cooling water environment.

3.4.2.4.5.3 Valve Bonnets: LRA Tables 2.3.4-1, 2.3.4-2, 2.3.4-3, 2.3.4-4, 3.5-1, and 3.5-2, list “valve body” in the component column. NRC position is that the aging effects identified in these tables, except for wall thinning due to flow-accelerated corrosion, are applicable to both the valve body and bonnet. The staff issued RAI 3.5-7 requesting the applicant to explain why the valve bonnets are not included with the valve bodies or provide aging management for the bonnets.

In its response by letter dated May 13, 2003, the applicant stated:

> Bonnets are a part of the body and are included in the LRA in Tables 3.5-1 and Table 3.5-2, under "valve body".

3.4.2.4.5.3.1 Staff Evaluation of RAI 3.5-7:

The staff finds the applicant’s response to RAI 3.5-7 provides an acceptable explanation that valve bonnets are part of the valve body.

3.4.2.4.5.4 Galvanic Corrosion: Tables 3.5-1 and 3.5-2 of the LRA do not identify galvanic corrosion as an aging effect that requires management for the steam and power conversion systems. Galvanic corrosion could occur at bimetallic joints in a raw water environment where the water chemistry is not controlled. This condition normally exists for the raw water side of heat exchangers. The staff issued RAI 3.5-8 requesting the applicant to explain if conditions exists where steam and power conversion systems piping or components at Ginna Station should be managed for galvanic corrosion. If conditions do exist, explain how these components are managed for galvanic corrosion.

In its response by letter dated May 23, 2003, the applicant stated:

> Loss of material due to galvanic corrosion was evaluated during the aging management review process as an applicable aging effect/mechanism. It is recognized that Tables 3.5-1 and 3.5-2 do not identify galvanic corrosion as an aging mechanism. Therefore, an engineering guidance document will be written directing inspections to evaluate galvanic corrosion at susceptible locations in raw water environments. These inspections will be performed under the one-time inspection program. The guidance document shall include acceptance criteria, guidance for evaluation of results, a requirement for follow-up inspections based on the initial inspection results if necessary, a requirement for initiation of an action report for any indication of degradation exceeding acceptance criteria and requiring engineering evaluation or resolution, and the time frame during which the components shall be inspected (note: all inspections will be completed before the period of extended operation).

Based on the applicant's response to RAI 3.5-8, staff submitted the following question:

As described in the GALL Report, the one-time inspection program is used to verify the effectiveness of an aging management program (AMP) and confirm the absence of an aging effect expected to occur very slowly or not at all. For example, the water chemistry program manages aging effects for piping internals and the one-time inspection program verifies effectiveness of the water chemistry AMP by confirming that unacceptable degradation is not occurring and the intended function will be maintained during the period of extended operation. In a raw water environment, galvanic corrosion is likely to occur; therefore, periodic inspections are more appropriate for managing these aging effects. Explain the basis for performing one-time inspections to manage galvanic corrosion in raw water or provide periodic inspections to manage this aging effect.

In its response by letter dated July 11, 2003, the applicant stated:

> The severity of galvanic corrosion is directly related to the following factors: 1) the galvanic potential difference between the alloys in electrical contact; 2) the conductivity/corrosivity of the environment; and 3) the cathode-to-anode (noble/active member) surface area ratio. Raw water at Ginna Station is fresh Lake Ontario water and is not aggressive. Typical chloride levels are 20-25 ppm; sulfate levels are 25-30 ppm and the pH is near neutral. Based on these facts, as well as plant-specific operating experience, the raw water environment at Ginna Station would not be expected to support significant galvanic corrosion. As a result, inspections will be performed under the one-time inspection program to evaluate galvanic corrosion in "susceptible" components prior to the end of the current license period. If the results of these inspections indicate that degradation due to galvanic corrosion has occurred in any component, then a repetitive inspection task will be created under the periodic surveillance and preventive maintenance program and the component will be periodically inspected.

3.4.2.4.5.4.1 Staff Evaluation of RAI 3.5-8:

The staff finds the applicant's response to RAI 3.5-8 provides an acceptable explanation of how galvanic corrosion is managed in a raw water environment.

<u>3.4.2.4.5.5 Fasteners for Turbine-Generator and Supporting Systems</u>: Table 2.3.4-4 of the LRA for the turbine-generator and supporting systems does not list fasteners in the component group column. The staff issued RAI 3.5-9 requesting the applicant to identify if there any fasteners in these systems that require aging management review? Also, if it is determined that valve and bonnets are in scope of LR, would the body to bonnet fasteners require an aging management review?

In its response by letter dated May 23, 2003, the applicant stated:

> Fasteners should have been included in LRA Table 2.3.4-4. These fasteners, however, were evaluated in Table 3.5-1 line number (8), and Table 3.5-2 line numbers (7) and (8) for aging management.

3.4.2.4.5.5.1 Staff Evaluation of RAI 3.5-9:

The staff finds the applicant's response to RAI 3.5-9 provides an acceptable explanation that fasteners in the turbine-generator and supporting systems are managed for aging in LRA Tables 3.5-1 and 3.5-2.

<u>3.4.2.4.5.6 Use of the Water Chemistry and One-Time Inspection Programs to Manage Aging Effects for Flow Elements</u>: LRA Table 3.5-2, Items 38 and 41 and Items 72, 73, 74, & 75 identify aging management of valve bodies and pipe for cracking due to SCC and loss of material using the water chemistry program. For these items, the One-Time Inspection Program is identified to verify the effectiveness of the Water Chemistry Program. LRA Table 3.5-2, Items 15 and 16 identify aging management of flow elements for cracking due to SCC and loss of material using the water chemistry program but do not identify the one-time inspection program to verify the effectiveness of the Water Chemistry Program. The staff issued RAI 3.5-10 requesting the applicant to explain why the One-Time Inspection Program is not used to verify the effectiveness of the Water Chemistry Program for the flow elements that have identical material and environment as the valve bodies and pipe.

In its response by letter dated May 23, 2003, the applicant stated:

> The water chemistry control program, as described in LRA section B2.1.37 relies on monitoring and control of water chemistry based on the EPRI guidelines in TR-105714 for primary systems chemistry and TR-102134 for secondary systems chemistry. 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.
>
> Therefore, the one-time inspection program is not listed in Table 3.5-2, items 15 and 16, for the stainless steel flow elements in a treated water secondary >120°F environment, since this is not stagnant or low flow. Table 3.5-2, conservatively shows the one-time inspection program for valve bodies and piping in the identical environment, however this is not a requirement based on the discussion of the water chemistry program defined in LRA Section B2.1.37.

3.4.2.4.5.6.1 Staff Evaluation of RAI 3.5-10:

The staff finds the applicant's response to RAI 3.5-10 provides an acceptable explanation of why the One-Time Inspection Program is not used to verification of the effectiveness of the Water Chemistry Control Program for certain flow elements.

<u>3.4.2.4.5.7 Use of the One-Time Inspection and Periodic Surveillance and Preventive Maintenance Programs to Manage Aging Effects for Components in an Open-Cycle Cooling Water Environment</u>: LRA Table 3.5.2, Items 20 and 21, identify the One-Time Inspection Program as managing loss of heat transfer and loss of material for heat exchangers in a raw water environment. The GALL Report aging management program for managing these aging effects is the Open-Cycle Cooling Water System Program. The staff issued RAI 3.5-11 requesting the applicant to explain how the One-Time Inspection Program will manage these aging effects and if the aging management program relies on the recommendations of NRC GL 89-13 to ensure that the effects of aging on the

open-cycle cooling water system will be managed for the extended period of operation. Also, use of the One-Time Inspection Program does not appear to be consistent with Table 3.5-1, Item 9, where the applicant identifies its Periodic Surveillance and Preventive Maintenance Program to managed similar aging effects for heat exchangers in an open-cycle cooling water environment.

In its response by letter dated May 23, 2003, the applicant stated:

> Items 20 and 21 in LRA Table 3.5-2 refer to the cast iron outboard bearing oil coolers for the two motor-driven and one turbine-driven auxiliary feedwater pumps. These coolers are of similar design to those on the safety injection pumps. These coolers consist of a cast iron chamber through which service water flows to provide cooling. Service water at Ginna Station is fresh Lake Ontario water and is not aggressive.
>
> A performance test is performed periodically on the safety injection pump outboard bearing coolers to verify service water flow. No evidence of reduction in flow has ever been detected. As a result of the excellent resistance of gray cast iron to service water at Ginna Station, aging effects would either not be expected to occur or would be expected to occur so slowly as to be essentially negligible. Therefore a one-time inspection of the outboard bearing coolers is appropriate to verify that the coolers will continue to perform their intended functions during the period of extended operation.
>
> LRA Table 3.5-1, item 9 refers to the lube oil coolers for the motor-driven and turbine driven auxiliary feedwater pumps. These coolers are stainless steel shell-and-tube heat exchangers that are cleaned and inspected periodically under the periodic surveillance and preventive maintenance program. Service water flows through the tube side of these units and lubricating oil through the shell side. Plant-specific operating experience has shown that these lube oil coolers are susceptible to tube-side fouling. Therefore these coolers are periodically cleaned and inspected as directed by the periodic surveillance and preventive maintenance program in support of the open-cycle cooling water system program which incorporates the recommendations of GL 89-13.

3.4.2.4.5.7.1 Staff Evaluation of RAI 3.5-11:

The staff finds the applicant's response to RAI 3.5-11 provides an acceptable explanation of how the one-time inspection and periodic surveillance and preventive maintenance programs manage aging effects for components in an open-cycle cooling water environment.

<u>3.4.2.4.5.8 Use of the Periodic Surveillance and Preventive Maintenance Program to Manage Aging Effects for Atmospheric Relief Valve Tailpieces</u>. A one-time inspection can be used to address concerns for the potential long incubation period for certain aging effects on structures and components. There are cases where either an aging effect is not expected to occur but there is insufficient data to completely rule it out, or an aging effect is expected to progress very slowly. For these cases, there is to be confirmation (by one-time inspection) that either the aging effect is indeed not occurring, or the aging effect is occurring very slowly as not to affect the component or structure intended function. Based on these guidelines, the staff issued RAI 3.5-12 requesting the applicant to provide operating experience to confirm that the aging effect is not expected to occur or is expected to progress very slowly for the pipe identified in LRA Table 3.5-2, Item 29.

In its response by letter dated May 23, 2003, the applicant stated:

> LRA Table 3.5-2, item 29 refers to the carbon steel tailpieces for the atmospheric relief valves. An inspection of these tailpieces will be performed to determine whether significant degradation has occurred. These components will subsequently be included in the periodic surveillance and preventive maintenance program. Table 3.5-2, item 29 should also have included the periodic

surveillance and preventive maintenance program as an applicable aging management program.

3.4.2.4.5.8.1 Staff Evaluation of RAI 3.5-12:

The staff finds the applicant's response to RAI 3.5-12 provides an acceptable explanation of how the Periodic Surveillance And Preventive Maintenance Program is used to manage aging effects for atmospheric relief valve tailpieces.

3.4.3 Evaluation Findings

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the steam and power conversion systems, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation. The staff also reviewed the applicable UFSAR supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging effects, as required by 10 CFR 54.21(d).

3.5 Containment, Structures, and Component Supports

This section addresses the applicant's AMR of structural components within the containment, other Class I structures, and component supports. The components that make up this group are described in the following SER sections:

- Containment (2.4.1)
- Auxiliary Building (2.4.2.1)
- Intermediate Building (2.4.2.2)
- Turbine Building (2.4.2.3)
- Diesel Building (2.4.2.4)
- Control Building (2.4.2.5)
- All Volatile Water Building (2.4.2.6)
- Screen House Building (2.4.2.7)
- Standby Auxiliary Feedwater Building (2.4.2.8)
- Service Building (2.4.2.9)
- Cable Tunnel (2.4.2.10)
- Essential Yard Structures (2.4.2.11)
- Component Supports (2.4.2.12)

As discussed in Section 3.0.1 of this SER, the structural components are included in one of two LRA tables. LRA Table 3.6-1 consists of the structural components that are evaluated in the GALL Report and LRA Table 3.6-2 consists of the structural components that are not evaluated in the GALL Report.

3.5.1 Summary of Technical Information in the Application

In LRA Section 3.6, the applicant described its AMRs for the structural components within the containment, other Class I structures, and component supports at Ginna. The passive, long-lived components in these structures that are subject to an AMR are identified in LRA Tables 2.4.1 and

2.4.2.

The applicant's AMRs included an 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 aging effects that require management. These reviews concluded that the aging effects requiring management, based on the Ginna operating experience, were consistent with the aging effects identified in GALL. The applicant's review of industry operating experience included a review of operating experience through 2002. The results of this review concluded that aging effects requiring management, based on industry operating experience, were consistent with the aging effects identified in GALL. The applicant's ongoing review of plant-specific and industry-wide operating experience is conducted in accordance with the Ginna Operating Experience Program.

3.5.2 Staff Evaluation

In Section 3.6 of the LRA, the applicant described its AMR for the structural components within the containment, other Class I structures, and component supports at Ginna. The staff reviewed LRA Section 3.6 to determine whether the applicant had provided sufficient information to demonstrate that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB throughout the period of extended operation, in accordance with the requirements of 10 CFR 54.21(a)(3), for structures and structural components that are determined to be within the scope of license renewal and subject to an AMR.

The applicant referenced the GALL Report in its AMR. The staff has previously evaluated the adequacy of the aging management of structural components for license renewal as documented in the GALL Report. Thus, the staff did not repeat its review of the items described in the GALL Report, except to ensure that the material presented in the LRA was applicable, and to verify that the applicant had identified the appropriate programs as described and evaluated in the GALL Report.

The staff evaluated those aging management issues recommended for further evaluation in the GALL Report, as well as the applicant's AMR for structural components not addressed in GALL. In addition, the staff evaluated the AMPs used by the applicant to manage the aging of structural components. Finally, the staff reviewed the structural components listed in LRA Section 2.4 to determine whether the applicant properly identified the applicable aging effects and the AMPs needed to adequately manage them.

Table 3.5-1 below provides a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.5 that are addressed in the GALL Report.

Table 3.5-1

Staff Evaluation for Ginna Structures and Structural Components in the GALL Report

Common Components of All Types of PWR and BWR Containment

Component Group	Aging Effect/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Penetration sleeves, penetration bellows, and dissimilar metal welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	TLAA (4.7.4)	Consistent with GALL. GALL recommends further evaluation (see Section 3.5.2.2.1.6 below).
Penetration sleeves, penetration, bellows, and dissimilar metal welds	Cracking due to cyclic loading or crack initiation and growth due to SCC	Containment ISI and containment leak rate test	ASME Section XI, Subsections IWE & IWL Inservice Inspection (B2.1.3)	Consistent with GALL. GALL recommends further evaluation (see Section 3.5.2.2.1.7 below).
Penetration sleeves, penetration bellows, and dissimilar metal welds	Loss of material due to corrosion	Containment ISI and containment leak rate est	ASME Section XI, Subsections IWE & IWL Inservice Inspection (B2.1.3)	Consistent with GALL. (See Section 3.5.2.1 below).
Personnel airlock and equipment hatch	Loss of material due to corrosion	Containment ISI and containment leak rate test	ASME Section XI, Subsections IWE & IWL Inservice Inspection (B2.1.3) and Periodic Preventive surveillance Maintenance Program (B2.1.23)	Consistent with GALL. (see Section 3.5.2.1 below).
Personnel airlock and equipment hatch	Loss of leak tightness in closed position due to mechanical wear of locks, hinges, and closure mechanisms	Containment leak rate test and Plant technical specifications	ASME Section XI, Subsections IWE & IWL Inservice Inspection (B2.1.3) and Periodic Surveillance and Preventive Maintenance Program (B2.1.23)	Consistent with GALL. (see Section 3.5.2.1 below).
Seals, gaskets, and moisture barriers	Loss of sealant and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers	Containment ISI and containment leak rate test	ASME Section XI, Subsections IWE & IWL Inservice Inspection (B2.1.3) and Periodic Surveillance and Preventive Maintenance Program (B2.1.23)	Consistent with GALL. (see Section 3.5.2.1 below).

PWR Concrete (Reinforced and Prestressed) and Steel Containment
BWR Concrete (Mark II and III) and Steel (Mark I, II, and III) Containment

Component Group	Aging Effect/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Concrete elements: foundation, walls, dome	Aging of accessible and inaccessible concrete areas due to leaching of calcium hydroxide, aggressive chemical attack, and corrosion of embedded steel	Containment ISI	ASME Section XI, Subsections IWE & IWL Inservice Inspection (B2.1.3)	Consistent with GALL. GALL recommends further evaluation (see Section 3.5.2.2.1.1 below).
Concrete elements: foundation	Cracks, distortion, and increases in component stress level due to settlement	Structures Monitoring	Structures Monitoring Program (B2.1.32)	Consistent with GALL. GALL recommends further evaluation (see Section 3.5.2.2.1.2 below).
Concrete elements: foundation	Reduction in foundation strength due to erosion of porous concrete subfoundation	Structures Monitoring	Structures Monitoring Program (B2.1.32)	Consistent with GALL. GALL recommends further evaluation (see Section 3.5.2.2.1.2 below).
Concrete elements: foundation, dome, and wall	Reduction of strength and modulus due to elevated temperature	Plant-specific	ASME Section XI, Subsections IWE & IWL Inservice Inspection (B2.1.3)	Consistent with GALL. GALL recommends further evaluation (see Section 3.5.2.2.1.3 below).
Prestressed containment: tendons and anchorage components	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA evaluated in accordance with 10 CFR 54.21(c)	TLAA (4.5)	Consistent with GALL. GALL recommends further evaluation (see Section 3.5.2.2.1.5 below).
Steel elements: liner plate, and containment shell	Loss of material due to corrosion in accessible and inaccessible areas	Containment ISI and containment leak rate test	ASME Section XI, Subsections IWE & IWL Inservice Inspection (B2.1.3) and Boric Acid Corrosion (B2.1.6)	Consistent with GALL. GALL recommends further evaluation (see Section 3.5.2.2.1.4 below).
Steel elements: vent header, drywell head, torus, downcomers, pool shell	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	None	Not applicable to Ginna - (BWR)
Steel elements: protected by coating	Loss of material due to corrosion in accessible areas only	Protective coating monitoring and maintenance	None	Protective coatings are not credited with managing the effects of aging at Ginna.

Component Group	Aging Effect/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Prestressed containment: tendons and anchorage components	Loss of material due to corrosion of prestressing tendons and anchorage components	Containment ISI	ASME Section XI, Subsections IWE & IWL Inservice Inspection (B2.1.3), Structures Monitoring Program (B2.1.32), and Periodic Surveillance and Preventive Maintenance Program (B2.1.23)	Consistent with GALL. (see Section 3.5.2.1 below).
Concrete elements: foundation, dome, and wall	Scaling, cracking, and spalling due to freeze-thaw; expansion and cracking due to reaction with aggregate	Containment ISI	ASME Section XI, Subsections IWE & IWL Inservice Inspection (B2.1.3)	Consistent with GALL. (see Section 3.5.2.1 below).
Steel elements: vent line bellows, vent headers, downcomers	Cracking due to cyclic loads or Crack initiation and growth due to SCC	Containment ISI and Containment leak rate test	None	Not applicable to Ginna - (BWR)
Steel elements: Suppression chamber liner	Crack initiation and growth due to SCC	Containment ISI and Containment leak rate test	None	Not applicable to Ginna - (BWR)
Steel elements: drywell head and downcomer pipes	Fretting and lock up due to wear	Containment ISI	None	Not applicable to Ginna - (BWR)

Class I Structures

Component Group	Aging Effect/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
All groups except Group 6: accessible interior/exterior concrete and steel components	All types of aging effects	Structures Monitoring	Structures Monitoring Program (B2.1.32)	Consistent with GALL. GALL recommends further evaluation (see Section 3.5.2.2.2.1 below).
Groups 1-3, 5, 7-9: inaccessible concrete components, such as exterior walls below grade and foundation	Aging of inaccessible concrete areas due to aggressive chemical attack and corrosion of embedded steel	Plant-specific	Structures Monitoring Program (B2.1.32)	Consistent with GALL. GALL recommends further evaluation (see Section 3.5.2.2.2.2 below).
Group 6: all accessible/inaccessible concrete, steel, and earthen components	All types of aging effects, including loss of material due to abrasion, cavitation, and corrosion	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance	Structures Monitoring Program (B2.1.32) and Periodic Surveillance and Preventive Maintenance Program (B2.1.23)	Inconsistent with GALL (see Sections 3.5.2.3 and 3.5.2.4 below).
Group 5: liners	Crack initiation and growth from SCC and loss of material due to crevice corrosion	Water Chemistry Program and monitoring of spent fuel pool water level	Water Chemistry Control Program (B2.1.37)	Consistent with GALL (see Section 3.5.2.1 below).

Component Group	Aging Effect/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Group 1-3, 5, 6: all masonry block walls	Crack due to restraint, shrinkage, creep, and aggressive environment	Masonry Wall	Structures Monitoring Program (B2.1.32)	Consistent with GALL. (see Section 3.5.2.1 below).
Group 1-3, 5, 7-9: foundation	Cracks, distortion, and increases in component stress level due to settlement	Structures Monitoring	Structures Monitoring Program (B2.1.32)	Consistent with GALL. GALL recommends further evaluation (see Section 3.5.2.2.2.1 below).
Group 1-3, 5-9: foundation	Reduction in foundation strength due to erosion of porous concrete subfoundation	Structures Monitoring	Structures Monitoring Program (B2.1.32)	Consistent with GALL. GALL recommends further evaluation (see Section 3.5.2.2.2.1 below).
Group 1-5: concrete	Reduction of strength and modulus due to elevated temperature	Plant-specific	Structures Monitoring Program (B2.1.32)	Consistent with GALL. GALL recommends further evaluation (see Section 3.5.2.2.2.1 below).
Groups 7, 8: liners	Crack initiation and growth due to SCC; loss of material due to crevice corrosion	Plant-specific	Concrete Tanks (G7) Steel Tanks (G8)	All tanks within the scope of license renewal receive their AMR with the system they serve. Thus, this line item is not applicable to Class 1 structures at Ginna.

Component Supports

Component Group	Aging Effect/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
All groups: support members: anchor bolts, concrete surrounding anchor bolts, welds, grout pad, bolted connections, etc.	Aging of component support	Structures Monitoring	Structures Monitoring Program (B2.1.32) and Periodic Surveillance and Preventive Maintenance Program (B2.1.23)	Consistent with GALL. GALL recommends further evaluation. (See section 3.5.2.2.3.1 below).
Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	None	A fatigue analysis for structures and components supports is not incorporated into Ginna's CLB. (see Section 3.5.2.2.3.2 below).
All Groups: support members: anchor bolts, welds	Loss of material due to boric acid corrosion	Boric acid corrosion	Boric Acid Corrosion (B2.1.6)	Consistent with GALL (see Section 3.5.2.1 below).
Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds, spring hangers, guides, stops, and vibration isolators	Loss of material due to environmental corrosion; loss of mechanical function due to corrosion, distortion, dirt, overload, etc.	ISI	ASME Section XI, Subsections IWF Inservice Inspection (B2.1.4)	Consistent with GALL (see Section 3.5.2.1 below).

Component Group	Aging Effect/Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Group B1.1: high strength, low alloy bolts	Crack initiation and growth due to SCC	Bolting integrity	Bolting Integrity (B2.1.5)	Consistent with GALL (see Section 3.5.2.1 below).

The staff's review of the structural components for the Ginna LRA is contained in four sections of this SER. Section 3.5.2.1 is the staff review of structures and structural components that the applicant indicated are consistent with GALL and do not require further evaluation. Section 3.5.2.2 is the staff review of structures and structural components that the applicant indicated are consistent with GALL and those for which GALL recommends further evaluation. Section 3.5.2.3 is the staff evaluation of the AMPs that are specific to the aging management of structural components. Section 3.5.2.4 contains an evaluation of the adequacy of aging management for components in each structure and includes an evaluation of structures and structural components that the applicant indicates are not in GALL.

3.5.2.1 Aging Management Evaluations in the GALL Report That Are Relied on for License Renewal, Which Do Not Require Further Evaluation

For component groups evaluated in GALL for which the applicant has claimed consistency with GALL, and for which GALL does not recommend further evaluation, the staff sampled components in these groups to determine whether the plant-specific components contained in these GALL component groups are bounded by the GALL evaluation. The staff also sampled component groups to determine whether the applicant had properly identified those component groups in GALL that are not applicable to its plant. The staff identified several areas where additional information or clarification was needed. The staff's evaluation of the applicants responses to those RAIs is included in Section 3.5.2.4 of this SER.

On the basis of its review, the staff has verified the applicant's claim of consistency with the GALL report. The staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 50.21(a)(3).

3.5.2.2 Aging Management Evaluations in the GALL Report That Are Relied on for License Renewal, For Which GALL Recommends Further Evaluation

For component groups evaluated in GALL for which the applicant has claimed consistency with GALL, and for which GALL recommends further evaluation, the staff reviewed the applicant's evaluation to determine whether it adequately addressed the issues for which GALL recommends further evaluation. In addition, the staff sampled components in these groups to determine whether the plant-specific components contained in these GALL component groups were bounded by the GALL evaluation.

The GALL Report indicates that further evaluation should be performed for the following:

3.5.2.2.1 Containments

<u>3.5.2.2.1.1 Aging of Inaccessible Concrete Areas</u>. The GALL Report recommends further evaluation to manage the aging effects for containment concrete components located in

inaccessible areas, if the aging mechanisms of (1) leaching of calcium hydroxide, (2) aggressive chemical attack, or (3) corrosion of embedded steel are significant. Possible aging effects for containment concrete structural components due to these three aging mechanisms are cracking, change in material properties, and loss of material.

The AMP recommended by the GALL Report for managing the above aging effects for containment concrete components in accessible portions of the containment structures is the ASME Section XI, Subsection IWL program (XI.S2). The staff's evaluation of the applicant's ASME Section XI, Subsection IWL Inservice Inspection Program is found in Section 3.5.2.3.1 of this SER.

Subsection IWL exempts from examination those portions of the concrete containment that are inaccessible (e.g., foundation, below grade exterior walls, concrete covered by liner). For inaccessible portions of the containment structure, 10 CFR 50.55a(b)(2)(ix) requires that the licensee evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.

The applicant addressed the specific criteria defined in the GALL Report regarding the need for further evaluation to manage the potential aging of containment concrete structural components in inaccessible areas in LRA Table 3.6-1. The GALL Report recommends further evaluation for containment concrete in inaccessible areas if the aging mechanisms of (1) leaching of calcium hydroxide, (2) aggressive chemical attack, or (3) corrosion of embedded steel are significant. Regarding these three aging mechanisms, the applicant stated the following in row entry 3.6.1.7 of LRA Table 3.6-1:

> Containment accessible and inaccessible concrete has been evaluated for the following aging mechanisms:
>
> Aging Mechanism: Aggressive Chemical Attack
> Aging Effect: Loss of Material, Changes in Material Properties
> Evaluation: Concrete degradation in air due to aggressive rainwater is insignificant and the below-grade/lake water environment is non-aggressive. Additionally, recent structural inspections revealed no evidence of degradation owing to aggressive chemical attack; therefore, loss of material and change in material properties due to aggressive chemical attack are not probable aging effects at Ginna Station and have not been observed to date. The Structures Monitoring Program requires periodic monitoring of ground/lake water to verify chemistry remains non-aggressive.
>
> Aging Mechanism: Corrosion of Embedded Steel
> Aging Effect: Loss of Material, Cracking, Loss of Bond
> Evaluation: 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 Ginna Station and have not been observed to date.
>
> Aging Mechanism: Leaching of Calcium Hydroxide
> Aging Effect: Change in Material Properties
> Evaluation: The original construction specifications met the intent of ACI 201.2R. Change in material properties due to leaching of calcium hydroxide is not a probable aging effect at Ginna Station and has not been observed to date.

Since the below-grade reinforced concrete at Ginna is not exposed to an aggressive soil/groundwater environment, the staff agrees with the applicant's conclusion that the aging mechanisms of aggressive chemical attack and corrosion of embedded steel are not likely to be

significant. In addition, because the below-grade reinforced concrete at Ginna is not exposed to flowing water, the staff concludes that leaching of calcium hydroxide from reinforced concrete is probably not significant. Because these three aging mechanisms are not significant for below-grade reinforced concrete at Ginna, the further evaluation recommended by the GALL Report is not warranted. Further discussion regarding the aging management of inaccessible containment concrete components can be found in Section 3.5.2.4.1 of this SER.

<u>3.5.2.2.1.2 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</u>. For the containment foundation, the GALL Report recommends further evaluation of the aging effects of (1) cracking due to settlement and (2) change in material properties as manifested by a reduction of foundation strength due to erosion of the porous concrete subfoundation, if these two effects are not covered by a structures monitoring AMP. In addition, the GALL Report recommends verification of the continued functionality of a dewatering system during the license renewal period, if relied on by the applicant to lower the site ground water level.

The applicant addressed the above criteria defined in the GALL Report regarding the need for further evaluation to manage the potential aging of the containment foundation in LRA Table 3.6-1. In row entries 3.6.1.08, 3.6.1.09, 3.6.1.21, and 3.6.1.22 of LRA Table 3.6-1, the applicant stated that it will use its Structures Monitoring Program to manage the aging effects of (1) cracking due to settlement and (2) change in material properties as manifested by a reduction in strength for the containment foundation. The staff's evaluation of the applicant's Structures Monitoring Program is found in Section 3.0.3.10 of this SER.

Regarding the aging effect of cracking due to settlement, the applicant stated the following in LRA Table 3.6-1:

> Consistent with NUREG-1801. Cracks, distortion, and increase in component stresses due to settlement of concrete foundations are considered in the Structures Monitoring Program. All structures at Ginna Station are either founded on bedrock, steel foundation piles that are driven to bedrock, or have foundations that consist of caissons extending to bedrock. Structural inspections indicate no visible evidence of settlement since construction of the station. During the Systematic Evaluation Program, the NRC concluded that settlement of foundations and buried equipment is not a safety concern for Ginna Station. Cracking, distortion, and an increase in component stress levels due to settlement are not probable aging effects at Ginna Station and have not been observed to date. That notwithstanding, the Structures Monitoring Program monitors for cracks and distortion and contains inspection criteria to verify these aging effects are not developing.

Regarding the aging effect of change in material properties as manifested by a reduction in strength, the applicant stated the following in LRA Table 3.6-1:

> Consistent with NUREG-1801. Reduction in foundation strength due to erosion of porous concrete subfoundations is not an aging effect requiring management at Ginna. Ginna Station's structure foundations are constructed of normal concrete and not the subject porous type, nor are foundations subject to flowing water. That notwithstanding, the Structures Monitoring Program monitors for settlement and cracking. The identification of indications of settlement by the Structures Monitoring Program, as well as the resistance provided by the materials of construction, provide adequate assurance that reductions in foundation strength for any reason will be identified and managed through out the extended period of operation.

Because the applicant is managing the aging effects of cracking and change in material properties for the containment foundation as recommended by the GALL Report, the staff finds that the applicant has adequately addressed this further evaluation criteria.

3.5.2.2.1.3 Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature. For the containment structure, the GALL Report recommends further evaluation to manage the aging effect of change in material properties as manifested by a reduction in strength and modulus if any portion of the containment concrete exceeds the temperature limit of 150 °F. The GALL Report notes that the implementation of Subsection IWL examinations and 10 CFR 50.55a would not be able to detect the reduction of concrete strength and modulus due to elevated temperature and also notes that no mandated aging management exists for managing this aging effect.

The GALL Report recommends that a plant-specific evaluation be performed if any portion of the concrete containment components exceeds specified temperature limits, viz., general temperature 66 °C (150 °F) and local area temperature 93 °C (200 °F). The staff verified that the applicant's discussion in the renewal application indicates that the affected PWR containment components are not exposed to temperatures that exceed the above temperature limits.

The applicant addressed the above criterion defined in the GALL Report, regarding the need for further evaluation in LRA Table 3.6-1. In row entries 3.6.1.10 and 3.6.1.23 of LRA Table 3.6-1, the applicant stated the following regarding temperatures within the containment structure:

> Consistent with NUREG-1801. For plant areas of concern, temperatures are normally maintained below the specified limits; therefore, loss of material, cracking, and change in material properties due to elevated temperature at Ginna Station have not been observed to date. (Note: The SSCs relied upon to maintain the concrete surrounding containment penetrations and the reactor vessel support pad within specified temperature limits are within the scope of the License Renewal Rule, i.e. penetration cooling and component cooling water.) That notwithstanding, the ASME Section XI, Subsections IWE & IWL Inservice Inspection Program monitors for loss of material, cracks, and changes in material properties and contains inspection criteria to verify these aging effects are not developing.

In RAI 3.6-5, the staff requested further information regarding the aging mechanism of elevated temperature for containment concrete components. Specifically, the staff requested that the applicant provide (1) sustained temperatures in the annulus between the primary shield wall and the reactor and in the concrete components around the steam generators, (2) the observed condition of the concrete components during the last inspection, and (3) the schedule for inspection of these components. In response to RAI 3.6-5, the applicant stated the following:

> The normal operating temperature of the air flowing through the annulus is approximately 80 degrees F. This air flows around the vessel, instrument ports, and vessel nozzles where air temperatures reach a normal maximum of approximately 130 degrees F. The air temperatures associated with the annulus, reactor vessel nozzles and the head shroud fan suctions and the water temperatures for the reactor vessel support pad cooling system are continuously recorded and displayed in the control room.
>
> No permanent telemetry is installed that monitors the temperatures associated with the concrete around the steam generators; however, temporary RTDs were placed in the containment over a number of operating cycles to verify temperatures used in equipment environmental qualification calculations. Some of these RTDs were in the inside the shield walls and near the steam generator level indications. These RTDs indicate local area temperatures are normally below 100 degrees F.
>
> No loss of material has been observed in the primary shield wall, the annulus region or in the vicinity of the steam generators. Some of these areas are routinely inspected where they interface with ASME

> component supports. The next general inspection is scheduled for the fall 2003 outage as part of the Structural Monitoring Program.

Based on the discussion in the LRA and in response to RAI 3.6-5, the staff noted that the high temperature areas of the containment concrete will be monitored by Subsection IWL of Section XI of the ASME Code, and the concrete components subjected to sustained high temperatures inside the containment will be monitored by the applicant's structural monitoring program. The staff finds the use of these two programs for managing the aging of concrete components of the containment and those inside the containment. The Subsection IWL Program and the Structural Monitoring Program are evaluated in Sections 3.5.2.3.1 and 3.0.3.10, respectively, of this SER. As such, F-RAI 3.6-5 is considered closed.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of the reduction of strength and modulus of concrete structures due to elevated temperatures for containment concrete, as recommended in the GALL Report. Because temperatures within the containment structure have not exceeded the 150 °F limit, the staff concludes that further evaluation, as recommended by the GALL Report, is not required.

<u>3.5.2.2.1.4 Loss of Material due to Corrosion in Inaccessible Areas of Steel Containment Shell or Liner Plate</u>. The GALL Report recommends further evaluation to manage the aging effect of loss of material due to corrosion for the embedded containment liner, if corrosion of the embedded liner is significant. The aging management program recommended by the GALL Report for managing loss of material for <u>accessible</u> steel elements within the containment structure is the ASME Section XI, Subsection IWE Program (XI.S1). The staff's evaluation of the applicant's ASME Section XI, Subsection IWE Inservice Inspection Program is found in Section 3.5.2.3.1 of this SER.

Subsection IWE exempts from examination portions of the containment that are <u>inaccessible</u>, such as embedded or inaccessible portions of steel liners and steel containment shells, piping, and valves penetrating or attaching to the containment. To cover inaccessible areas, 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 applicant addressed the above criterion defined in the GALL Report regarding the need for further evaluation to manage the aging of the embedded containment liner in LRA Table 3.6-1. In row entry 3.6.1.12 of LRA Table 3.6-1, the applicant stated the following regarding the potential for significant corrosion of the embedded steel containment liner:

> Consistent with NUREG-1801. The ASME Section XI, Subsections IWE & IWL Inservice Inspection Program includes inspections and leak rate tests which would indicate the presence of significant degradation due to loss of material from all applicable corrosion mechanisms. Additionally, plant operating experience has shown that borated water spills in containment have the potential to impact the containment liner. Accordingly, the Boric Acid Corrosion Program is also credited with assessing and managing loss of material in the containment liner.

Because the above statement does not address the criterion regarding the need for further evaluation if corrosion of the embedded liner is significant, the staff requested the applicant in F-RAI 3.6-16 to specifically address the GALL criterion for further evaluation. In response to F RAI 3.6-16, the applicant stated the following:

> Review of plant-specific operating experience and recent maintenance and corrective action documents identified only one nonconforming condition at the moisture barrier (caulking) which protects the inaccessible portion of the Containment steel liner from corrosion. This condition was discovered during inservice inspections performed to meet the requirements of ASME Section XI, Subsection IWE in 2000. As discussed in the response to RAI B2.1.3-3, insulation was removed and the liner was exposed for visual inspection in two areas. Evidence of minor surface corrosion was present in the area with the nonconforming caulking detail. Ultrasonic thickness readings were taken in both areas, including locations above and along the interface between the liner and the Containment concrete floor. All measured values exceeded the minimum required thickness with considerable margin. The liner was cleaned, re-coated and the moisture barrier restored in accordance with original design specification requirements in both areas.
>
> As a result of this discovery, the configuration of the moisture barrier was inspected around the entire circumference of the Containment and verified to be intact with no visible gaps or discontinuities. Additional inspections of the liner were performed during the 2002 refueling outage. As discussed in the response to RAI B2.1.3-3, approximately 70 linear feet of the liner were exposed and ultrasonic thickness measurements taken at four different excavated areas below the floor level. These measurements verified that no loss of liner thickness had occurred at these locations. The exposed portion of the liner was again cleaned, re-coated, and the moisture barrier restored in accordance with original design specification requirements.
>
> Additional inspections of the moisture barrier and liner are planned during the second and third periods of the Fourth ISI interval, which commenced on January 1, 2000. The condition of the inaccessible portions of the Containment liner may be assessed by evaluation of the condition of the liner at the interface with the concrete floor. Therefore, inspections performed under the ASME Section XI, Subsections IWE/IWL ISI Program will provide reasonable assurance that aging effects for the inaccessible portions of the liner plate can be managed so that the liner plate will continue to perform its intended function consistent with the current licensing basis during the period of extended operation.

Since previous inspections of the inaccessible portions of the liner (behind the moisture barrier) revealed only minor degradation and since additional inspections of both the moisture barrier and liner will take place under the applicant's ASME Section XI, Subsections IWE and IWL Inservice Inspection Program, the staff finds that the applicant has provided a reasonable basis for concluding that the aging of the containment liner behind the insulation and the moisture barrier will be adequately managed consistent with its CLB during the extended period of operation. In addition, the IWE and IWL Inservice Inspection Program manages the aging of the accessible portions of the liner with the stipulation that the applicant 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. As such, the staff considers RAI 3.6-16 closed. The staff evaluation of RAI B.2.1.3-3, which further covers the aging management of the containment liner by the ASME Section XI, Subsections IWE and IWL Inservice Inspection Program is discussed in Section 3.5.2.3.1 of this SER.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of loss of material due to corrosion in inaccessible areas of the steel containment shell or liner plate for structures and structural components, as recommended in the GALL Report. Because the corrosion of the embedded steel containment liner is not significant, the further evaluation recommended by the GALL Report is not warranted.

<u>3.5.2.2.1.5 Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature</u>. The GALL Report identifies loss of prestress due to relaxation, shrinkage, creep, and elevated temperature for prestressed containment tendons and anchorage components as a TLAA to be performed for the period of license renewal. The applicant addressed this aging effect for this component grouping in row entry 3.6.1.11 of LRA Table 3.6-1. However, in its review of Section

2.4, “Scoping and Screening Results: Structures,” the staff found that row entry 3.6.1.11 was not applied to the containment component group for tendons in LRA Table 2.4.1-1. In RAI 3.6-11, the staff requested that the applicant explain this omission. In response to RAI 3.6-11, the applicant stated the omission was due to a “typographical error” and that row entry 3.6.1.11 of LRA Table 3.6-1 applies to the containment tendons. The staff finds the applicant’s response to be adequate. The applicant covered the TLAA for containment tendons in Section 4.5 of the application and the staff evaluation of this TLAA is addressed in Section 4.5 of this SER.

3.5.2.2.1.6 Cumulative Fatigue Damage. The GALL Report identifies cumulative fatigue damage as a TLAA for penetration sleeves, penetration bellows, and dissimilar metal welds to be performed for the period of license renewal. The applicant covered this TLAA in Section 4.7.4 of the application and the staff evaluation of this TLAA is addressed in Section 4.7.4 of this SER.

3.5.2.2.1.7 Cracking due to Cyclic Loading and SCC. The GALL Report recommends further evaluation of the AMPs to manage cracking of containment penetrations (including penetration sleeves, penetration bellows, and dissimilar metal welds) due to cyclic loading or SCC for all types of PWR containments. Containment ISI and leak rate testing may not be sufficient to detect cracks. The staff evaluated the applicant’s proposed programs to verify that adequate inspection methods will be implemented to ensure that cracking of containment penetrations is detected.

The applicant addressed the further evaluation recommendations in the GALL Report with regard to cracking of containment penetrations in LRA Table 3.6-1. In row entry 3.6.1.02 of LRA Table 3.6-1, the applicant stated the following with regard to the aging effect of cracking due to cyclic loading or SCC:

> The Containment Program implements and formally adopts the requirements of the ASME Section XI, Subsections IWE & IWL Inservice Inspection Program as part of the Ginna Station Inservice Inspection Program. Included in the scope of the IWE program are the exposed portions of the containment liner, the liner for the fuel transfer penetration, all other penetrations, associated bolting, moisture barriers, and all airlocks, seals, gaskets and penetration bellows previously included in the scope of Appendix J. The ASME Section XI, Subsections IWE & IWL Inservice Inspection Program includes inspections and leak rate tests which would indicate the presence of significant degradation from cracking due to cyclic loading or crack initiation and growth due to SCC. That notwithstanding, SCC is not an applicable aging mechanism for penetration sleeves, bellows and dissimilar metal welds. The carbon steel components within penetrations are not susceptible to SCC. The stainless steel components require both a high temperature (>140 °F) and exposure to an aggressive chemical environment (e.g. exposure to chlorides). The bellows at Ginna Station are not exposed to aggressive chemical environments. A review of plant specific operating experience did not identify any occurrences of bellows failures due to SCC. Furthermore a review of industry operating experience indicated that SCC of bellows was typically caused by poor design controls leading to the inadvertent introduction of contaminants.

In RAI 3.6-3, the staff requested additional information regarding (1) the type of bellows (e.g., one ply or two ply), (2) the accessibility of the bellows for ASME Section XI, Subsection IWE inspections, (3) the ability to detect leakage from the bellows by Type B (Appendix J) testing, and (4) occurrences of excessive leakage through the bellows. In response to RAI 3.6-3, the applicant stated:

> There are no penetration bellows at Ginna Station which perform a Containment isolation function. The bellows are single ply, ASTM A240, Type 304 stainless steel. The only function of the bellows is to accommodate lateral and axial pipe displacements.

Based on the applicant’s assertion regarding the absence of pressure boundary bellows, the staff

considers RAI 3.6-3 closed.

On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of cracking of containment penetrations (including penetration sleeves, penetration bellows, and dissimilar metal welds) due to cyclic loading and SCC, as recommended in the GALL Report. A complete review of the applicant's Containment ISI AMP can be found in Section 3.5.2.3.3 of this SER.

3.5.2.2.1.8 Conclusions. On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of containment structural components, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2 Class I Structures

3.5.2.2.2.1 Aging of Structures Not Covered by Structures Monitoring Program. The GALL Report recommends further evaluation for certain structure/aging effect combinations if they are not covered by the applicant's structures monitoring program. This includes (1) scaling, cracking, and spalling due to repeated freeze-thaw for Groups 1-3, 5, and 7-9 structures, (2) scaling, cracking, spalling and increase in porosity and permeability due to leaching of calcium hydroxide and aggressive chemical attack for Groups 1-3, 5, and 7-9 structures, (3) expansion and cracking due to reaction with aggregates for Groups 1-3, 5, and 7-9 structures, (4) cracking, spalling, loss of bond, and loss of material due to corrosion of embedded steel for Groups 1-5 and 7-9 structures, (5) cracks, distortion, and increase in component stress level due to settlement for Groups 1-3, 5, and 7-9 structures, (6) reduction of foundation strength due to erosion of porous concrete subfoundation for Groups 1-3 and 5-9 structures, (7) loss of material due to corrosion of structural steel components for Groups 1-5 and 7-8 structures, (8) loss of strength and modulus of concrete structures due to elevated temperatures for Groups 1-5 structures, and (9) crack initiation and growth due to SCC and loss of material due to crevice corrosion of stainless steel liner for Groups 7 and 8 structures. Further evaluation is necessary only for structure/aging effect combinations that are not covered by the applicant's structures monitoring program.

The applicant addressed the above criterion defined in the GALL Report regarding the need for further evaluation to manage the potential aging of concrete and steel structural components in LRA Table 3.6-1. In row entry 3.6.1.16 of LRA Table 3.6-1, the applicant stated that it will use its Structures Monitoring Program to manage the aging effects identified in the preceding paragraph. Specifically, the applicant stated:

> The Structures Monitoring Program identifies the evidence that an aging mechanism is present and active and also provides confirmation and verification of the absence of all types of aging effects. Indication of aging effects may be absent if the materials of construction, design specifications, and operational environment preclude an aging mechanism but, due to the long lead time necessary for some effects to manifest themselves, it is prudent to periodically assess the condition of SSCs regardless of the likelihood that a particular aging mechanism is applicable. The degradation of inaccessible concrete can create symptoms of aging effects that are detectable in accessible areas. Conversely, if aging effects are present in accessible areas it is sensible to extrapolate those effects into inaccessible areas and perform additional evaluations.

Because the applicant is managing the aging effects for the concrete and steel structural items covered by row entry 3.6.1.16 of LRA Table 3.6-1, as recommended by the GALL Report, the staff finds that the applicant has adequately addressed this further evaluation criterion. The staff's evaluation of the applicant's Structures Monitoring Program can be found in Section 3.0.3.10 of this SER.

3.5.2.2.2.2 Aging Management of Inaccessible Areas. The GALL Report recommends further evaluation for aging of inaccessible concrete areas, such as below-grade foundation and exterior walls exposed to ground water, due to aggressive chemical attack, if an aggressive below-grade environment exists. An aggressive below-grade environment could result in either cracking or loss of material for concrete components subjected to such an environment. The GALL Report recommends that a plant-specific AMP be developed by the applicant, if an aggressive below-grade environment exists.

The applicant addressed the above criterion defined in the GALL Report regarding the potential aging of below-grade concrete exposed to an aggressive environment in LRA Table 3.6-1. In row entry 3.6.1.17 of LRA Table 3.6-1, the applicant stated the following:

> Inaccessible wall and concrete foundations are considered in the Structures Monitoring Program. Results of inspections for accessible concrete are evaluated and, if aging effects are noted, the Structures Monitoring Program evaluates the symptom and possible causes with respect inaccessible areas. The Structures Monitoring Program requires periodic monitoring of ground water to verify chemistry remains non-aggressive. Concrete degradation in air due to aggressive rainwater is insignificant and the below-grade/lake water environment is non-aggressive. Additionally, recent structural inspections revealed no evidence of degradation owing to aggressive chemical attack; therefore, degradation due to chemical attack is not a probable aging effect at Ginna Station. The concrete at Ginna Station was designed in accordance with ACI 301-66 or ACI 318-63. ACI 301-66 refers to ACI 318 for concrete reinforcement. Designing concrete to ACI 318 also provides for sufficient concrete cover over embedded steel to provide ample corrosion protection. Chemical analyses performed on the rock and groundwater indicate these environments are non-aggressive. Since the embedded steel is not exposed to an environment which is considered aggressive, corrosion of embedded steel is not a probable aging effect at Ginna Station and has not been observed to date.

In RAI 3.6-4, the staff requested that the applicant provide the results of the Groundwater Monitoring Program, in terms of chlorides, sulfates, and pH of the groundwater, in order for the staff to verify the applicant's claim of a nonaggressive below-grade environment. In response to F-RAI 3.6-4, the applicant stated, "the most recent samples ranged between 6 and 8 ppm chloride, 20 to 40 ppm sulfate, and a pH of 7.0." Since these groundwater chemistry values do not constitute an aggressive environment as specified in the GALL Report ($pH < 5.5$, sulfates > 1500 ppm, chlorides > 500 ppm), the staff finds that the applicant's claim of a non-aggressive below-grade environment to be accurate. As such, further evaluation, as recommended by the GALL Report, is unnecessary. In addition, the applicant's Structures Monitoring Program requires periodic monitoring of ground/lake water to verify chemistry remains non-aggressive. Therefore, RAI 3.6-4 is considered closed.

On the basis of its review, the staff finds that the applicant has adequately evaluated the potential aging of below-grade concrete components exposed to groundwater due to an aggressive environment. Since the below-grade environment is not aggressive, the further evaluation recommended by the GALL Report is not warranted.

3.5.2.2.2.3 Conclusions . On the basis of its review, the staff finds that the applicant appropriately

evaluated AMR results involving management of Class I structures, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.3 Component Supports

3.5.2.2.3.1 Aging of Supports Not Covered by Structures Monitoring Program. 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 the structure/aging effect combinations listed above that are not covered by the applicant's Structures Monitoring Program.

The applicant addressed the above criterion defined in the GALL Report regarding the need for further evaluation to manage the potential aging of component supports in LRA Table 3.6-1. In row entry 3.6.1.25 of LRA Table 3.6-1, the applicant stated that it will use its Structures Monitoring Program to manage the aging effects identified in the preceding paragraph. Specifically, the applicant stated the following in row entry 3.6.1.25:

> The aging effects associated with component supports are considered in the Structures Monitoring Program. Additionally, component supports submerged in raw water are considered in the Periodic Surveillance and Preventive Maintenance Program. Component supports include those structural elements that are connected to civil structures and which extend to a system or system components for the purpose of providing support or restraint. Inclusive in this boundary definition are any vibration dampeners or other passive connective appurtenances intrinsic to the functioning of the support. The group also includes spray or drip shields attached to equipment as well as electrical system rack, panels and enclosures. Component supports are located throughout the plant. Included in the evaluation of the component supports are supports for both safety-related components and non-safety related components whose failure could affect a safety function (typically referred to as seismic II/I).

Because the applicant is managing the aging effects for the component supports covered by row entry 3.5.1.25 of LRA Table 3.5-1, as recommended by the GALL Report, the staff finds that the applicant has adequately addressed this further evaluation criterion. The staff's evaluation of the applicant's Structures Monitoring Program is found in Section 3.0.3.10 of this SER.

3.5.2.2.3.2 Cumulative Fatigue Damage Due to Cyclic Loading. The GALL Report identifies cumulative fatigue damage as a TLAA for support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports, if a CLB fatigue analysis exists. Since a CLB fatigue analysis does not exist at Ginna Station, cumulative fatigue damage for component supports is not addressed by the applicant as a TLAA.

Although a CLB fatigue analysis does not exist at Ginna, in RAI 3.6-14, the staff requested that the applicant explain how the aging effect of cumulative fatigue for supports for ASME piping and components will be managed during the period of extended operation. In response to F-RAI 3.6-14, the applicant stated the following:

Consistent with the Ginna CLB (Reference 1), supports for ASME piping and components were qualified and designed to the requirements of ASME III, Subsection NF (Reference 2) and AISC Manual (Reference 3). Both codes had accounted for fatigue cyclic loads by limiting the allowable stress ranges corresponding to cycles as high as greater than 2E6 cycles which bounds the number of cycles anticipated during 60 years of operation.

The Westinghouse Owners' Group Generic Technical Report (Reference 4), which has been approved by the NRC subject to limitations which were addressed in the LRA, concluded that fatigue cumulative usage factors for supports are much less than 1.0, even when effects of the extended period of operation are included. The conclusion of the evaluation is that fatigue is not an aging effect requiring management, and consequently no aging management program is needed.

Nevertheless, RG&E inspects for aging degradation of supports, including the effects of fatigue for supports of ASME piping and components, utilizing an inspection program which is documented in References 5 and 6. This program conforms to the requirements of Subsection IWF of ASME Section XI (Reference 7).

The RG&E in-service inspection program provides a Category F-A and VT-3 examination of Class 1, 2, and 3 piping supports and supports for other safety related components. It monitors and inspects for evidence of fatigue such as deformation or structural degradation of support parts. Non-conformances are administratively controlled in accordance with Reference 8. Repair or replacement actions to mitigate the consequences of fatigue (crack initiation and growth) are specified in Section 12 of the In-service Inspection Program documented in Reference 5.

References:
1. Ginna UFSAR, Section 3.9.3.3, "Pipe Supports."
2. ASME Boiler and Pressure Vessel Code, 1974 Edition, Section III, Subsection NF.
3. Manual of Steel Construction, AISC, 7th Edition.
4. Westinghouse Report, WCAP-14422 Rev. 2-A, "License Renewal Evaluation: Aging Management for Reactor Coolant System Supports", December 2000.
5. RG&E In-service Inspection Program, November 2, 2001.
6. RG&E Nuclear Directive, ND-IIT, "In-service Inspection and Testing"
7. ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWF, 1995 Edition with 1996 Addenda.
8. RG&E Procedure IP-CAP-1,"Abnormal Condition Tracking Initiation or Notification (ACTION) Report."

Because the supports for ASME piping and components are qualified and designed to codes that account for fatigue cyclic loads as high as $2x10^6$ cycles, which bounds the number of cycles anticipated during 60 years of operation, the staff finds the AMR of this component to be adequate. In addition, the Westinghouse Owners' Group Generic Technical Report, WCAP-1422 (see Reference 4 above), which has been approved by the NRC subject to limitations which were addressed in the LRA, concludes that fatigue cumulative usage factors for supports are much less than 1.0, even when the effects of the extended period of operation are included. WCAP-1422 concluded that fatigue is not an aging effect requiring management, and consequently no AMP is needed. As such, the staff considers RAI 3.6-14 closed.

3.5.2.2.3.3 Conclusions. On the basis of its review, the staff finds that the applicant appropriately evaluated AMR results involving management of component supports, as recommended in the GALL report. Since the applicant's AMR results are otherwise consistent with the GALL report, the staff finds that the applicant has demonstrated the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3 Aging Management Programs for Containment, Structures, and Component Supports

In SER Section 3.5.2.1, the staff evaluated the applicant's conformance with the aging management recommended by GALL for containment, other Class I structures, and component support component groupings. In SER Section 3.5.2.2, the staff reviewed the applicant's evaluation of the issues for which GALL recommends further evaluation. In this SER section, the staff presents its evaluation of the programs used by the applicant to manage the aging of the component groups within the containment, other Class I structures, and component supports.

The applicant credits nine AMPs to manage the aging effects associated with the containment, other Class I structures, and component supports. Five of the AMPs are credited to manage aging for components in other system groups (common AMPs), while four AMPs are credited with managing aging only for structures and structural components. The staff's evaluation of the common AMPs credited with managing aging in structures and structural components is provided in Section 3.0.3 of this SER. The common AMPs are listed below:

- Bolting Integrity Program (3.0.3.3)
- Boric Acid Corrosion Prevention Program (3.0.3.4)
- Periodic Surveillance and Preventive Maintenance (3.0.3.8)
- System Monitoring (3.0.3.11)
- Water Chemistry Program (3.0.3.1)

The staff's evaluation of the three structure-specific AMPs is provided in the following subsections.

3.5.2.3.1 ASME Section XI, Subsections IWE & IWL Inservice Inspection Program

<u>3.5.2.3.1.1 Summary of Technical Information in the Application</u> . The applicant describes its ASME Section XI, Subsections IWE & IWL Inservice Inspection Program in Section B2.1.3 of the LRA. The LRA states that this program is consistent with GALL programs, XI.S1, "ASME Section XI, Subsection IWE;" XI.S2, "ASME Section XI, Subsection IWL;" and XI.S4, "10 CFR 50, Appendix J." The applicant credits this program with aging management 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. Ginna Station has maintained an ISI program in accordance with 10 CFR 50.55a and Technical Specification requirements. The containment program which outlines the first IWE and IWL inservice inspection interval requirements for Ginna Station was implemented on September 9, 1998, and formally included in the ASME Section XI ISI Program.

The applicant provides a summary of the operating experience an corrective measures as follows:

- loss of prestress in most containment tendons, retensioning of 137 tendons
- containment moisture barrier found to be out of conformance with drawing due to loose insulation; nonconformance corrected by recaulking
- minor corrosion of steel containment liner with wall thickness verified by UT; restoration by protective paint coating
- low grease levels in certain tendon grease cans at top of containment; cans refilled
- corroded and leaking tendon fill-port piping; all fill ports repaired

In its LRA, the applicant stated that the ASME Section XI, Subsections IWE & IWL Inservice Inspection Program provides an effective means for timely detection and correction of any degradation of the containment pressure boundary, concrete, and post-tensioning system and

concluded that continued implementation of this program will be managed such that the intended functions of the containment will be maintained throughout the license renewal period.

3.5.2.3.1.2 Staff Evaluation . In addition to the review of Section B2.1.3 of the LRA, the staff reviewed the relevant information in Sections 2.4 and 3.6 of the LRA. Under this program, the applicant combines the aging management of metallic pressure boundary, concrete, and post-tensioning components of the Ginna Station containment during the extended period of operation. For the aging management of these components, the LRA states this program is consistent with Section XI.S1, “ASME Section XI, Subsection IWE,” and Section XI.S2, “ASME Section XI, Subsection IWL,” of the GALL Report. In addition, for the aging management of certain pressure boundary components, and performance monitoring of the containment and its components, the LRA states this program is consistent with Section XI.S4, “10 CFR Part 50, Appendix J,” of the GALL Report. The staff confirmed the applicant’s claim of consistency during the AMP audit. In addition, the staff determined whether the applicant properly applied the GALL Program to its facility.

To make a reasonable conclusion regarding the implementation of the program, the staff requested information from the applicant in RAIs B2.1.3-1, B2.1.3-2, B2.1.3-3, B2.1.3-4, and B2.1.3-5.

In RAI B2.1.3-1, the staff requested the applicant to provide a summary of the corrective actions taken, including the root cause determination, and the results of subsequent inspections related to the prestressing tendon surveillance.

In its response dated May 13, 2003, the applicant provided the following information:

> During lift-off surveillance testing in 1977 it was discovered that the average compressive force of the tendons had decreased to a value marginally above the design requirement of 636 kips. A 10-year retest was performed in 1979 and the marginal force values confirmed. In 1980, a total of 137 tendons were retensioned. In 1981, lift-off surveillance tests were performed, and witnessed by NRC inspectors (see Inspection Report 81-14). Subsequent surveillance testing has demonstrated that all tendons have met operability criteria. Investigation of the cause of the loss of prestress was undertaken at the Fritz Engineering Laboratory of Lehigh University. An extensive testing program was conducted with two primary objectives. The first objective was to determine the root cause of the loss of prestress, and the second was to determine the effect of retensioning at various times after initial stressing on subsequent loss of prestress. The results of the testing program can generally be summarized as follows (Refs. 1 and 2):
>
> 1) The principal cause of the loss of prestress in the wall tendons was stress relaxation;
> (2) An increase in temperature from ambient conditions to operating conditions significantly increases the amount of stress relaxation over time. For example, at a temperature of 104°F after 40 years the stress relaxation in the tendon would be expected to be as high as 21% as opposed to 12% as originally predicted;
> (3) Retensioned tendons exhibit considerably less stress relaxation than initially tensioned tendons.

In its response dated May 13, 2003, the applicant also provided information regarding the root cause of the tendon prestress loss:

> The results of the Lehigh University testing program were reviewed by Franklin Research Center (FRC) and Geotechnical Engineers, Inc. The reviews included assessment of other potential contributions to loss of tendon prestress, such as rock anchor slippage, bedrock creep, creep in concrete containment walls, elastic shortening of the containment concrete, tendon stress relaxation, and tendon wire corrosion. It was concluded that stress relaxation was the most reasonable and probable cause of the loss of prestress (Refs. 3 and 4). The review concluded that contributions from rock anchor slippage and creep of concrete containment walls were significantly less than the contribution from stress

> relaxation. The NRC agreed with this analysis and concluded that the tendon lift-off surveillance program should be continued.
>
> Tendon lift-off surveillance tests were performed in 1981, 1983, and 1985, and thereafter, every five years (1990, 1995 and 2000). Regulatory Guide 1.35 requires that at least 4% of the population of each tendon group be randomly sampled during each surveillance. The tendon group for Ginna Station consists of 160 vertical tendons, and 4% amounts to a sample size of 7 per surveillance. The actual test sample size during each lift-off surveillance testing activity since retensioning has ranged from 14 to 21, well in excess of the minimum required by the regulatory guide. The measured lift-off forces in all surveillance tests performed to date have exceeded the minimum required prestress force.

The applicant cited the following references in support of its response to RAI B2.1.3-1:

(1) Containment Building Tendon Investigation, GAI Report 2347, Doc. No. GC 20224, EWR 1900, Record ID GC20224, 1981.
(2) Evaluation of Lehigh Retension Tendon Stress Relaxation Data to Predict Tendon Surveillance Forces, Doc. No. GC20250, EWR 1900, Record ID GC20250, 1983.
(3) Tendon Evaluation, Rochester Gas and Electric Corp., R. E. Ginna Nuclear Power Station, Technical Evaluation Report C5506-551, Franklin Research Center, March 29, 1985.
(4) Review of Rock Anchor Evaluation, R. E. Ginna Nuclear Power Plant, Geotechnical Engineers, Inc., January 10, 1985.
(5) U.S. NRC Letter dated August 19, 1985 from John A. Zwolinski to R. W. Kober.

In its evaluation of the applicant's response to RAI B2.1.3-1, the staff found the root cause and corrective actions implemented for the loss of tendon prestress to be informative. Based on the applicant's plans to closely monitor the containment tendon system, as discussed in Sections 4.5 of this SER, the staff finds the applicant's actions acceptable for the extended period of operation.

In RAI B2.1.3-2, the staff requested information regarding the inspection of the unique support system of Ginna containment, and pointed out that its inspection requirements are not specifically addressed in Subsections IWE and IWL of Section XI of the ASME Code.

In its response dated May 13, 2003, the applicant provided the following information:

> As of September 2000, the containment system at Ginna Station is inspected and monitored according to the provisions of the ASME Code, Section XI, Subsections IWE and IWL as implemented by the Ginna Station containment program. The functionality of the structure will be monitored for structural adequacy of its unique support system by successful completion of testing performed under the containment tendon surveillance program, as defined in plant procedure PT 27.2, "Tendon Surveillance Program." The material condition and functionality of the containment structure is also evaluated under the provisions defined in Engineering Procedure EP-2-P-0169, "Structural Assessment and Monitoring Program," which provides guidance for evaluating galvanic potential measurements for the rock anchor tendons.

In its staff evaluation of the applicant's response to RAI B2.1.3-2, the staff recognized that the applicant is aggressive in performing tendon inspections, and the tendon inspections provide a certain degree of confidence regarding the integrity of the rock anchor system coupled to the tendons. However, it is for the other inaccessible features of the containment that the staff needs additional assurance for the extended period of operation. Inspections performed in accordance with the requirements of Subsection IWL of Section XI of the ASME Code will not be able to detect problems with the (1) tendon bellows, (2) elastomer pads, and (3) radial tension bars. Moreover, the areas of the containment where these components are located are below the ground water

level, and the staff had identified water related problems around the elastomer pads in the early 1990s. The applicant needs to develop an AMP (or periodic functional tests) that would verify the containment functionality at the location of the containment support. In a subsequent discussion with the applicant, the staff suggested that the applicant should perform two or three structural integrity tests (SITs) during the extended period of operation. An SIT could be performed at the peak calculated pressure that would demonstrate conformance with the expected behavior of the lower part of the containment. SIT measurements would consist of radial and vertical deformations similar to the measurements taken during initial and subsequent SITs, and visual observations during and after the tests. The comparison will allow the applicant to detect significant deviation from the containment expected behavior.

In a letter dated July 30, 2003, the applicant committed (reference item #27 Appendix A of this SER) to perform two SITs during the extended period of operation, one in 2009 and one in 2029. The staff finds the commitment acceptable, as it would periodically verify the behavior of the containment in the lower portion of the containment. Evaluation of the test results would indicate if there is a gross change in the containment behavior which would indicate significant degradation of the inaccessible components.

In RAI B2.1.3-3, the staff requested the following information regarding moisture barrier degradation and corrosion of the liner, (a) the acceptance criteria used for repairing the liner plate, (b) the successive (IWE-2420), additional (IWE-2430), and augmented (IWE-2500(c)) liner inspections performed (and to be performed), and (c) sampling plans (if any) for removing the insulation for the purpose of inspection.

In its response dated May 13, 2003, the applicant provided the following information regarding items (a) and (b) of RAI B2.1.3-3:

> During scheduled ASME Section XI, Subsection IWE inspections of the containment circumference at the intersection of the basement concrete floor with the containment steel liner, one area was discovered where the sealing (caulking) detail of the concrete floor to liner plate did not conform to drawings. The caulking seals the gap between the foam insulation on the containment walls and the concrete floor. As a result of this discovery, the inspection scope was increased to include a visual inspection of the caulking detail around the entire circumference of the containment concrete/liner interface. The caulking was found to be continuous with no visible gaps or discontinuities.
>
> As a result of the discovery of the non-conforming caulking detail, insulation in two areas (one on the north side and one on the west side of the containment) was removed and the containment liner was visually inspected. Evidence of minor surface corrosion was visible in the area of non-conforming caulking detail (north side). Ultrasonic thickness readings were taken in both areas. The thickness readings ranged from 0.346" to 0.404" on the north side, and 0.388" to 0.404" on the west side. The minimum required thickness was determined by engineering analysis and documented in EWR 5190 to be 0.281". Therefore the minimum liner thickness requirements were met.
>
> The containment liner surface had been coated with a layer of zinc-rich paint during construction. The area of the liner which exhibited minor surface corrosion was cleaned and restored with a new coating of zinc-rich paint. The foam insulation was restored in both areas and new caulking installed in conformance with engineering specifications.

In its response dated May 13, 2003, the applicant stated the following information regarding item (c) of RAI B2.1.3-3: “Additional inspections of the caulking and containment liner are scheduled during the second and third periods of the Fourth Ten-Year Inservice Inspection Interval which commenced January 1, 2000.”

The staff found that the applicant's response to RAI B2.1.3-3 items (a) & (b), was not clear as to whether the liner plate was restored to its nominal thickness before recoating. The applicant was requested to clarify this issue. The applicant was also requested to include a sampling plan for removing the insulation for examining the liner surfaces in a clarification to RAI B2.1.3-3 item (c).

In its July 30, 2003 letter, the applicant provided the following response to RAI B2.1.3-3 items (a) and (b):

> Examinations of the containment liner will be performed at Ginna Station in accordance with the requirements of ASME Section XI, Subsection IWE, Paragraph IWE-3512. Ultrasonic (UT) thickness measurements that reveal material losses exceeding 10% of the nominal containment liner wall thickness, or material loss that is projected to exceed 10% of the nominal containment liner wall thickness prior to the next examination, will be documented. Such areas may be accepted by engineering evaluation or corrected by repair or replacement in accordance with Paragraph IWE-3122. If either the thickness of the liner is reduced by no more than 10% of the nominal plate thickness or the reduced thickness can be shown by analysis to satisfy the minimum design requirements, then such areas are acceptable by engineering evaluation.
>
> The area of the liner exhibiting degradation that was discovered during previous inspections will be re-examined in 2005 and thereafter on a three-year frequency. The minimum required thickness of the containment liner at Ginna Station has been determined by engineering analysis (and documented in EWR 5190) to be 0.281". Repair activities to restore the liner to its nominal thickness will be taken when the liner thickness reaches .300", or is expected to reach .300" before the next scheduled examination.

The staff considers the applicant's acceptance criterion for restoring the liner to its nominal thickness reasonable and acceptable. Moreover, the commitment (reference item #28 Appendix A of this SER) to reexamine the liner, in the year 2005, will confirm if the corrective actions taken in the past examinations are effective in preventing further degradation of the containment liner.

In the clarification dated July 11, 2003, the applicant addressed item (c) as follows:

> One-third of the circumference of the moisture barrier at the interface between the containment basement floor and the liner plate was inspected during the refueling outage in 2000. The remaining two-thirds of the moisture barrier will be inspected during the 2005 refueling outage. During the 2005 refueling outage, a minimum of three additional 20-foot lengths of insulation will be removed and inspections (including visual inspections and UT thickness measurements) of the exposed liner plate will be performed. Two of the areas selected for inspection will be on each side of the region inspected in 2002 on the southeast side of the containment. The third area will be located on the northwest side. In addition, insulation will be removed at any locations requiring further investigation where the moisture barrier exhibits evidence of degradation due to cracking, separation or loss of seal. Visual inspections and UT thickness measurements of the liner plate will be performed in these areas.

The staff considers the applicant's process of examining the liner covered by the insulation reasonable and acceptable, as the process will identify any significant degradation in the most suspect areas and would initiate further investigations of the insulation covered liner areas.

In RAI B2.1.3-4, the staff requested the applicant to provide information regarding its choice among the options for performing Type C testing during the period of extended operation. In its response dated May 23, 2003, the applicant stated:

> Ginna Station containment isolation valves are currently tested under 10 CFR 50, Appendix J, Type C, Option B, as required by Technical Specification 5.5.15. This testing methodology will be maintained

during the period of extended operation.

The staff finds the 10 CFR 50, Appendix J, Type C, Option B method adopted by the applicant acceptable based on the description of the implementation of 10 CFR 50, Appendix J, Option B in the LRA and the response to RAI B2.1.3-5. The staff finds the process used by the applicant for leak rate testing of containment acceptable.

In RAI B2.1.3-5, the staff pointed out that Section A2.1.3 of Appendix A (UFSAR Supplement) of the LRA summarized the content of the IWE and IWL AMP. However, it did not include the containment leak rate testing (i.e., GALL report Section XI.S4) as part of the AMP. The applicant was requested to provide information regarding the inclusion of this aspect of the AMP in the UFSAR Supplement.

In its response dated May 23, 2003, the applicant agreed that Section A2.1.3 of Appendix A of the LRA should have addressed Section XI.S4 of the GALL report, and proposed the following addition to Section A2.1.3:

> This program also implements the requirements of 10 CFR 50, Appendix J. Containment leakage rates, in accordance with Option B of that regulation, through containment liner/welds, penetrations, and other openings are maintained within plant Technical Specification limits, or corrective actions are taken as required.

With this supplement, the staff considers the scope of LRA Section A2.1.3 (UFSAR Supplement) provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

3.5.2.3.1.3 Conclusion. On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL Program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.5.2.3.2 ASME Section XI, Subsection IWF Inservice Inspection Program

3.5.2.3.2.1 Summary of Technical Information in the Application. The applicant's inservice inspection program is discussed in LRA Section B2.1.4, "ASME Section XI, Subsection IWF Inservice Inspection." In its response to RAI B2.1.4-1, dated May 13, 2003, the applicant states that the 10 program attributes have been reviewed and found to be consistent with the corresponding attributes in NUREG-1801 and that the program is consistent with the GALL program XI.S3, "ASME Section XI, Subsections IWF," with no deviation. This is an existing

program at Ginna.

The parameters monitored or inspected under the ASME Section XI, Subsection IWF Inservice Inspection Program include corrosion, deformation, misalignment, improper clearances, improper spring settings, damage to close-tolerance machined or sliding surfaces, and missing, detached, or loosened support items. Component bolting is visually inspected for indications of potential degradation, including loss of coating integrity, cracking, and obvious evidence of corrosion.

As part of its operating experience, the applicant states that the ASME Section XI, Subsection IWF Inservice Inspection Program has been effective in managing the aging effects of Ginna ASME Class 1, 2, 3 and MC supports. No significant age-related deterioration has been identified in the inspections performed.

In the LRA, the applicant concluded that the continued implementation of the ASME Section XI, Subsection IWF Inservice Inspection Program provides reasonable assurance that aging effects will be managed such that the intended functions of Class 1, 2, and 3 piping and MC supports will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

In LRA Section B2.1.4, "ASME Section XI, Subsection IWF Inservice Inspection Program," the applicant described its AMP to manage the aging effects of Class 1, 2, 3 piping and MC components and their associated supports. The LRA stated that this AMP is consistent with the GALL program XI.S3, "ASME Section XI, Subsections IWF," with no deviations. The staff confirmed the applicant's claim of consistency during the AMP audit. In addition, the applicant provided, in its response dated May 13, 2003, the detailed plant-specific operating experiences at Ginna. The staff determined that the applicant properly applied the GALL program to its facility. In addition, the staff reviewed the UFSAR supplement to determine whether it provides an adequate description of the program and found it to be acceptable, as required by 10 CFR 54.21(d).

<u>3.5.2.3.2.2 Conclusion</u>. On the basis of its review and audit of the applicant's program, the staff finds that this program is consistent with the GALL program. Therefore, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.5.2.3.3 Concrete Containment Tendon PreStress Program

<u>3.5.2.3.3.1 Summary of Technical Information in the Application</u>. The applicant describes its Concrete Containment Tendon PreStress Program in Section B3.3 of the LRA. The LRA states that this program is consistent with GALL program X.S1, "Concrete Containment Tendon Pre-Stress." The applicant credits this program with aging management of prestressing forces in

prestressed concrete containments during the extended period of operation. The LRA also states that in order to ensure the adequacy of prestressing forces in prestressed concrete containments during the extended period of operation, the applicant performed a TLAA was performed. The results of this analysis indicated that continued monitoring and potential retensioning of the containment tendons may be necessary to ensure that the prestressing forces remain above the minimum required value for all tendons. The applicant describes the AMP as follows:

> The aging management program (AMP) consists of an assessment of the results of inspections performed in accordance with the requirements of Subsection IWL of the ASME Section XI Code (Reference 19), as supplemented by the requirements of 10 CFR 50.55a(b)(2)(ix) or (viii) in the later amendment of the regulation. The assessment related to the adequacy of the prestressing force will consist of the establishment of (1) acceptance criteria and (2) trend lines. The acceptance criteria are developed consistent with the methodology of NRC Regulatory Guide 1.35.1 and will normally consist of predicted lower limit (PLL) and the minimum required prestressing force, also called minimum required value (MRV). NRC Information Notice IN 99-10 provides guidance for constructing the trend line. The goal is to keep the trend line above the PLL because, as a result of any inspection performed in accordance with ASME Section XI, Subsection IWL, if the trend line crosses the PLL, the existing prestress in the containment could go below the MRV soon after the inspection and would not meet the requirements of 10 CFR 50.55a(b)(2)(ix)(B) or 10 CFR 50.55a(b)(2)(viii)(B).

The applicant provides a description of the 10 elements relevant to this program that are similar to the 10 elements contained in GALL program X.S1, "Concrete Containment Tendon PreStress." These 10 elements are discussed in Section 3.5.2.3.3.2 of this SER.

Based on the above assertions, the applicant concludes that the Concrete Containment Tendon PreStress Program will manage the aging effect of loss of containment prestressing forces such that the tendon intended functions will be maintained during the period of extended operation.

<u>3.5.2.3.3.2 Staff Evaluation</u>. In addition to the review of Section B3.3 of the LRA, the staff reviewed the relevant information in Sections 2.4.1, 3.6, 4.5, 4.7.4, and B2.1.3 of the LRA. Based on its operating experience, the applicant foresees a need to have this program exclusively for managing the containment tendon prestress during the extended period of operation in conjunction with the ISI program of B2.1.3 and TLAAs in Sections 4.5 and 4.7.4.

The staff evaluated the following 10 program elements:

<u>Scope of Program</u>. The program addresses the assessment of containment prestressing force. The staff finds this element acceptable, as it exclusively covers the aging management of containment prestressing force.

<u>Preventive Actions</u>. Maintaining the prestress above the MRV, as described in the program description above, will ensure that the structural and functional adequacy of the containment are maintained. The staff finds the preventive actions element acceptable because as a result of implementing the program, the applicant ensures that the containment prestressing force will not go below what would be required for maintaining the containment intended function during the period of extended operation.

<u>Parameters Monitored/Inspected</u>. The parameters to be monitored are the containment prestressing forces in accordance with requirements specified in Subsection IWL of Section XI of the ASME Code, as incorporated by reference in 10 CFR 50.55a. The staff finds the parameters monitored/inspected element of the program acceptable as they will be in accordance with

Subsection IWL of Section XI of the ASME Code, as incorporated by reference in 10 CFR 50.55a.

Detection of Aging Effects. This program detects the loss of containment prestressing forces. The staff finds the detection of aging effects element acceptable, as lower than expected prestressing force in the containment will trigger evaluations and corrective actions.

Monitoring and Trending. The estimated and measured prestressing forces are plotted against time and the PLL, MRV, and trending lines are developed for the period of extended operation. The staff finds the monitoring and trending element acceptable as it will trend the prestressing forces from the prior inspections and ensure that the trend line developed will not indicate prestressing forces in containment tendons lower than the MRV during the period of extended operation.

Acceptance Criteria. The prestressing force trend lines indicate that existing prestressing forces in the containment would not be below the MRVs prior to the next scheduled inspection, as required by 10 CFR 50.55a(b)(2)(ix)(B) or 10 CFR 50.55a(b)(2)(viii)(B). The staff finds the acceptance criteria element acceptable as it meets the requirement of 10 CFR 50.55a.

Corrective Actions. Corrective actions are implemented at the Ginna station in accordance with the requirements of 10 CFR Part 50, Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” as described in the “Quality Assurance Program for Station Operation” (ND-QAP). Provisions for timely evaluation of adverse conditions and implementation of required corrective actions, including root cause determinations and prevention of recurrence, are included in the Ginna Station Corrective Action Program. This element is acceptable as it complies with the requirement for corrective action in 10 CFR Part 50, Appendix B.

Conformation Process. Confirmation of the effectiveness of the Concrete Containment Tendon Pre-stress Program is accomplished in accordance with the Ginna Station Corrective Action Program, site quality assurance (QA) procedures, review and approval processes, and administrative controls which are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. This element is acceptable as it complies with the requirement for corrective action in 10 CFR Part 50, Appendix B.

Administrative Controls. The Ginna station QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B, and will continue to be adequate for the period of extended operation. The staff finds the administrative controls to be in compliance with the requirements of 10 CFR Part 50, Appendix B, and is, therefore, acceptable.

Operating Experience. The Ginna station retensioned 23 of the 160 vertical tendons 1000 hours after initial prestressing. Subsequent tests identified that tendon lift-off forces were generally lower than the predicted values. An investigation was started to determine the reason for the accelerated loss of lift-off forces. Prior to completing the investigation, the Ginna Station retensioned the 137 tendons that were not originally retensioned. The investigation concluded that stress relaxation of the tendon wires was the only significant cause for the lower-than-predicted tendon forces. To quantify these findings, RG&E initiated a tendon stress relaxation test program that was conducted at the Fritz Engineering Laboratory of Lehigh University. The TLAA for the Evaluation of Loss of Prestress in Containment Tendons concluded that the initial retensioned set of 23 tendons should be retensioned prior to the end of the current licensing period to ensure that prestressing forces

remain above the MRV in the period of extended operation. See Section 4.5 of this SER for staff evaluation of the applicant's TLAA for loss of concrete containment prestress.

The staff reviewed the UFSAR Supplement for the concrete containment tendon force in Section A3.5 of the UFSAR Supplement to determine whether it provides an adequate description of the program. The summary includes the information relative to the containment tendon fatigue in Section A3.5.1 of the LRA, and the related information on containment tendon bellows fatigue found in Section A3.5.2 of the LRA. The staff's evaluation of these activities is discussed in the evaluation of TLAAs in Sections 4.5, 4.7.2, and 4.7.4 of this SER.

3.5.2.3.3.3 Conclusions. On the basis of its review and audit of the applicant's program, the staff finds that this program is consistent with the GALL program. Therefore, the staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.5.2.4 *Aging Management Review of Plant-Specific Structures and Structural Components*

In this section of the SER, the staff presents its review of the applicant's AMR for specific structures and structural components. To perform its evaluation, the staff reviewed the components listed in LRA Tables 2.4.1-1 through 2.4.2-12 to determine whether the applicant properly identified the applicable aging effects and AMPs needed to adequately manage these aging effects. This portion of the staff's review involved identification of the aging effects for each component, ensuring that each component was evaluated in the appropriate LRA AMR Table in Section 3, and ensuring that management of the aging effect was captured in the appropriate AMP. The results of the staff's review are provided below.

3.5.2.4.1 Containment

3.5.2.4.1.1 Summary of Technical Information in the Application. The AMR results for the containment structural components are presented in Tables 3.6-1 and 3.6-2 of the LRA. The applicant used the GALL Report format to present its AMR of containment components in LRA Table 3.6-1. In LRA Table 3.6-2, the applicant identified the component group designation along with its (1) material, (2) environment, (3) aging effect(s), and (4) aging management program(s).

As described by the applicant in Section 2.4.1 of the LRA—

> The reactor Containment Structure is a reinforced-concrete, vertical right cylinder with a flat base and a hemispherical dome. The structure houses and supports safety related equipment, provides radiation shielding, and provides a barrier against the release of radioactive nuclides. A welded steel liner is attached to the inside face of the concrete shell to ensure a high degree of leak tightness. The

thickness of the liner in the cylinder and dome is 3/8-in. and in the base it is 1/4 in. The cylindrical reinforced-concrete walls are 3 ft 6 in. thick, and the concrete hemispherical dome is 2 ft 6 in. thick. The concrete base slab is 2 ft thick with an additional 2-ft-thick concrete fill over the bottom liner plate. The Containment Structure is 99 ft high to the spring line of the dome and has an inside diameter of 105 ft.

The Containment Structure consists of a reinforced concrete cylinder post-tensioned in the vertical direction and reinforced circumferentially with mild steel deformed bars. The dome is hemispherical and constructed of reinforced concrete.

A two-foot thick reinforced concrete base slab extends radially from the reactor cavity pit to the containment cylinder wall. Except for participation in anchoring the radial tension bars at the base of the cylinder, the base slab is not an integral part of the containment shell in this design. The base slab rests directly on rock, and the loads on base slab are those from the internal structures and equipment. Near the cylinder wall the slab thickens to 6 ft., and extends beneath the wall above the concrete ring beam. The base slab and ring beam supports the dome and cylinder walls. The ring beam rests directly on rock and is the location of the end anchorage for the rock anchors. No drainage or de-watering system is provided under the Containment Structure. The base of the cylinder is supported by a neoprene pad, which provides a hinge support at the base. The vertical post-tensioning system is anchored at the base of the cylinder to rock anchors. The rock anchors are post-tensioned and grouted, which ensures that the rock acts as an integral part of the containment.

The materials of construction for the containment structure, as shown in Table 2.4.1-1 of the LRA, are (1) steel, (2) concrete, (3) elastomers, (4) PVC, (5) bronze, and (6) epoxy resin. These materials are exposed to containment air, outdoor air, borated water, and a buried environment.

Aging Effects

The LRA identifies the following aging effects for the components comprising the containment structure:

- cracking, loss of material, change in material properties, and loss of bond for concrete components
- cracking for masonry block walls
- loss of sealant for elastomers exposed to an outdoor environment
- loss of sealant, cracking, and change in material properties for elastomers inside containment
- loss of material for carbon steel components
- loss of material for epoxy inside containment
- cumulative fatigue, cracking, and loss of material for steel containment penetrations
- loss of leak tightness for containment hatches
- loss of material for the bronze manual valves attached to the tendon fill port piping

Aging Management Programs

The LRA credits the following AMPs with managing the identified aging effects for the components comprising the containment structure:

- ASME Section XI, Subsection IWE & IWL Inservice Inspection Program
- The Boric Acid Corrosion Prevention Program
- Concrete Containment Tendon Prestress Program
- Periodic Surveillance and Preventive Maintenance Program
- Structures Monitoring Program

- Systems Monitoring Program

A description of these AMPs is provided in Appendix B of the LRA. The applicant concluded that the effects of aging associated with the components comprising the containment structure will be adequately managed by these AMPs such that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

3.5.2.4.1.2 Staff Evaluation. In addition to Section 3.6 of the LRA, the staff reviewed the pertinent information provided in Section 2.4, “Scoping and Screening Results: Structures,” and the applicable AMP descriptions provided in Appendix B of the LRA to determine whether the aging effects for the components comprising the containment structure have been properly identified and will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

This section of the SER provides the staff’s evaluation of the applicant’s aging management review for the aging effects and the appropriateness of the programs credited for the aging management of the components comprising the containment structure at Ginna. The staff’s evaluation includes a review of the aging effects considered and the basis for the applicant’s elimination of certain aging effects. In addition, the staff has evaluated the appropriateness of the AMPs that are credited for managing the identified aging effects for the components comprising the containment structure.

Aging Effects

Concrete. For containment concrete components, the applicant’s AMR is consistent with the recommendations in the GALL Report. As such, the applicant has committed to manage cracking, change in material properties (including loss of bond), and loss of material for containment concrete components that are accessible. Further discussion of cracking due to settlement and change in material properties as manifested by a reduction in foundation strength for containment concrete can be found in Sections 3.5.2.2.1.2 and 3.5.2.2.1.3 of this SER.

The above aging effects for containment concrete components result from several different aging mechanisms, which are included in the GALL Report. In RAI 3.6-12, the staff noted that the concrete containment groups CV-C-BUR, EXT, INT in LRA Table 2.4.1-1 do not link to entry 15 in AMR Table 3.6-1 of the LRA. Entry 15 in AMR Table 3.6-1 covers cracking due to freeze thaw and reaction with aggregates through the containment ISI program for concrete elements including foundation, dome, and walls. In response to RAI 3.6-12, the applicant stated that the omission was due to a typographical error and that entry 15 in AMR Table 3.6-1 is applicable to the commodity groups CV-C-BUR, EXT, INT. Because the applicant has acknowledged the missing link between the concrete containment groups and the appropriate AMR Table entry, the staff finds the applicant’s response to be acceptable.

For below-grade containment concrete components, the GALL Report recommends aging management only for an aggressive below-grade soil/ground water environment. Because ASME Section XI, Subsection IWL exempts from examination those portions of the concrete containment that are inaccessible, the GALL Report recommends that a plant-specific AMP be developed for concrete that may be exposed to an aggressive below-grade soil/ground water environment. As stated previously in SER Sections 3.5.2.2.1.1 and 3.5.2.2.2.2, the applicant claimed in LRA Table

3.6-1 that the below-grade environment is nonaggressive. However, because the applicant did not provide any ground water chemistry values (pH, sulfates, and chlorides) in support of this claim, the staff requested in RAI 3.6-4 that the applicant provide these values. In response to RAI 3.6-4, the applicant stated, “the most recent samples ranged between 6 and 8 ppm chloride, 20 to 40 ppm sulfate, and a pH of 7.0.” Because these ground water chemistry values do not constitute an aggressive environment as specified in the GALL Report (pH < 5.5, sulfates > 1500 ppm, chlorides > 500 ppm), the staff finds that the applicant’s claim of a nonaggressive below-grade environment to be accurate.

Because the ground water chemistry values provided by the applicant indicate a nonaggressive environment for concrete components, a plant-specific AMP for below-grade concrete components is not warranted. 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 such inaccessible areas. The staff’s review of the applicant’s ASME Section XI, Subsection IWE & IWL Inservice Inspection AMP in SER Section 3.5.2.3.1 provides further discussion concerning the inspection of inaccessible containment concrete structures.

For masonry block walls inside the containment, the applicant identifies cracking as an applicable aging effect and its Structures Monitoring Program to manage it. Industry experience has shown that masonry is susceptible to cracking and therefore, the staff finds the applicant’s identification of cracking as an aging effect to be managed for masonry block walls inside the containment to be acceptable.

Steel. Consistent with the GALL Report recommendations, the applicant identified loss of material for containment carbon steel structural components and cumulative fatigue, cracking, and loss of material as applicable aging effects for steel containment penetrations. The applicant also identified loss of leak tightness as an applicable aging effect for the moveable hatch and equipment hatch; however, the GALL Report also recommends the management of loss of material due to general corrosion for these containment hatches. In RAI 3.6-10, the staff requested that the applicant explain this omission. In response to RAI 3.6-10, the applicant stated that the omission was due to a typographical error and that entry 10 in AMR Table 3.6-1 is applicable to the containment hatches. Since the applicant has acknowledged the missing link between the containment hatches and the appropriate AMR Table entry, the staff finds the applicant’s response to be acceptable.

The GALL Report also recommends management for loss of prestress for containment tendons; however, the applicant did not identify this aging effect for the component group CV-SS(CS)-Tendons, listed in LRA Table 2.4.1-1. In RAI 3.6-11, the staff requested that the applicant explain this omission. In response to RAI 3.6-11, the applicant stated that the omission was due to a typographical error and that entry 11 in AMR Table 3.6-1 is applicable to the containment tendons. Because the applicant has acknowledged the missing link between the containment tendons and the appropriate AMR table entry, the staff finds the applicant’s response to be acceptable. Further discussion of the aging effect of loss of prestress for containment tendons is found is Section 4.5 of this SER.

In LRA Section 2.4.1, the applicant described a corrosion protection system for the containment tendons. The applicant stated that this corrosion protection system is needed because the tendons are unbonded (i.e., not in intimate and integral contact with the surrounding concrete). As such,

the protection of the surrounding concrete, as an inhibitor of corrosion for the tendons, is lost and the additional protection provided by the corrosion protection system is needed. As described in Section 2.4.1 of the LRA, one element of the corrosion protection system is a cathodic protection system in which all tendons are connected to the liner and then to a copper grounding system which is completed by the addition of reference cells and anodes. From this system, a protective potential can be generated if the need for cathodic protection is indicated by the reference cells.

The staff noted that this cathodic protection system does not appear in the LRA Section 2.4.1-1 scoping tables and hence is not evaluated as part of the AMR in Section 3.6 for the containment structural components. As such, the staff requested in RAI 3.6-2 that the applicant explain this omission. In response to RAI 3.6-2, the applicant stated:

> As described in UFSAR section 3.8.1.4.3.4, Corrosion Protection, section dd, at the time of containment construction, Durichlor anodes were installed around the perimeter of the vessel. Protective current can be applied from these anodes and regulated as needed to maintain a protective potential if cathodic protection is found necessary by measurements from the reference cells. The system was a construction feature installed because of a lack of operating experience involving the particular tendon design. The architect/engineers recognized that if unforeseen problems developed in the future the tendon design precludes easy repairs.   To date voltage measurements, now incorporated into the Structures Monitoring program, have not indicated the need to employ cathodic protection measures. The containment tendon cathodic protection system is not used (no currents are impressed on the tendons) and is not relied upon to manage tendon aging. Operating experience has not indicated a current or future need for impressed current cathodic protection.

Through the use of the cathodic protection system, the applicant is able to monitor gross changes (i.e., severe loss of material) in the condition of the containment liner, tendons, and rock anchors, which are all connected to the cathodic protection system. Although the applicant stated above that periodic voltage measurements are made as part of the Structures Monitoring Program, these voltage tests are not documented in the LRA. As such, the staff in subsequent communications with the applicant obtained a commitment (reference item #29 Appendix A of this SER) from the applicant to incorporate the periodic voltage measurements, referenced above in response to RAI 3.6-2, in one of its license renewal AMPs. The applicant committed to use the Periodic Surveillance and Preventive Maintenance Program for the periodic voltage measurements. The applicant also included this commitment in its “List of Regulatory Commitments,” and modified Sections A2.1.17 and B2.1.23 of the LRA to reflect this commitment.

For the steel containment liner, the applicant identified loss of material due to general corrosion as an applicable aging effect and, consistent with the GALL Report recommendations, proposed to use both the ASME Section XI, Subsection IWE & IWL Inservice Inspection and The Boric Acid Corrosion Programs to manage this aging effect. However, the GALL Report also recommends further evaluation for the embedded portion of the containment liner, if corrosion of the containment liner is significant. This additional step is necessary since Subsection IWE exempts from examination portions of the containment that are inaccessible, such as embedded or inaccessible portions of steel liners and steel containment shells, piping, and valves penetrating or attaching to the containment. To cover inaccessible areas, 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. Because the applicant did not adequately address, in LRA Table 3.6-1, the above criterion defined in the GALL Report, regarding the need for further evaluation to manage the potential aging of the embedded liner, the staff requested further information in RAI 3.6-16. In response to RAI 3.6-16, the applicant stated:

> Review of plant-specific operating experience and recent maintenance and corrective action documents identified only one nonconforming condition at the moisture barrier (caulking) which protects the inaccessible portion of the Containment steel liner from corrosion. This condition was discovered during inservice inspections performed to meet the requirements of ASME Section XI, Subsection IWE in 2000. As discussed in the response to RAI B2.1.3-3, insulation was removed and the liner was exposed for visual inspection in two areas. Evidence of minor surface corrosion was present in the area with the nonconforming caulking detail. Ultrasonic thickness readings were taken in both areas, including locations above and along the interface between the liner and the Containment concrete floor. All measured values exceeded the minimum required thickness with considerable margin. The liner was cleaned, re-coated and the moisture barrier restored in accordance with original design specification requirements in both areas.
>
> As a result of this discovery, the configuration of the moisture barrier was inspected around the entire circumference of the Containment and verified to be intact with no visible gaps or discontinuities. Additional inspections of the liner were performed during the 2002 refueling outage. As discussed in the response to RAI B2.1.3-3, approximately 70 linear feet of the liner were exposed and ultrasonic thickness measurements taken at four different excavated areas below the floor level. These measurements verified that no loss of liner thickness had occurred at these locations. The exposed portion of the liner was again cleaned, re-coated, and the moisture barrier restored in accordance with original design specification requirements.
>
> Additional inspections of the moisture barrier and liner are planned during the second and third periods of the Fourth ISI interval, which commenced on January 1, 2000. The condition of the inaccessible portions of the Containment liner may be assessed by evaluation of the condition of the liner at the interface with the concrete floor. Therefore, inspections performed under the ASME Section XI, Subsections IWE/IWL ISI Program will provide reasonable assurance that aging effects for the inaccessible portions of the liner plate can be managed so that the liner plate will continue to perform its intended function consistent with the current licensing basis during the period of extended operation.

Because previous inspections of the inaccessible portions of the liner (behind the moisture barrier) revealed only minor degradation and because additional inspections of both the moisture barrier and liner will take place under the applicant's ASME Section XI, Subsections IWE and IWL Inservice Inspection Programs, the staff finds that the applicant has provided a reasonable basis for concluding that the aging of the containment liner behind the insulation and the moisture barrier will be adequately managed consistent with its CLB during the extended period of operation. As such, the staff considers RAI 3.6-16 closed. This topic is also discussed in Section 3.5.2.2.1.4 of this SER.

For stainless steel components that are exposed only to indoor containment air, the applicant did not identify any applicable aging effects. These stainless steel structural components include the refueling cavity and fuel transfer liners (including attachments).

<u>Elastomers (gaskets, caulking, seals)</u>. Consistent with the GALL Report recommendations, the applicant identified loss of seal as an applicable aging effect for elastomers exposed to either indoor or outdoor air. In addition, for the interior elastomers, the applicant also identified cracking due to thermal stress, ultraviolet radiation, and ozone and change in material properties due to thermal stress as applicable aging effects.

In LRA Section 2.4.1, the applicant described a neoprene pad which provides a hinge support at the base of the containment cylinder wall. The applicant stated the following in LRA Section 2.4.1:

> The vertical post tensioning system is anchored at the base of the cylinder to rock anchors. The rock anchors are post-tensioned and grouted, which ensures that the rock acts as an integral part of the containment.

> The rock anchors resist vertical axial loads in the cylinder walls and thereby avoid the transfer of vertical shear to the base slab. A sufficient physical separation is provided between wall and base slab to ensure that there is no transfer of vertical reaction to the base slab. A hinge is developed at the base of the containment cylinder by supporting the wall vertically on a series of elastomer bearing pads and anchoring the wall horizontally into the base slab with radial, high-strength steel tension bars. The tension bars resist the radial shear at the base of the containment cylinder and transfer this force as radial compression into the thickened portion of the base slab and ring beam, and thence, as a lateral load, onto the rock outboard of the ring beam and base slab.

The staff noted that these elastomer bearing pads do not appear in the LRA Section 2.4.1-1 scoping tables and hence are not evaluated as part of the AMR in Section 3.6 for the containment structural components. As such, the staff requested, in RAI 3.6-1, that the applicant explain this omission and provide an evaluation of the containment support system, which includes the neoprene bearing pads, in order to ensure its (the support system's) ability to stay functional during the extended period of operation. In response to RAI 3.6-1, the applicant stated the following:

> The accessible portions of the unique containment support system at Ginna Station include the upper wall-tendon anchorage hardware and grease cans. The inaccessible portions of the support system include the neoprene bearing pads, radial tension rods, and rock-anchors.
>
> Each of the 160 vertical wall tendons, consisting of 90, ¼ inch diameter wire bundles is connected at the base of the containment wall to another 90-wire tendon that is anchored by grouting into a 6-inch diameter hole drilled 43 feet into the base rock. These rock anchors were prestressed prior to construction of the containment. The functionality of this unique support system is monitored for structural adequacy by periodic tendon surveillance lift-off tests performed under plant procedure PT 27.2, "Tendon Surveillance Program." This procedure requires measurement of tendon lift-off forces, comparison of measured lift-off forces with predicted forces, evaluation of 6% overstress capability, inspection and testing of surveillance wire specimens, analytical testing of casing filler grease samples, and visual examination of tendon anchorage hardware and grease cans.
>
> The condition of other inaccessible components such as the neoprene pads and radial tension rods is inferred from visual examinations of the accessible portions of the containment structure such as the ring beam and containment wall surfaces performed under the ASME Section XI, Subsection IWE/IWL Program and the Structures Monitoring Program.

The staff recognizes that the applicant is aggressive in performing tendon inspections and that the tendon inspections provide a certain degree of confidence in the integrity of the rock anchor system coupled to the tendons. However, it is the inaccessible components of the containment support system that will not be directly managed for the extended period of operation. Inspections performed in accordance with the requirements of Subsection IWL of Section XI of the ASME Code will not be able to detect problems with the (1) tendon bellows, (2) elastomer bearing pads, or (3) radial tension bars. Moreover, the areas of the containment where these components are located are below the ground water level, and the staff identified water related problems around the elastomer bearing pads in the early 1990s. As such, the staff concludes that the applicant needs to develop an AMP (which should include periodic functional tests) to verify the functionality of the containment support system.

In subsequent discussions, in a letter dated July 30, 2003, the applicant committed (reference item #27 in Appendix A of this SER) to performing two SITs during the extended period of operation (one in 2009 and one in 2029). The SIT will be performed at the peak calculated pressure in order to demonstrate conformance with the expected behavior of the containment support system, located in the lower part of the containment. SIT measurements will consist of radial and vertical deformations and can be compared to similar measurements taken during previous SITs. In addition, visual observations will be made during and after the tests. The comparison will allow the

applicant to detect significant deviation from the expected behavior of the containment support system. The staff finds the commitment acceptable, as it would periodically verify the behavior of the lower portion of the containment. Evaluation of the test results would indicate if there is a gross change in the containment behavior that would indicate significant degradation of the inaccessible containment support system components. As such, RAI 3.6-1 is considered closed.

Miscellaneous Materials (PVC, epoxy resin, bronze). For the polyvinyl chloride (PVC) plastic foam insulation panels, the applicant did not identify any applicable aging effects. For the epoxy resin used to encapsulate the exposed tendon fill port piping and the bronze manual valves attached to the tendon fill port piping, the applicant identified loss of material as an applicable aging effect.

Aging Management Programs

The LRA credits the following AMPs with managing the identified aging effects for the components comprising the containment structure:

- ASME Section XI, Subsection IWE & IWL Inservice Inspection Program
- Boric Acid Corrosion Program
- Concrete Containment Tendon Prestress Program
- Periodic Surveillance and Preventive Maintenance Program
- Structures Monitoring Program
- Systems Monitoring Program

With the exception of the ASME Section XI, Subsection IWE & IWL Inservice Inspection, Concrete Containment Tendon Prestress, and Structures Monitoring Programs, each of the above AMPs are credited with managing the aging of several components in several different structures and systems and are, therefore, considered common AMPs. The staff review of the common AMPs is in Section 3.0.3 of this SER. The staff review of the ASME Section XI, Subsection IWE & IWL Inservice Inspection, Concrete Containment Tendon Prestress, and Structures Monitoring Program are found in Sections 3.5.2.3.1, 3.5.2.3.3, and 3.0.3.10, respectively, of this SER.

After evaluating the applicant's AMR for each of the components comprising the containment structure, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects. For those components identified in Table 3.6-1 of the LRA, the staff verified that the applicant credited the AMP recommended by the GALL Report. For the components identified in Table 3.6-2, the staff verified that the applicant credited an AMP that is appropriate for the identified aging effect(s).

For many of the LRA Table 3.6-1 and 3.6-2 entries, in addition to the GALL-recommended AMP (i.e., the Structures Monitoring Program or ASME Section XI, Subsection IWE & IWL Inservice Inspection Program), the Periodic Surveillance and Preventive Maintenance AMP is also listed. In RAI 3.6-6, the staff requested that the applicant clarify the relationship between the Periodic Surveillance and Preventive Maintenance AMP and the other listed AMPs with respect to managing the aging effects identified for the components in LRA Tables 3.6-1 and 3.6-2. In response to RAI 3.6-6, the applicant stated the following:

> In Table 3.6-1 the ASME Section XI, Subsections IWE & IWL ISI (Containment ISI) program and the Structures Monitoring program are referenced as the approved NUREG-1801 aging management programs for structural components and component supports. However, for certain components, the

> Periodic Surveillance and Preventive Maintenance (PSPM) program was also credited for managing the effects of aging because periodic inspections of these components are driven by repetitive tasks (reptasks) in the PSPM program. For example, the PSPM program is credited along with the Containment ISI program for managing the effects of aging for the Containment personnel airlock and equipment hatch [line numbers (4) and (5)] seals, gaskets and moisture barriers [line number (6)], and tendon and anchorage components [line number (14)]. An explanation for crediting the PSPM program is provided in the discussion column for these line numbers.

Because the Periodic Surveillance and Preventive Maintenance Program is credited in addition to the GALL recommended program(s) and is not the sole AMP used for the inspections of the GALL components, the staff finds the applicant's approach to be acceptable. Inspection frequencies, acceptance criteria, and other AMP attributes used for the aging management of the GALL components are those of the GALL-recommended program(s). The Periodic Surveillance and Preventive Maintenance Program is used only as the vehicle under which the actual inspections are undertaken. The staff considers RAI 3.6-6 closed.

3.5.2.4.1.3 Conclusion. The staff has reviewed the information in Sections 2.4 and 3.6 of the LRA, as well as the applicable AMP descriptions in Appendix B of the LRA. On the basis of this review, the staff concludes that the applicant has demonstrated that the aging effects associated with the components comprising the containment structure will be adequately managed so that there is reasonable assurance that these components will perform their intended functions in accordance with the CLB during the period of extended operation.

3.5.2.4.2 Other Structures

The AMR results for Other Structures are presented in Tables 3.6-1 and 3.6-2 of the LRA. The applicant used the GALL Report format to present its AMR of structural components in LRA Table 3.6-1. In LRA Table 3.6-2, the applicant identified the component group designation along with its (1) material, (2) environment, (3) aging effect(s), and (4) AMP(s). The structural components listed in Tables 3.6-1 through 3.6-2 of the LRA are in the following structures:

- auxiliary building
- intermediate building
- turbine building
- diesel building
- control building
- all volatile water building
- screen house building
- standby auxiliary feedwater building
- service building
- cable tunnel
- essential yard structures

A brief description of each of the above structures is provided in Sections 2.4.2.1 through 2.4.2.11 of the LRA. The materials of construction identified in the LRA for each of the above structures are (1) concrete including masonry, (2) steel, (3) aluminum, (4) elastomers, and (5) miscellaneous materials, such as glass, roofing, lead, rock, and cast iron. These materials are exposed to outdoor, buried, indoor-not air conditioned, borated water, and raw water environments.

Aging Effects

Tables 3.6-1 and 3.6-2 of the LRA identify the following applicable aging effects for components in structures outside the containment:

- loss of material
- change in material properties
- cracking
- loss of seal or leak tightness
- loss of prestress
- loss of bond
- loss of form

Aging Management Programs

Tables 3.6-1 and 3.6-2 of the LRA credit the following AMPs with managing the identified aging effects for the components in structures outside the containment:

- Boric Acid Corrosion Program
- Periodic Surveillance and Preventive Maintenance Program
- Structures Monitoring Program
- Systems Monitoring Program
- Water Chemistry Control

A description of these AMPs is provided in Appendix B of the LRA. The applicant concluded that the effects of aging associated with the components in structures outside the containment will be adequately managed by these AMPs such that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

3.5.2.4.2.2 Staff Evaluation. In addition to Section 3.6 of the LRA, the staff reviewed the pertinent information provided in Section 2.4, "Scoping and Screening Results - Structures," and the applicable AMP descriptions provided in Appendix B of the LRA to determine whether the aging effects for components in structures outside the containment have been properly identified and will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

This section of the SER provides the staff's evaluation of the applicant's AMR for the aging effects and the appropriateness of the programs credited for the aging management of structures outside the containment at Ginna. The staff's evaluation includes a review of the aging effects considered and the basis for the applicant's elimination of certain aging effects. In addition, the staff has evaluated the appropriateness of the AMPs that are credited for managing the identified aging effects for the components in structures outside the containment.

Aging Effects

Concrete. For concrete components in structures outside the containment, the applicant's AMR is consistent with the recommendations in the GALL Report. As such, the applicant has committed to manage cracking, change in material properties (including loss of bond), and loss of material for concrete structural components that are accessible. Section 3.5.2.2.2.1 of this SER provides further detail on the applicant's aging management of concrete components in structures outside the containment.

For below-grade concrete structural components, the GALL Report recommends aging management only for an aggressive below-grade soil/ground water environment. As previously stated in Section 3.5.2.2.2.2 of this SER, the applicant addressed the above criterion, defined in the GALL Report, in row entry 3.6.1.17 of LRA Table 3.6-1. Entry 17 of LRA Table 3.6-1 states the following:

> Inaccessible wall and concrete foundations are considered in the Structures Monitoring Program. Results of inspections for accessible concrete are evaluated and, if aging effects are noted, the Structures Monitoring Program evaluates the symptom and possible causes with respect inaccessible areas. The Structures Monitoring Program requires periodic monitoring of ground water to verify chemistry remains non-aggressive. Concrete degradation in air due to aggressive rainwater is insignificant and the below-grade/lake water environment is non-aggressive. Additionally, recent structural inspections revealed no evidence of degradation owing to aggressive chemical attack; therefore, degradation due to chemical attack is not a probable aging effect at Ginna Station. The concrete at Ginna Station was designed in accordance with ACI 301-66 or ACI 318-63. ACI 301-66 refers to ACI 318 for concrete reinforcement. Designing concrete to ACI 318 also provides for sufficient concrete cover over embedded steel to provide ample corrosion protection. Chemical analyses performed on the rock and groundwater indicate these environments are non-aggressive. Since the embedded steel is not exposed to an environment which is considered aggressive, corrosion of embedded steel is not a probable aging effect at Ginna Station and has not been observed to date.

In RAI 3.6-4, the staff requested that the applicant provide the results of the Ground water Monitoring Program, in terms of chlorides, sulfates, and pH of the groundwater, in order for the staff to verify the applicant's claim of a nonaggressive below-grade environment. In response to RAI 3.6-4, the applicant stated, "the most recent samples ranged between 6 and 8 ppm chloride, 20 to 40 ppm sulfate, and a pH of 7.0." Because these ground water chemistry values do not constitute an aggressive environment as specified in the GALL Report (pH < 5.5, sulfates > 1500 ppm, chlorides > 500 ppm), the staff finds that the applicant's claim of a nonaggressive below-grade environment to be accurate. As such, the further evaluation, as recommended by the GALL Report, is unnecessary. In addition, the applicants Structural Monitoring Program requires periodic monitoring of ground/lake water to verify chemistry remains non-aggressive. Therefore, RAI 3.6.-4 is considered closed.

For the buried concrete components in the screen house building that are exposed to flowing water, LRA Table 3.6.2.7 states that the aging effect of loss of material/abrasion due to cavitation is managed through periodic underwater inspections. These underwater inspections are part of the Periodic Surveillance and Preventive Maintenance Program.

<u>Steel</u>. Consistent with the recommendations of the GALL Report, the applicant identified loss of material as an applicable aging effect for carbon steel components in structures outside the containment. This includes carbon steel components both in indoor and outdoor environments, as well as carbon steel exposed to borated water leaks.

For buried carbon steel, such as the steel piles that support the Cable Tunnel, LRA Table 3.6.2.9 states the following:

> Buried carbon steel components can experience loss of material from corrosion. The Cable Tunnel is founded on steel piles driven to bedrock. These piles are inaccessible. The Structures Monitoring Program evaluates the effects of pile aging by monitoring the tunnel for signs of settlement which would indicate foundation degradation. Site operating experience on sheet piles, below grade on one side and exposed to air on the other, has shown that only minimal loss of material has occurred since construction. Additionally, inspections of opportunity performed on other buried carbon steel components provide valuable information that may be used to infer the condition of inaccessible carbon

> steel piles. Thus, it can be concluded that the Structures Monitoring Program provides reasonable assurance that the aging effects of carbon steel piles will be managed through the period of extended operation.

The applicant's commitment to monitor the cable tunnel for evidence of settlement will provide sufficient aging management of the buried carbon steel foundation piles which support the tunnel. Any severe loss of material of these steel piles should be manifested through differential settlement of the cable tunnel.

<u>Elastomers</u>. For the structures outside containment, the applicant identified change in material properties and cracking as applicable aging effects in Table 3.6-2 of the LRA. The applicant credited the Structures Monitoring Program to manage these two aging effects for elastomeric material.

<u>Miscellaneous Materials</u>. For the structures outside containment, the miscellaneous component materials are (1) rock, (2) cast iron, (3) lead, (4) aluminum, and (5) architectural materials. For the rock revetment, which protects the plant from lake flooding, the applicant identified loss of form (erosion) as an applicable aging effect. For the cast iron manhole covers that are exposed to the weather, the applicant identified loss of material as an applicable aging effect. For the lead bricks and leaded glass used in the intermediate building as shielded enclosure, the applicant did not identify any applicable aging effects. Also, for the aluminum used in flood barriers and aluminum conduit exposed to an indoor environment, the applicant did not identify any applicable aging effects. For the architectural materials (i.e., non-load-bearing building elements) such as building siding, built-up roof systems, and windows, the applicant identified hardening and shrinkage due to weathering, loss of material due to general corrosion, and cracking due to restraint, shrinkage, and creep as applicable aging effects.

Aging Management Programs

Tables 3.6-1and 3.6-2 of the LRA credit the following AMPs with managing the identified aging effects for the components in structures outside the containment:

- Boric Acid Corrosion Program
- Periodic Surveillance and Preventive Maintenance Program
- Structures Monitoring Program
- Systems Monitoring Program
- Water Chemistry Control Program

The applicant credits the above listed AMPs to manage the aging effects associated with structures and structural components outside the containment. Four of the AMPs (i.e., the Boric Acid Corrosion, Periodic Surveillance and Preventive Maintenance, Systems Monitoring, and Water Chemistry Control Programs) are credited to manage aging for components in other system groups (common AMPs), while the remaining AMP (Structures Monitoring Program) is credited with managing aging only for structures and structural components. The staff's evaluation of the common AMPs credited with managing aging in structures and structural components outside the containment is provided in Section 3.0.3 of this SER. The Structures Monitoring Program is evaluated in Section 3.0.3.10 of this SER.

After evaluating the applicant's AMR for each of the components comprising the structures other

than containment, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects. For those components identified in Table 3.6-1 of the LRA, the staff verified that the applicant credited the AMP recommended by the GALL Report. For the components identified in Table 3.6-2, the staff verified that the applicant credited an AMP that is appropriate for the identified aging effect(s).

In LRA Table 3.6.1.17, the applicant acknowledged that it used a different AMP than the GALL recommended AMP for the Ginna water control structures, which include the circulating water system discharge canal, the canal's interface with the pump screen house, and a stone revetment which protects the site from surge flooding. The GALL-recommended AMP is RG 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants." The applicant instead uses the Structures Monitoring Program in conjunction with the Periodic Surveillance and Preventive Maintenance Program, for the water control structures. In RAI 3.6-7, the staff requested that the applicant clarify this inconsistency with the GALL Report. In response, the applicant provided the following information:

> The Structures Monitoring Program and the Periodic Surveillance and Preventive Maintenance (PSPM) Program are inter-related, in that the PSPM program defines the periodicity of the inspections (repetitive tasks) to be performed under the Structures Monitoring program. As inspection results of the Structures Monitoring Program are analyzed, the frequency, or extent, of the inspections may be modified. These will be reflected in the PSPM program.
>
> It is important to note that Ginna's water control structure inspection program was developed by the Army Corps of Engineers during the Systematic Evaluation Program, SEP Topic III-3.C. Regulatory Guide 1.127 was issued well after Ginna Station was licensed, and we are not committed to its use. For example, the information requested by Regulatory Position C.1 was not compiled for the Ginna water control structures. Most of the information in Regulatory Position C.2 is also not applicable to Ginna, since these structures do not exist on the site. However, the information in C.2.a,C.2.b, and C.2.e can be applied at Ginna Station. Procedure M-92.2, "Inservice Inspection of Miscellaneous Water Control Structures at Ginna" uses RG 1.127 for guidance. We will evaluate the guidance provided in Regulatory Guide 1.127 to determine if more specific detail should be included in M-92.2.

Because the applicant uses the relevant portions of RG 1.127 for its aging management of the water control structures at Ginna, the staff finds the applicant's response to RAI 3.6-7 to be acceptable. RAI 3.6-7 is considered closed.

3.5.2.4.2.3 Conclusions. The staff has reviewed the information in Sections 2.4 and 3.6 of the LRA, the applicant's responses to the staff's RAIs, and the applicable AMP descriptions in Appendix B of the LRA. On the basis of this review, the staff concludes that the applicant has demonstrated that the aging effects associated with the components in structures outside the containment will be adequately managed so that there is reasonable assurance that these components will perform their intended functions in accordance with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplements provide adequate program descriptions of the AMPs credited for managing aging in structures and structural components outside the containment to satisfy 10 CFR 54.21(d).

3.5.2.4.3 Component Supports

3.5.2.4.3.1 Summary of Technical Information in the Application. The AMR results for the component supports are presented in Tables 3.6-1 and 3.6-2 of the LRA. The applicant used the GALL Report format to present its AMR of the components in LRA Table 3.6-1. In LRA Table 3.6-2, the applicant identified the component group designation along with its (1) material, (2) environment, (3) aging effect(s), and (4) AMP(s).

Component supports are those components that provide support or enclosure for mechanical and electrical equipment. The component supports identified in LRA Section 2.4.2.12 include (1) expansion/grouted anchors, (2) electrical conduits and supports, (3) Nuclear steam supply system (NSSS) pipe and supports, (4) vibration isolation equipment mounts, (5) seals and gaskets, (6) structural fasteners including high-strength fasteners, and (7) plates, channels, support member beams.

The materials of construction for the component supports, which are subject to an AMR, are steel, aluminum, elastomers, grout, and wood. These materials are exposed to internal, external, raw and borated water, and embedded environments.

Aging Effects

Tables 3.6-1 and 3.6-2 of the LRA identify the following applicable aging effects for the component supports:

- loss of material
- cracking
- change in material properties
- loss of mechanical function
- reduction in concrete anchor capacity
- reduction/loss of isolation function

Aging Management Programs

Tables 3.6-1 and 3.6-2 of the LRA credit the following AMPs with managing the identified aging effects for the component supports:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- ASME Section XI, Subsection IWF Inservice Inspection Program
- Periodic Surveillance and Preventive Maintenance Program
- Structures Monitoring Program
- Systems Monitoring

A description of these AMPs is provided in Appendix B of the LRA. The applicant concluded that the effects of aging associated with the components in structures outside the containment will be adequately managed by these AMPs such that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.4.3.2 Staff Evaluation. In addition to Section 3.6 of the LRA, the staff reviewed the pertinent information provided in Section 2.4, "Scoping and Screening Results: Structures," and the

applicable AMP descriptions provided in Appendix B of the LRA to determine whether the aging effects for the component supports had been properly identified and will be adequately managed during the period of extended operation, as required by 10 CFR 54.21(a)(3).

This section of the SER provides the staff's evaluation of the applicant's AMR for the aging effects and the appropriateness of the programs credited for the aging management of the component supports at Ginna. The staff's evaluation includes a review of the aging effects considered and the basis for the applicant's elimination of certain aging effects. In addition, the staff has evaluated the appropriateness of the AMPs that are credited for managing the identified aging effects for the component supports.

Aging Effects

Steel. Consistent with the GALL Report, the applicant identified loss of material as an applicable aging effect for carbon steel component supports. For the carbon steel expansion/grouted anchors, the applicant identified reduction in anchor capacity as an applicable aging effect. For carbon steel component supports that are exposed to boric acid corrosion, the applicant also identified loss of material as an applicable aging effect. For the NSSS pipe and component supports, the applicant identified loss of material, as well as loss of mechanical function as applicable aging effects. Finally, for high-strength structural fasteners, in addition to loss of material, the applicant also identified cracking due to SCC as an applicable aging effect. Each of the above aging effects for steel components is consistent with the GALL Report recommendations.

For stainless steel fasteners, plates, channel support members, and beams that are exposed to raw water, the applicant identified loss of material as an applicable aging effect.

Elastomers. Consistent with the GALL Report recommendations, for elastomers used in cabinet door seals, gaskets, and as vibration equipment mounts, the applicant identified cracking, change in material properties, and reduction/loss of isolation function as applicable aging effects.

Aluminum. For aluminum electrical conduits and supports, the applicant did not identify any applicable aging effects; however, LRA Table 3.6.2-1 states that the Structures Monitoring Program will be used to inspect these components during the period of extended operation.

Concrete/Grout. For the grout used in the expansion/grouted anchors and for equipment foundations, the applicant identified reduction in anchor capacity as an applicable aging effect.

Wood. For the wood that is used as a platform base in a fan assembly and as an electrical cable spacer, the applicant did not identify any applicable aging effects; however, LRA Table 3.6.2-11 states that the Structures Monitoring Program will be used to inspect these components during the period of extended operation.

Aging Management Programs

Tables 3.6-1 and 3.6-2 of the LRA credit the following AMPs with managing the identified aging effects for the component supports:

- Bolting Integrity Program

- Boric Acid Corrosion Program
- ASME Section XI, Subsection IWF Inservice Inspection Program
- Periodic Surveillance and Preventive Maintenance Program
- Structures Monitoring Program
- Systems Monitoring Program

The applicant credits the above listed AMPs to manage the aging effects associated with the component supports. Four of the AMPs (i.e., the Bolting Integrity, Boric Acid Corrosion, Periodic Surveillance and Preventive Maintenance, and Systems Monitoring Program) are credited to manage aging for components in other system groups (common AMPs) while the remaining AMPs (ASME Section XI, Subsection IWF, Inservice Inspection and Structures Monitoring Programs) are credited with managing aging only for structures and structural components. The staff's evaluation of the common AMPs credited with managing aging in structures and structural components is provided in Section 3.0.3 of this SER. The Structures Monitoring Program is evaluated in Section 3.0.3.10 of this SER and the ASME Section XI Subsection IWF Inservice Inspection Program is covered in Section 3.5.2.3.2 of this SER.

After evaluating the applicant's AMR for each of the components comprising the structures other than containment, the staff evaluated the AMPs listed above to determine if they are appropriate for managing the identified aging effects. For those components identified in Table 3.6-1 of the LRA, the staff verified that the applicant credited the AMP recommended by the GALL Report. For the components identified in Table 3.6-2, the staff verified that the applicant credited an AMP that is appropriate for the identified aging effect(s).

For the aging management of carbon steel structural fasteners, the Structures Monitoring Program, Boric Acid Corrosion Program, and Bolting Integrity Program are all used. In RAI 3.6-8, the staff asked the applicant to describe the interaction of these three AMPs with regard to the aging management of structural fasteners. In response to RAI 3.6-8, the applicant stated the following:

> The Bolting Integrity Program consists of four separate aging management programs, in addition to the Boric Acid Corrosion Program and Structures Monitoring Program, which manage the effects of aging associated with bolting. These four programs are: (1) ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection Program, (2) ASME Section XI, Subsection IWF Inservice Inspection Program, (3) Periodic Surveillance and Preventive Maintenance Program, and (4) Systems Monitoring Program. These six programs encompass the requirements for and attributes of the Bolting Integrity Program.
>
> Structural bolting is inspected under two separate aging management programs: Structures Monitoring Program and Boric Acid Monitoring Program.
>
> Visual inspections of bolting associated with structures within the scope of the Structures Monitoring Program are performed concurrent with the structure inspection. Structural bolting is inspected visually for evidence of corrosion, pitting, cracking, loose or missing hardware, evidence of boric acid buildup, physical damage or deformation, proper thread engagement of all nuts, proper bolt pattern, elongated or oversized bolt holes, proper washers, and proper stud alignment into the building structure.
>
> The scope of the Boric Acid Corrosion Program includes visual examinations of structures, components and associated bolting in all areas and spaces that could potentially be wetted and damaged by leaking boric acid. The program relies on visual inspections conducted during normal plant walkdowns and while performing maintenance work, as well as VT-2 inspections performed at operating pressure and temperature of systems that contain boric acid. The program incorporates the guidelines in NRC GL 88-05 and thereby provides for timely detection of leakage by observance of boric acid crystals deposits.

> The ASME Section XI, Subsections IWB, IWC, & IWD Inservice Inspection Program, the ASME Section XI, Subsection IWF Inservice Inspection Program, the Periodic Surveillance and Preventive Maintenance Program, and the Systems Monitoring Program are described in Sections B2.1.2, B2.1.4, B2.1.23, and B2.1.33, respectively, of the LRA.
>
> It is important to note that volumetric inspections (UT) are performed on high strength fasteners associated with Class 1 component supports under the ASME Section XI Subsection IWF ISI Program.

The applicant's aging management of bolting, as detailed in response to RAI 3.6-8, is consistent with the recommendations of the GALL Report. The only difference is that the applicant has combined several different AMPs under a single program, Bolting Integrity Program, to manage bolting. As such, RAI 3.6-8 is considered closed.

3.5.2.4.3.3 Conclusions. The staff has reviewed the information in Sections 2.4 and 3.6 of the LRA, the applicant's responses to the staff's RAIs, and the applicable AMP descriptions in Appendix B of the LRA. On the basis of this review, the staff concludes that the applicant has demonstrated that the aging effects associated with the component supports will be adequately managed so that there is reasonable assurance that these components will perform their intended functions in accordance with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.3 Evaluation Findings

On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the structures and structural components, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation. The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR supplement for Ginna provides an adequate program description of the AMPs credited for managing aging effects, as required by 10 CFR 54.21(d).

3.6 Electrical and Instrumentation and Controls

This section addresses the aging management of electrical and instrumentation and controls (I&C) components. The components have been divided into commodity groups as described in the following LRA sections:

- medium voltage insulated cables and connectors (2.5.1)
- low voltage insulated cables and connectors (2.5.1)
- electrical penetration assemblies (2.5.1)
- electrical phase bus (2.5.1)
- switchyard bus (2.5.1)
- transmission conductors (2.5.1)
- uninsulated ground conductors (2.5.1)
- high voltage insulators (2.5.1)

LRA Section 2.5.1 concluded that only the following commodity groups required an AMR:

- medium voltage insulated cables and connectors
- low voltage insulated cables and connectors

- electrical penetration assemblies
- electrical phase bus
- switchyard bus
- high voltage insulators

3.6.1 Summary of Technical Information in the Application

In LRA Section 3.7, the applicant described its AMRs for the components within the electrical and I&C commodity groups at Ginna. The description of the electrical and I&C commodity groups can be found in LRA Section 2.5.

The results of the AMR of the electrical and I&C components are provided in LRA Section 3.7 and summarized in Table 3.7-1 and Table 3.7-2. Table 3.7-1 shows the aging management of system components evaluated in the GALL Report that are relied on for license renewal of the electrical and I&C components at Ginna. Table 3.7-2 contains the AMR results for those components that are not addressed in the GALL Report. A plant component is considered to be not addressed by the GALL Report if the component type is not evaluated in the GALL Report or it has a different material of construction or operating environment than evaluated in the GALL Report.

LRA Section 3.7 describes how the materials of construction of a component and the environments to which it is exposed were identified and then utilized in the AMRs. After the components requiring AMR were identified and grouped by materials of construction and environment, a review of industry and plant-specific operating experience was performed. The purpose of this review was to assure that all applicable aging effects were identified, and to evaluate the effectiveness of existing AMPs. This experience review was performed utilizing various industry and plant-specific programs and databases. Industry operating experience sources included NRC generic publications (including information notices, circulars, bulletins, and generic letters), Institute of Nuclear Power Operators (INPO) significant operating event reports (SOERs), Electric Power Research Institute (EPRI) technical reports, and other information sources, such as the Sandia Aging Management Guidelines for Electrical Cable and Terminations, Westinghouse generic technical reports (GTRs), and the GALL Report. Plant- specific operating experience sources included semi-annual and Annual Reports to Atomic Energy Commission (AEC)/NRC, abnormal occurrence and licensee event reports (LERs), non-conformance reports (NCRs), corrective action reports (CARs), refueling, inspection and overhaul Reports (RIOs), Inservice Inspection (ISI) Reports, Identified Deficiency Reports (IDRs), and action reports (ARs) from 1969 to the present. Information from these sources was compiled in various databases. Based upon the material of construction, the applicable environments, and operating experience, the potential aging effects requiring management for each of the components was identified as documented in Table 3.7-1 and Table 3.7-2.

3.6.2 Staff Evaluation

In Section 3.7 of the LRA, the applicant describes its AMR for electrical and I&C systems at Ginna. The staff reviewed LRA Section 3.7 to determine whether the applicant had provided sufficient information to demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB throughout the period of extended operation, in accordance with the requirements of 10 CFR 54.21(a)(3), for electrical and I&C system components that are determined to be within the scope of license renewal and subject to an

AMR.

The applicant referenced the GALL Report in its AMR. The staff has previously evaluated the adequacy of the aging management of electrical and I&C system components for license renewal as documented in the GALL Report. Thus, the staff did not repeat its review of the matters described in the GALL Report, except to ensure that the material presented in the LRA was applicable and consistent with GALL, and to verify that the applicant had identified the appropriate programs as described and evaluated in the GALL Report. The staff evaluated those aging management issues recommended for further evaluation in the GALL Report. The staff also reviewed aging management information submitted by the applicant that was different from that in the GALL Report or was not addressed in the GALL Report. Finally, the staff reviewed the UFSAR Supplement to ensure that it provided an adequate description of the programs credited with managing aging for the electrical and I&C system components.

Table 3.6-1 below provides a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.7 that are addressed in the GALL Report.

Table 3.6-1

Staff Evaluation Table for Ginna Electrical Components Evaluated in the GALL Report

Component Group	**Aging Effect/ Mechanism**	**AMP in GALL Report**	**AMP in LRA**	**Staff Evaluation**
Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements	Degradation due to various aging mechanisms	Environmental Qualification of Electrical Components	Environmental Qualification Program	Staff evaluation of TLAAs or EQ equipment is provided in Section 4.4.
Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/thermoxidative degradation of organics; radiolysis and photolysis (ultraviolet [UV] sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	Aging management program for electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements	Consistent with GALL (see Section 3.6.2.3.1 below).
Electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor IR	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/thermoxidative degradation of organics; radiation-induced oxidation; moisture intrusion	Aging management program for electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements	Electrical Cables Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits	New AMP proposed by applicant in response to staff questions. Not consistent with GALL. Determined by staff to be an acceptable substitute for GALL program (see Section 3.6.2.3.2 below).
Inaccessible medium-voltage (2 kV to 15 kV) cables (e.g., installed in conduit or direct buried) not subject to10 CFR 50.49 EQ requirements	Formation of water trees, localized damage leading to electrical failure (breakdown of insulation); water trees caused by moisture intrusion	Aging management program for inaccessible medium-voltage cables not subject to 10 CFR 50.49 EQ requirements	N/A	Not applicable. No underground cables within license renewal scope.
Electrical connectors not subject to 10 CFR 50.49 EQ requirements that are exposed to borated water leakage	Corrosion of connector contact surfaces caused by intrusion of borated water	Boric acid corrosion	Boric Acid Corrosion Program	Consistent with GALL (see Section 3.6.2.1 below and SER Section 3.0.3.4).

The staff's review of the electrical and I&C systems group for the Ginna LRA is contained within four sections of this SER. Section 3.6.2.1 is the staff review of components in the electrical and I&C systems that the applicant indicates are consistent with GALL and do not require further evaluation. Section 3.6.2.2 is the staff review of components in the electrical and I&C systems that the applicant indicates are consistent with GALL and GALL recommends further evaluation. Section 3.6.2.3 is the staff evaluation of aging management programs that are specific to the

electric and I&C components. Section 3.6.2.4 contains an evaluation of the adequacy of aging management for components in the electrical and I&C systems group and includes an evaluation of components in the electrical and I&C systems that the applicant indicates are not in GALL.

3.6.2.1 *Aging Management Evaluations in the GALL Report That Are Relied on for License Renewal, Which Do Not Require Further Evaluation*

For component groups evaluated in GALL for which the applicant has claimed consistency with GALL, and for which GALL does not recommend further evaluation, the staff toured plant spaces that the license renewal application indicated did not contain any license renewal functions to determine whether components were improperly eliminated from the scope of license renewal. The staff also identified several areas where additional information or clarification was needed. The staff's evaluation of the applicant's responses to those RAIs are included in Sections 3.6.2.3.1and 3.6.2.3.2 of this SER.

On the basis of its review, the staff has verified the applicant's claim of consistency with the GALL report. The staff finds that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 50.21(a)(3).

3.6.2.2 *Aging Management Evaluations in the GALL Report That Are Relied on for License Renewal, For Which GALL Recommends Further Evaluation*

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with GALL, and for which the GALL Report recommends further evaluation, the staff reviewed the applicant's evaluation to determine whether it adequately addressed the issues for which GALL recommended further evaluation. In addition, the staff sampled components in these groups to determine whether the plant-specific components contained in these GALL component groups were bounded by the GALL evaluation.

The GALL Report indicates that further evaluation should be performed for the electrical equipment subject to environmental qualification. Environmental qualification (EQ) 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 staff's evaluation of this TLAA is documented in Section 4.4 of this SER, following the guidance in Section 4.4 of the SRP-LR.

3.6.2.3 *Aging Management Programs for Electrical and I&C Components*

In SER Sections 3.6.2.1, the staff determined that the applicant's AMRs and associated AMPs will adequately manage component aging in electrical and I&C systems. The applicant has included the appropriate Ginna plant-specific components in the appropriate GALL AMPs. The staff also reviewed information in the Ginna LRA and the applicant's responses to staff questions to ensure that (1) specific electrical and I&C system components were properly evaluated in the applicant's AMR, (2) electrical and I&C components requiring an AMP were put into an appropriate AMP, and (3) the applicant's claim of consistency with the GALL AMPs was accurate.

To perform its review, the staff reviewed the components listed in LRA Tables 2.5.2-1 through 2.5.14-1 to determine whether the applicant had properly identified the applicable AMRs and AMPs needed to adequately manage the aging effects for the components. This portion of the staff

review involved identifying of the aging effects for each component, ensuring that each aging effect was evaluated using the appropriate AMR in Section 3.7, and ensuring that management of the aging effect was captured in the appropriate AMP. The results of the staff review are provided below in Section 3.6.2.4.

The staff also reviewed the UFSAR Supplements for the AMPs credited with managing aging in electrical and I&C system components to determine whether the program descriptions adequately describe the programs.

The applicant credits six AMPs to manage the aging effects associated with electrical and I&C components. Three of the AMPs are credited to manage aging for components in other system groups (common AMPs), while the remaining three AMPs are credited with managing aging only for electrical and I&C components. The staff's evaluation of the common AMPs credited with managing aging in electrical and I&C components is provided in Section 3.0.3 of this SER. The common AMPs include the following programs:

- Boric Acid Corrosion Prevention Program - (3.0.3.4)
- One-Time Inspection Program - (3.0.3.7)
- Periodic Surveillance and Preventive Maintenance Program - (3.0.3.8)

The staff's evaluation of the electrical and I&C component AMPs is provided below.

3.6.2.3.1 Electrical Cables and Connections Not Subject to EQ

<u>3.6.2.3.1.1 Summary of Technical Information in the Application</u>. The applicant's Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is discussed in Item (2) of LRA Table 3.7-1 and in LRA Section B2.1.11. The applicant states that the program is consistent with NUREG-1801, and will adequately manage the potential aging effects for this component. The applicant's analysis of material/environment combinations for normal plant environments indicates that a large majority of components have no aging effects that require management throughout the period of extended operation. Exceptions to this include PVC cables in containment subject to heating above ambient temperatures (self-heating) and cables installed in adverse localized equipment environments. However, due to plant-specific operating experience, all material/environment combinations will be included in the scope of the program using an encompassing approach.

The applicant provided the Ginna UFSAR Supplement for this program in LRA Section A2.1.9. It states the following:

> The program requires that cables and connections in accessible areas exposed to adverse localized environments caused by heat, radiation, or moisture are inspected on a periodic basis. Visual inspections for cable and connector jacket surface anomalies such as embrittlement, discoloration, cracking, and surface contamination are performed at least once every ten years.

<u>3.6.2.3.1.2 Staff Evaluation</u>. In LRA Section B2.1.11, the applicant described its Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed this AMP against the 10 program elements using the guidance in BTP RLSB-1 in Appendix A of the SRP-LR. The staff also reviewed the UFSAR Supplement to determine whether it provides an adequate description of the program.

Under *Program Description* the applicant states that, "Selected cables and connections from accessible areas (the inspection sample) are inspected and represent, with reasonable assurance, all cables and connections in the adverse localized environments." Statements in other sections of the Ginna LRA, however, seem to indicate that all cables and connections within designated buildings/areas will be inspected. It was not clear to the staff whether the inspections under the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will be limited to samples within adverse, localized environments, or whether all cables and connections within the designated buildings/areas will be inspected. If only a sample of all cables and connections are inspected, the applicant was asked to provide the technical basis for the sample, consistent with GALL Program XI.E1 attribute number 3 on *Parameters Monitored/Inspected*. The applicant was also asked to indicate whether the sample will include the PVC cables in containment identified in Item (2) of Table 3.7-1.

The applicant provided responses to these staff questions in letters dated June 10, 2003, and July 11, 2003. The program described in B2.1.11 was revised, and the applicant stated that the scope does not limit the program to adverse localized environments but is structured to identify any such areas that may exist within the plant spaces containing electrical equipment subject to an AMR. The response indicated that, because containment is a plant space within the scope of license renewal, the PVC cables in containment are addressed as part of the program. The response goes on to say that the AMP allows for a graded approach to examination based on operating experience and the specific environment. Therefore, it is not the intent to imply that all the accessible cable and connections within the identified plant building/areas will be visually inspected. When it is clear during the implementation of the program that a plant space contains no significant stressors and is within the analyzed assumptions for limiting materials of construction, then detailed inspections are not likely to occur. However, this does not eliminate the plant space from review for future inspections. A general inspection of the space will be performed in the future to verify that no changes have been made since the last inspection that could add significant stressors or adverse localized environments to the space. These responses resolve the staff's questions on this matter and are acceptable.

The revised *Scope of Program* attribute for this program states the following:

> This inspection program applies to accessible electrical cables and connections within the scope of license renewal that are installed or stored in the following plant buildings/areas (inspection areas):
>
> Auxiliary Building, Standby Auxiliary Feedwater Building, Control Building, All-Volatile- Treatment Building, Cable Tunnel, Diesel Generator Building, Intermediate Building, Reactor Containment, Service Building, Screen House, Turbine Building, Technical Support Center, Transformer Yard
>
> Plant buildings/areas not listed above that are used to store electrical cables and connections in the scope of license renewal for a specific, approved application (i.e., Appendix R equipment restoration) do not have adverse localized environments.

The *Scope of Program* attribute indicates that certain plant buildings/areas not specifically stated to be within scope, that are used to store cables and connections for Appendix R equipment restoration do not have adverse localized environments. This statement was verified to be accurate during the Ginna License Renewal inspections. The inspector toured two warehouses where the licensee stored cables and connections for Appendix R equipment restoration and determined that the licensee controls the environment in the warehouses. The Appendix R

electrical equipment is being stored on shelves above the ground. The warehouses also have a rodent prevention program.

The staff reviewed the applicant's revised UFSAR supplement and found that it provided an adequate summary description of the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program, as required by 10 CFR 54.21(d).

3.6.2.3.1.3 Conclusions. On the basis of its review and audit of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.6.2.3.2 Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits

3.6.2.3.2.1 Summary of Technical Information in the Application. The Ginna LRA states in Item (3) of Table 3.7-1 that cables used in low-level signal applications that are sensitive to reduction in insulation resistance (IR) (e.g., radiation monitoring and nuclear instrumentation) are not consistent with NUREG-1801. RG&E believes that invoking the GALL XI.E1, Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program to manage the effects of aging in accessible non-EQ cable and connectors provides reasonable assurance that these SCs will perform their intended function during the period of extended operation. The aging effects of cable and connector insulation may have very long incubation periods. In essence, routine maintenance, calibration, and repair activities on the active components in an instrument loop initially work to mask indications of cable and cable and connector insulation degradation. Only after the active portions of a loop can no longer be adjusted to compensate for cable and connector degradation would the passive portions of the instrument loop become suspect. Surveillance provides meaningful information, but that information is primarily used to cause changes to the active portions of an instrument loop. The predominant cause of non-event driven degradation in cable and connector insulation is thermal aging. External inspection of cables and connectors and their host environments that identifies the possibility of thermal aging long before instrument loop adjustments cannot compensate for current leakage. Because of this, RG&E feels that the only legitimate way to ensure the continued functioning of the long-lived passive components are those inspection activities performed under the GALL XI.E1 program, Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.

3.6.2.3.2.2 Staff Evaluation. Cables used in low-level signal applications that are sensitive to

reduction in IR (e.g., radiation monitoring and nuclear instrumentation) were intended by the staff to be included in GALL program XI.E2, Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits. The applicant, instead, had originally included them in a program that is intended to be consistent with GALL program XI.E1, Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The XI.E1 program is a visual inspection program and the XI.E2 program is a calibration program. The applicant's discussion in Item (3) of LRA Table 3.7-1 indicates that the Ginna treatment of these circuits is not consistent with the GALL Report. It states that external inspection of cables and connectors and their host environments that identifies the possibility of thermal aging long before instrument loop adjustments cannot compensate for current leakage.

The staff asked the applicant to provide evidence or operational experience that supports this statement for non-EQ radiation monitoring and nuclear instrumentation cables. Such evidence could come from non-EQ radiation monitoring and nuclear instrumentation cables in the field or following accelerated aging tests. The staff was looking for examples of cables that exhibited visual signs of thermal aging, even though the current leakage of the circuits was small relative to the output signal level of the circuit. If this information was not available, the staff indicated that the aging management program (XI.E2) identified in NUREG 1801 (GALL Report) should be adopted to ensure that the aging of non-EQ radiation monitoring and nuclear instrumentation cables is appropriately managed, consistent with the requirements in 10 CFR 54.21(a)(3).

Also with regard to this issue, the discussion in Item (3) of LRA Table 3.7-1 indicates that surveillance, such as calibration, may not be as good a choice as visual inspection to detect aging effects in low-signal level instrumentation cable. It states that the predominant cause of non-event-driven degradation in cable and connector insulation is thermal aging.

The staff found that another potential cause of cable degradation is moisture. Chapter 3 of EPRI report TR-103834-P1-2, "Effects of Moisture on the Life of Power Plant Cables," identifies some water-related problems with instrumentation type circuits. The *Operating Experience Summary* states that the first problem type, affecting the noise immunity of instrumentation circuits, was due to submergence degrading the jackets of instrumentation and coaxial cables. It would appear from this statement that activities, such as checking for increases in signal distortion level or other signal anomalies during the calibration process, could add additional benefit to the calibration surveillance and make it a more effective tool for detecting cable aging effects. This would be of particular benefit to the highly sensitive radiation monitoring and nuclear instrumentation circuits on the portion of the cable run that is located in conduit, subject to moisture intrusion, and not capable of being visually checked. The staff asked the applicant to address the moisture question.

The applicant provided its response to the staff questions on these issues in a letter dated June 10, 2003. The applicant states the following:

> Based on the evidence presented in NUREG/CR-5772, RG&E has concluded that the mechanical aging effects are more pronounced than the electrical aging effects and therefore Ginna Station has determined that the visual inspection for mechanical aging effects will be more effective than attempting to implement a program such as that described in NUREG-1801 Section XI.E2.

The response discusses some of the findings in the NUREG, but concludes with the following:

> That being said, Ginna Station periodically performs insulation resistance testing on the Nuclear Instrumentation System circuits and High Range Radiation Monitor circuits. This testing is conducted based on plant specific operating experience and is used to identify gross changes in insulation resistance that could have an adverse impact on circuit operation. While changes in insulation resistance are sometimes caused by heat or radiation, moisture is also a stressor that may cause a reduction in insulation resistance. Ginna Station intends to continue periodic testing throughout the period of extended operation. Therefore, an aging management program based on the measurement of insulation resistance has been provided below. Ginna Station considers that this program more directly addresses the aging effect identified in NUREG-1801 Section XI.E2. Use of the insulation resistance testing does not preclude visual inspections of the accessible portions of these circuits as described in response to RAI 3.7-2.

The staff finds the combination of insulation resistance testing and visual inspection of the nuclear instrumentation system and high range radiation monitor circuits to be an acceptable substitute for GALL program XI.E2. The following program elements for the applicant's version of Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP were provided in the applicant's response:

Program Description. Exposure of electrical cables to adverse localized environments caused by heat, radiation, or moisture can result in reduced IR. An adverse, localized environment is defined as a condition in a limited plant area that is significantly more severe than the specified service condition for the circuit. Reduced IR causes an increase in leakage currents between conductors and from individual conductors to ground. A reduction in IR is a concern for circuits with sensitive, low-level signals such as radiation monitoring and nuclear instrumentation because it may contribute to inaccuracies in the instrument circuit.

The purpose of this AMP is to provide reasonable assurance that the intended function of high-voltage, low-signal circuits exposed to an adverse localized environment caused by heat, radiation, or moisture will be maintained consistent with the CLB throughout the period of extended operation.

In this AMP, an appropriate test, such as an IR will be used to identify the potential existence of a reduction in cable IR.

Scope of Program. This program applies to electrical cables used in circuits with sensitive, high-voltage, low-level signals, such as radiation monitoring and nuclear instrumentation that are within the scope of license renewal. The staff finds this acceptable because it is consistent with the program scope for the circuits identified in GALL.

Preventive Actions. No actions are taken as part of this program to prevent or mitigate aging degradation. The staff concurs with this assessment and does not identify the need for any preventive actions associated with this program.

Parameters Monitored or Inspected. The parameters monitored include a loss of dielectric strength caused by thermal/thermoxidative degradation of organics, radiation-induced oxidation (radiolysis) of organics, or moisture intrusion. The staff finds that periodically monitoring these parameters will adequately detect aging effects covered by this program. Therefore, the staff finds this acceptable.

Detection of Aging Effects. Cables will be tested at least once every 10 years. Testing may include IR, or other testing judged to be effective in determining cable insulation condition.

Following issuance of a renewed operating license, the initial test will be completed before the end of the initial 40-year license term. The staff finds that testing is capable of detecting aging effects applicable to this program.

Monitoring and Trending. Trending actions are not included as part of this program because the ability to trend test results is dependent on the specific type of test chosen. Although not a requirement, test results that are trendable provide additional information on the rate of degradation. The staff finds that monitoring and trending performed is consistent with that identified in GALL for these cables and is acceptable.

Acceptance Criteria. The acceptance criteria for each test is defined by the specific type of test performed and the specific cable tested. The staff finds that acceptance criteria performed is consistent with that identified in GALL for these cables and is acceptable.

Corrective Actions. Corrective actions are implemented at the Ginna station in accordance with the requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," and ANSI N18.7-1976, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants," as committed to in Chapter 17 of the Ginna station UFSAR and described in ND-QAP "Quality Assurance Program." Provisions for timely evaluation of adverse conditions and implementation of any corrective actions required, including root cause determinations and prevention of recurrence where appropriate, are included in the corrective action program.

Corrective actions are implemented through the initiation of an Action Report in accordance with IP-CAP-1, "Abnormal Condition Tracking Initiation or Notification (Action) Report." Equipment deficiencies are corrected through the initiation of a work order in accordance with A-1603.2, "Work Order Initiation".

Confirmation Process. The confirmation process is part of the corrective action program, which is implemented in accordance with the requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," and ANSI N18.7-1976, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants," as committed to in Chapter 17 of the Ginna Station UFSAR. The aging management activities required by this program would also reveal any unsatisfactory condition due to ineffective corrective action.

IP-CAP-1, "Abnormal Condition Tracking Initiation or Notification (Action) Report", includes provisions for tracking, coordinating, monitoring, reviewing, verifying, validating, and approving corrective actions to ensure that effective corrective actions are taken. Potentially adverse trends are also monitored through the action report process. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of an action report. A-1603.6, "post-maintenance/modification testing", includes provisions for verifying the completion and effectiveness of corrective actions for equipment deficiencies. A-1603.6 provides guidance for the selection and documentation of Post-Maintenance Tests (PMTs) or operability tests (OPTs), guidelines to ensure equipment will perform its intended function prior to return to service, and guidelines to ensure the original equipment deficiency is corrected and a new deficiency has not been created.

Administrative Controls. The documents which implement the program are subject to

administrative controls, including a formal review and approval process, are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," and ANSI N18.7-1976, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants," as committed to in Chapter 17 of the Ginna station UFSAR.

Various procedures provide the required administrative controls, including a formal review and approval process, for procedures and other forms of administrative control documents.

ND-PRO, "Procedures, Instructions and Guidelines," and IP-PRO-3, "Procedure Control," provide guidance on procedures and other administrative control documents. IP-PRO-3 provides guidance on procedure hierarchy and classification, content and format, and preparation, revision, review, and approval of nuclear directives and all nuclear operating group procedures. *IP-PRO-4*, "Procedure Adherence Requirements," establishes procedure usage and adherence requirements. IP-RDM-3, "Ginna Records," delineates the system for review, submittal, receipt, processing, retrieval, and disposition of the Ginna station records to meet, at a minimum, the Quality Assurance Program for Station Operation (QAPSO).

Operating Experience*.* Operating experience has shown that anomalies found during cable testing can be caused by degradation of the instrumentation circuit cable and are a possible indication of potential cable degradation. Gross changes in IR may be indicative of cable degradation caused by excessive heat, radiation, or moisture.

The staff reviewed the applicant's revised UFSAR Supplement and found that it provided an adequate summary description of the applicant's AMP, Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits, as required by 10 CFR 54.21(d).

3.6.2.3.2.3 Conclusion. On the basis of its review of the applicant's program, the staff 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, the staff has reviewed the exceptions to the GALL program and finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR Supplement for this AMP and finds that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Therefore, the staff concludes that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs subject to an AMR such that there is reasonable assurance that the activities authorized by a renewed license will continue to be conducted in accordance with the CLB, as required by 10 CFR 54.29(a).

3.6.2.3.3 Environmental Qualification

Environmental qualification 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 staff's evaluation of this TLAA is documented separately in Section 4.4 of this SER, following the guidance in Section 4.4 of the SRP-LR.

3.6.2.4 Aging Management of Plant-Specific Components

The following sections provide the results of the staff's evaluation of the adequacy of aging management for electrical and I&C system components.

3.6.2.4.1 Medium Voltage Insulated Cables and Connectors

3.6.2.4.1.1 Summary of Technical Information in the Application. The description of the medium voltage insulated cables and connectors commodity group can be found in Section 2.5.1 of this SER. LRA Tables 2.5.4-1, 2.5.6-1, and 2.5.8-1 identify the systems which contain this commodity group, as well as the passive function and aging management references for the commodity group. The aging effects and AMR for the components in this commodity group are provided in LRA Table 3.7-1, Item numbers (2), (3), and (5).

Aging Effects

The LRA identified the following applicable aging effects for the medium voltage insulated cables and connectors:

- electrical cables and connections not subject to 10 CFR 50.49 EQ requirements components (Table 3.7-1, Item (2)) – embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/thermoxidative degradation of organics; radiolysis and photolysis (ultraviolet [UV] sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion

- electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor IR components (Table 3.7-1, item (3)) – embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/thermoxidative degradation of organics; radiation-induced oxidation; moisture intrusion

- electrical connectors not subject to 10 CFR 50.49 EQ requirements that are exposed to borated water leakage components (Table 3.7-1, item (5)) – corrosion of connector contact surfaces caused by intrusion of borated water.

Aging Management Programs

The LRA credited the following AMPs with managing the identified aging effects for the medium voltage insulated cables and connectors:

- electrical cables and connections not subject to 10 CFR 50.49 EQ requirements components (Table 3.7-1, item (2)) – Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program

- electrical connectors not subject to 10 CFR 50.49 EQ requirements that are exposed to borated water leakage components (Table 3.7-1, item (5)) – Boric Acid Corrosion program

3.6.2.4.1.2 Staff Evaluation. This section provides the results of the staff's evaluation of the applicant's AMR for the aging effects and the AMPs credited for managing them in medium

voltage insulated cables and connectors. The staff also reviewed the applicable UFSAR Supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects

- electrical cables and connections not subject to 10 CFR 50.49 EQ requirements components (Table 3.7-1, item (2))

The aging effects identified for the components in LRA Table 3.7-1, item (2) (electrical cables and connections not subject to 10 CFR 50.49 EQ requirements components) are consistent with the aging effects for the same components identified in the GALL Report. However, these aging effects only deal with the insulating portions of electrical cables and connections. They do not address the metallic portions (metallic clamps) of fuse holders. Fuse holders are identified in LRA Section 2.5.1 as part of the medium voltage insulated cables and connections commodity group. The staff has developed interim staff guidance (ISG) for fuse holders. The ISG states that fuse holders (including both the insulation material and the metallic clamps) are subject to both an AMR and AMP for license renewal. It indicates that the AMP for fuse holders needs to identify and include fatigue, mechanical stress, vibration, chemical contamination, and corrosion as the following metallic clamp aging stressors, if applicable. Neither the GALL Report nor the applicant's AMR currently address these metallic clamp stressors for fuse holders. The staff is currently working with NEI to develop an appropriate AMP for the fuse holder metallic clamps which will be incorporated into the GALL Report. The applicant provided the following response to a staff question on this subject in a letter dated May 23, 2003:

> Ginna Station has reviewed plant design documents and identified a limited number of fuse holder installations that are not part of a larger assembly. For several of the installations, a failure of the fuse (or fuse holder) does not prevent a safety function identified in 10CFR54.4(a)(1) from being accomplished. All fuse holder installations are enclosed to prevent mechanical damage and exposure to moisture or contaminants. No installations were identified that are used to routinely isolate the load device and therefore fatigue of the metallic portion of the fuse holder is considered unlikely. Additionally, none of the identified installations are subject to significant vibration, chemical contamination, or corrosion. Several of these installations were confirmed by visual inspection. Stress caused by thermal expansion and contraction of the metal is limited to the amount of current carried by the circuit and the frequency of load cycling. Only one power circuit with significant current capacity was identified that contained fuse holders that meet the intended scope of the interim staff guidance. These fuse holders were installed in 1996 as supplemental penetration protection for the pressurizer backup heater group. This heater group is infrequently energized, and would not be subject to significant thermal stress.
>
> Ginna Station reviewed entries in the corrective action program searching for deficiencies related to fuse holders and fuse clips, and determined that there have been a limited number of failures and no failures of such components that are not part of a larger assembly. The deficiencies identified are focused on only those locations such as motor control centers and switchgear where the fuses are removed for component maintenance. All such issues were readily identified during maintenance, and did not adversely impact component function.
>
> Ginna Station reviewed NUREG-1760 and Information Notices identified in the March 10, 2003 letter from the NRC to NEI. NUREG-1760 provides little evidence to suggest that the fuse holders at Ginna Station are subject to aging effects requiring management within the period of extended operation. Issues discussed in Information Notices do not identify a stressor applicable to the fuse installations at Ginna Station. All fuse holders identified at Ginna Station as meeting the intended scope of the interim staff guidance have been installed as part of plant modifications and are not original plant equipment. None of the fuse holders identified as within the scope of the ISG will have

> 40 years of accumulated life at the end of the period of extended operation.
>
> Based on a review of industry operating experience, plant specific operating experience, plant environments, and selected visual inspections, the fuses identified at Ginna Station that meet the intended scope of the interim staff guidance do not have aging effects requiring management within the period of extended operation. Ginna Station will continue to monitor industry and plant specific operating experience for aging effects that may be applicable to components subject to Aging Management Review and take steps as necessary to mitigate applicable aging effects as they arise.

The staff finds that the additional aging stressors evaluated by the applicant in its response for the metallic portions of the fuse holders are consistent with the stressors (fatigue, mechanical stress, vibration, chemical contamination, and corrosion) identified in the staff's fuse holder ISG.

- electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor IR components (Table 3.7-1, item (3))

The aging effects identified for the components in LRA Table 3.7-1, item (3) (electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor IR components) are consistent with the aging effects for the same components identified in the GALL Report.

- electrical connectors not subject to 10 CFR 50.49 EQ requirements that are exposed to borated water leakage components (Table 3.7-1, item (5))

The aging effects identified for the components in LRA Table 3.7-1, item (5) (electrical connectors not subject to 10 CFR 50.49 EQ requirements that are exposed to borated water leakage components) are consistent with the aging effects for the same components identified in the GALL Report.

On the basis of its review, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with medium voltage insulated cables and connectors.

Aging Management Programs

The applicant has credited the following AMPs to manage the aging effects described above for the medium voltage insulated cables and connectors.

- Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Environmental Qualification Requirements Program

The program Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements identified for the components (electrical cables and connections not subject to 10 CFR 50.49 EQ requirements components) in LRA Table 3.7-1, item (2) is consistent with the program for these same components identified in the GALL Report. However, both the programs address only the insulating portions of electrical cables and connections. They do not address the metallic portions (metallic clamps) of fuse holders. Fuse holders are identified in LRA Section 2.5.1 as part of the medium voltage insulated cables and connections commodity group. The staff has developed interim staff guidance (ISG) for fuse holders. The ISG states

that fuse holders (including both the insulation material and the metallic clamps) are subject to both an AMR and AMP for license renewal. It indicates that the AMP for fuse holders needs to identify and include fatigue, mechanical stress, vibration, chemical contamination, and corrosion, as metallic clamp aging stressors, if applicable. Neither the GALL Report nor the applicant's AMR currently address these metallic clamp stressors for fuse holders. The staff is currently working with NEI to develop an appropriate AMP for the fuse holder metallic clamps that will be incorporated into the GALL Report. The Aging Effects section above provides the applicant's response on this subject. Based on that response, the staff agrees that those fuse holders at Ginna that are not subject to fatigue, mechanical stress, vibration, chemical contamination, and corrosion do not fall within the scope of the staff fuse holder ISG and do not require an AMP for the metallic portion of the fuse holder. The Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is an acceptable AMP for the insulating portion of these fuse holders. With regard to the fuse holders that do fall within the scope of the staff's ISG, the applicant stated that none of the fuse holders identified as within the scope of the ISG will have 40 years of accumulated life at the end of the period of extended operation. The staff finds that, based on this fact, these fuse holders do not require an AMP for either the metallic portion or the insulating portion.

- Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program

The program (Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements) identified in the Ginna LRA for the nuclear instrumentation system and high range radiation monitoring circuits components is not consistent with the program for these same components identified in the GALL Report. This issue is evaluated above in Section 3.6.2.3.2.2 of this SER. The applicant committed (reference item #20 Appendix A of this SER) to provide an AMP (applicant's version of Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program) that utilizes an IR test for these components. The staff found the combination of IR testing and visual inspection of the nuclear instrumentation system and high range radiation monitor circuits to be an acceptable substitute for GALL program XI.E2.

- Boric Acid Corrosion Program

The Boric Acid Corrosion program is a common AMP credited for managing components in other system groups, as well as electrical components (electrical connectors not subject to 10 CFR 50.49 EQ requirements that are exposed to borated water leakage components). The Boric Acid Corrosion program is evaluated in Section 3.0.3.4 of this SER.

<u>3.6.2.4.1.3 Conclusions</u>. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing them, for the medium voltage insulated cables and connections, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the medium voltage insulated cables and connections, as required by 10 CFR 54.21(d).

3.6.2.4.2 Low Voltage Insulated Cables and Connectors

3.6.2.4.2.1 Summary of Technical Information in the Application. The description of the low voltage insulated cables and connectors commodity group can be found in Section 2.5.1 of this SER. LRA Tables 2.5.2-1, 2.5.3-1, 2.5.4-1, 2.5.5-1, 2.5.6-1, 2.5.7-1, 2.5.8-1, 2.5.9-1, 2.5.10-1, 2.5.11-1, 2.5.12-1, 2.5.13-1, and 2.5.14-1 identify the systems which contain this commodity group, as well as the passive function and aging management references for the commodity group. The aging effects and AMPs for the components in this commodity group are provided in LRA Table 3.7-1, Item numbers (2), (3), and (5).

Aging Effects

The LRA identified the following applicable aging effects for the low voltage insulated cables and connectors:

- electrical cables and connections not subject to 10 CFR 50.49 EQ requirements components (Table 3.7-1, item (2)) – embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/thermoxidative degradation of organics; radiolysis and photolysis (ultraviolet [UV] sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion

- electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor IR components (Table 3.7-1, item (3)) – embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/thermoxidative degradation of organics; radiation-induced oxidation; moisture intrusion

- electrical connectors not subject to 10 CFR 50.49 EQ requirements that are exposed to borated water leakage components (Table 3.7-1, item (5)) – corrosion of connector contact surfaces caused by intrusion of borated water.

Aging Management Programs

The LRA credited the following AMPs with managing the identified aging effects for the low voltage insulated cables and connectors:

- electrical cables and connections not subject to 10 CFR 50.49 EQ requirements components (Table 3.7-1, item (2)) –- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program

- electrical connectors not subject to 10 CFR 50.49 EQ requirements that are exposed to borated water leakage components (Table 3.7-1, item (5)) – Boric Acid Corrosion program

3.6.2.4.2.2 Staff Evaluation. The staff's technical evaluation for the low voltage insulated cables and connectors commodity group is identical to that provided for the medium voltage insulated cables and connectors commodity group (Section 3.6.2.4.1.2 of this SER).

3.6.2.4.2.3 Conclusion. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects and the AMPs credited for managing the aging effects, for the low voltage insulated cables and connections, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of

extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement provides an adequate program description of the AMPs credited for managing aging in the low voltage insulated cables and connections, as required by 10 CFR 54.21(d).

3.6.2.4.3 Electrical Penetration Assemblies

3.6.2.4.3.1 Summary of Technical Information in the Application. The description of the electrical penetration assemblies commodity group can be found in Section 2.5.1 of this SER. LRA Section 2.5-1 states that all primary containment electrical penetration assemblies at the Ginna station are included in the scope of the environmental qualification program (10 CFR 50.49). The TLAA of electrical penetration assemblies is discussed in LRA Section 4.4.3.

3.6.2.4.3.2 Staff Evaluation. Section 2.5-1 of the LRA states that all primary containment electrical penetration assemblies at the Ginna Station are included in the scope oF the Environmental Qualification Program (10 CFR 50.49). Components that are covered under the program are evaluated in Section 4.4 of this SER.

3.6.2.4.4 Electrical Phase Bus

3.6.2.4.4.1 Summary of Technical Information in the Application. The description of the electrical phase bus commodity group can be found in Section 2.5.1 of this SER. LRA Tables 2.5.4-1 and 2.5.5-1 identify the systems which contain this commodity group, as well as the passive function and aging management references for the commodity group. The aging effects and aging management programs for the components in this commodity group are provided in LRA Table 3.7-2, Item number (1).

Aging Effects

The LRA identified the following applicable aging effects for the electrical phase bus:

- electrical phase bus components (Table 3.7-2, item (1)) – Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/thermoxidative degradation of organics; moisture intrusion

Aging Management Programs

The LRA credited the following AMP with managing the identified aging effects for the electrical phase bus:

- Electrical phase bus components (Table 3.7-2, item (1)) – One-Time Inspection program

3.6.2.4.4.2 Staff Evaluation. This section provides the results of the staff's evaluation of the applicant's AMR for the aging effects and the AMP credited for managing the aging effects in electrical phase bus.

Aging Effects

- electrical phase bus components (Table 3.7-2, item (1))

The discussion in LRA Table 3.7-2, item (1) *Electrical Phase Bus,* indicates that because a one-time inspection found no aging effects requiring management, no additional aging management programs are required through the period of extended operation. The potential aging effects requiring management identified in item (1) for the electrical phase bus appear to be associated with the organic insulating components of the phase bus, although the *Material* column in the table only identifies porcelain insulators at Ginna. NRC IN 89-64 and a recent LRA identify bus duct insulation problems requiring management. IN 89-64 indicates that a combination of cracked insulation and accumulation of dust, debris, and moisture caused failure of the bus. Corrective actions included enhanced periodic inspections and cleaning of bus bars and their housings.

Item (1), *Electrical Phase Bus*, of Table 3.7-2 also does not address aging effects associated with the metallic electrical current carrying components of the phase bus. Oxidation and corrosion of the metallic components, or loosening of the fastener components (bolted bus connections), are examples of aging stressors that were not addressed. For example, oxidation of aluminum electrical connections can be problematic. The oxidation can create a high resistance connection, resulting in additional heating at the connection, and further oxidation until failure occurs.

With regard to the fastener components, Reference 1 to Section 3.7 of the Ginna LRA, Aging Management Guideline for Commercial Nuclear Power Plants, on page 4-38 states:

> Circuits exposed to appreciable ohmic or ambient heating during operation may experience loosening related to the repeated cycling of connected loads or of the ambient temperature environment— Repeated cycling in this fashion can produce loosening of the termination under ambient conditions, and may lead to high electrical resistance joints or eventual separation of the termination from the conductor.

Similarly, NRC IN 2000-14 identifies the phenomenon of “torque relaxation” of bus splice plate connecting bolts that can lead to overheating and arcing at the bus joint connection.

As a result of this background, the applicant was asked to provide a description of its AMP, in accordance with the requirements of 10 CFR 54.21(a)(3), used to detect aging effects associated with these aging stressors, or to provide justification as to why such a program is not needed.

The applicant provided its response in a letter dated July 16, 2003. The response provided the following description of the phase bus at Ginna:

> The phase bus at Ginna within the scope of license renewal is used to provide offsite power from the station auxiliary transformers to Bus 12A and Bus 12B. All phase bus discussed is non-segregated phase bus. The outdoor phase bus installed in the transformer yard was replaced in 1989 to support an offsite power reconfiguration. The outdoor phase bus (Unibus) contains copper conductors and uses an aluminum enclosure. It is non-ventilated, however it contains screened breathers on the bottom of the bus enclosure and electric space heaters for moisture control. Covers are sloped to shed water and gasketed to assist with water tightness. The design of the Unibus provides for overhanging metallic channels such that the gasket is not challenged by normal precipitation. This portion of the switchyard was installed in 1989 and will not have 40 years of operation at the end of the period of extended operation.
>
> The indoor phase bus (Westinghouse bus) is original plant construction and begins at the “link” separating the transformer yard from the control building identified on drawing LR33013-2409. This phase bus is constructed of aluminum conductors and uses a steel enclosure. This phase bus is

non-ventilated and does not contain vents, breather screens, or electric space heaters.

During the offsite power reconfiguration, the Westinghouse bus was cut and a splice box was built to transition to Unibus. These connection surfaces were constructed in 1989, and will have 40 years of operation upon the end of the license renewal period of extended operation.

The response goes on to address aging effects for the phase bus, the conductor heat rise and bolting stress, and a review of insulating materials and antioxidant. The response states that the Ginna station performed a visual inspection of both the Unibus and the Westinghouse bus in 2002. The inspection confirmed the lack of moisture, significant contaminants, and insulation degradation.

The response further stated that the rated ampacity of the 4 kV phase bus at Ginna is 3000 A. The normal loading of the phase bus within the scope of license renewal is less than 500 A under single offsite source operation. During the more common two offsite source operation, this current is split between the two buses. Under startup conditions the conductors may experience a short term increase of no more than 1250 A to carry station auxiliary loads. Therefore, under worst case loading conditions, the maximum current experienced by the phase bus is conservatively calculated at 1750 A. The applicant calculated service temperatures based on this loading and compared them to applicable ANSI standards and the calculated temperatures on the Diablo Canyon phase bus found in IN 2000-14. The Ginna temperatures are significantly lower. The applicant concluded that plastic deformation of connection hardware will not occur and states that this is supported by Section 7.2.4 of EPRI TR-104213, “Bolted Joint Maintenance and Application Guide. The applicant states that, based on analysis and industry guidance, bolt relaxation is not an aging effect requiring management at the Ginna station.

The response provided a review of the insulating materials and antioxidants believed to have been used on the phase bus. Aging information was not readily available for the exact materials of construction, however, the service temperature was evaluated for all materials identified in EPRI 1003057, Table B-3, “License Renewal Electrical Handbook. The response states that, while the original AMR considered all Westinghouse splices to be tape wrapped based on installation instructions, photographs confirm that removable boots are used, and it is reasonable and conservative to consider these connections to be constructed of PVC. The applicant concludes all insulating materials, except the PVC boots, will perform their design function throughout the period of extended operation. The applicant committed (reference item #25 Appendix A of this SER) to visual inspections of boots installed on Westinghouse buses to identify potential degradation due to thermal effects. This inspection will be added to procedures for existing periodic switchgear inspection and preventive maintenance. Switchgear maintenance procedures and requirements for administrative controls will be referenced within the basis document for the Periodic Surveillance and Preventative Maintenance AMP submitted in the LRA and modified by RAI responses. The scope attribute of this program will be modified to indicate that phase bus inspections are included within the program. Because inspections were performed in 2002, inspections will be required to be performed once prior to 2012, and will continue consistent with scheduled bus inspections and maintenance. The program owner will be provided with the option of substituting inspections of 11A and 11B phase buses instead of performing inspections of 12A and 12B phase buses because, although not included within the scope of license renewal, 11A and 11B buses are subject to larger loading and higher resulting temperatures/stresses.

The response provided a review of potential oxidation of phase bus connections. It states that during the offsite power reconfiguration, the Westinghouse bus was cut and a splice box was built

to transition to Unibus. It assumed that Penetrox was used to connect the aluminum to the copper transition piece because the Westinghouse bus was not plated at the field cut/prepared end. In this location, the antioxidant material is credited with preventing oxidation of the connecting surfaces. Also considered in the response is that connection surfaces were constructed in 1989 and will not have 40 years of operation until the end of the license renewal period of extended operation.

The staff has reviewed the information in the response and finds that, because the Unibus outdoor phase bus was installed in 1989 and will have only 40 years of operation at the end of the period of extended operation, it does not require an AMP.

With regard to the Westinghouse phase bus, the staff finds that visual inspection of the 12A and 12B phase bus under control of the Periodic Surveillance and Preventative Maintenance AMP is acceptable for monitoring aging degradation of the phase bus insulating components. The staff does not agree that inspections of the 11A and 11B phase bus is an acceptable substitute for the 12A and 12B inspections. The staff believes the 11A and 11B phase bus inspections can be used to gain insight into potential future aging degradation of the 12A and 12B phase bus, but should not be used as a substitute for the 12A and 12B inspections due to potential dissimilarities in manufacture, assembly, and operation (faults, transients, surges, lightning, etc.). The applicant should remove or modify this provision. In a letter dated September 16, 2003, the applicant stated that the provision for substituting inspections of 11A and 11B phase bus will be removed from the Periodic Surveillance and Preventive Maintenance Program. This resolves this concern.

With regard to torque relaxation of the Westinghouse phase bus connecting bolts, the staff agrees that the conditions at Ginna are less severe than those found on the Diablo Canyon Unit 1 phase bus identified in IN 2000-14. The conditions at Diablo Canyon Unit 1, however, led to early failure of the phase bus in May 2000, less than 20 years following licensing of the plant in 1984. The staff reviewed the EPRI bolting guide referenced by the applicant. The guide provides general good bolting practices and guidelines for the use of threaded fasteners. Sections 6.12 and 7.0 provide guidance on proper assembly of electrical bolted connections. Section 8.2 provides guidance for inspection of electrical bolted joints. The staff believes it’s unlikely the Westinghouse phase bus at Ginna will be subject to the early failures experienced at Diablo Canyon. It is unclear, however, at what electrical loading profile a bolted electrical joint will not be subject to thermal relaxation over a 60-year period. The staff, therefore, believes the applicant should follow the inspection guidance in EPRI TR-104213 calling for bolted joint resistance testing (utilizing an ohm meter of appropriate magnitude), or should obtain the phase bus manufacturer’s (Westinghouse) endorsement that the testing is not required, given the electrical loading profile seen on these phase buses at Ginna. This is Open Item 3.6-1.

With regard to the splice box that was constructed in 1989 to join the existing aluminum conductor Westinghouse phase bus to the new copper conductor Unibus phase bus, the applicant’s response stated that, “It is assumed that Penetrox was used to connect the aluminum to the copper transition piece because the Westinghouse bus was not plated at the field cut/prepared end.” The applicant should confirm that Penetrox or another suitable antioxidant material was indeed used on the electrical joint mating surfaces. Although the splice box will have only 40 years of operation upon the end of the license renewal period of extended operation, lack of a suitable antioxidant coating on the aluminum to copper mating surfaces could result in early failure of the electrical joint. This is Confirmatory Item 3.6-1.

On the basis of its review, the staff finds pending satisfactory resolution of Open Item 3.6-1, and Confirmatory Item 3.6-1, the applicant has identified the appropriate aging effects for the materials and environments associated with the electrical phase bus.

Aging Management Programs

The applicant has credited the following AMPs to manage the aging effects described above for the electrical phase bus.

- One-Time Inspection Program

The One-Time Inspection Program is a common AMP credited to manage aging for components in other system groups as well as the electrical phase bus components. The One-time Inspection Program is evaluated in Section 3.0.3.7 of this SER. The staff believes that the One-time Inspection Program may not be sufficient to manage the aging effects of electrical phase bus components. The discussion above under *Aging Effects* identifies a past history of aging effects and potential aging effects associated with electrical phase bus that require ongoing management. Open Item 3.6-1 and Confirmatory Item 3.6-1 apply.

Periodic Surveillance and Preventative Maintenance Program

The Periodic Surveillance and Preventative Maintenance Program is a common AMP credited to manage aging for components in other system groups, as well as the electrical phase bus components. The Periodic Surveillance and Preventative Maintenance Program is evaluated in Section 3.0.3.8 of this SER. The staff finds that visual inspection of the 12A and 12B phase bus under control of the Periodic Surveillance and Preventative Maintenance AMP is acceptable for monitoring aging degradation of the Westinghouse phase bus insulating components. This AMP, however, by itself does not resolve the other electrical phase bus issues identified above under Aging Effects. Open Item 3.6-1 and Confirmatory Item 3.6-1 apply.

On the basis of its review, the staff finds, pending satisfactory resolution of Open Item 3.6-1 and Confirmatory Item 3.6-1, the applicant has credited the appropriate AMP to manage the aging effects for the materials and environments associated with electrical phase buses. The UFSAR Supplement for the One-time Inspection program is evaluated in Section 3.0.3.8 of this SER, and the UFSAR Supplement for the Periodic Surveillance and Preventive Maintenance Program is evaluated in Section 3.0.3.8 of this SER.

3.6.2.4.4.3 Conclusions. On the basis of its review, pending satisfactory resolution of Open Item 3.6-1 and Confirmatory Item 3.6-1, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing them, for the electrical phase bus, such that there is reasonable assurance that the component 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 UFSAR Supplement for the One-time Inspection program is evaluated in Section 3.0.3.8 of this SER, and the UFSAR Supplement for the Periodic Surveillance and Preventative Maintenance Program is evaluated in Section 3.0.3.8 of this SER.

3.6.2.4.5 Switchyard Bus

3.6.2.4.5.1 Summary of Technical Information in the Application. The description of the switchyard bus commodity group can be found in Section 2.5.1 of this SER. LRA Table 2.5.8-1

identifies the system which contains this commodity group, as well as the passive function and aging management references for the commodity group. The aging AMPs for the components in this commodity group are provided in LRA Table 3.7-2, item number (2).

Aging Effects

The LRA identified the following applicable aging effects for the switchyard bus:

- Switchyard bus components (Table 3.7-2, item (2)) – Loss of material due to corrosion leading to increased resistance

Aging Management Programs

The LRA did not credit an AMP for managing the identified aging effects of the switchyard bus.

3.6.2.4.5.2 Staff Evaluation. This section provides the results of the staff's evaluation of the applicant's AMR for the aging effects and the AMP credited for managing them in the switchyard bus.

Aging Effects

- switchyard bus components (Table 3.7-2, item (2))

The discussion in LRA Table 3.7-2, item (2) Switchyard Bus provides the following information:

> Rochester Gas and Electric's Energy Delivery Department performs inspection and maintenance of the Switchyard Bus components. Switchyard Bus components subject to aging management review contain materials that when exposed to plant operating environments could potentially lead to aging effects requiring management. Plant Operating Experience reviews have not identified any case where aging effects requiring management have developed however, evidence of aging effects may in fact be removed (masked) by ongoing routine Energy Deliver Department maintenance activities. That notwithstanding, the Energy Delivery Department inspections identify if the evidence of an aging mechanism is present and active and also provides the confirmation and verification of the absence of all types of aging effects. Indication of aging effects may be absent if the materials of construction and operational environment preclude an aging effect but, due to the long lead time necessary for some effects to manifest themselves, it is prudent to periodically assess the condition of SSCs regardless of the likelihood that a particular aging mechanism is applicable.
>
> Plant operating experience reviews show that the activities performed by the Energy Delivery Department on the Switchyard Buses are effective in managing Switchyard Bus components. The Maintenance Rule activities monitor the effectiveness of the Energy Delivery Department Activities by tracking system level performance indicators.

It appears that the activities performed by RG&E's Energy Delivery Department may be controlling the aging effects of the switchyard bus. If so, that program should be included under license renewal in accordance with the requirements of 10 CFR 54.21(a)(3). The applicant was, therefore, asked to describe the ten attributes of the switchyard bus AMP consistent with the guidance provided in BTP RLSB-1 of the staff's license renewal SRP (NUREG-1800).

The aging effects identified by the staff in SER Section 3.6.2.4.4.2 above for the metallic portions of the electrical phase bus might also be applicable to the switchyard bus. The applicant was, therefore, also asked to include a discussion of this topic in its response.

The applicant provided its response to the staff questions in a letter dated May 23, 2003, and in a subsequent letter dated July 11, 2003, responding to a follow-up staff clarification question. The July 11, 2003, response states the following:

> While there is no evidence that torque relaxation is an aging effect requiring management, there are several routine maintenance and inspection activities performed at Ginna Station as part of existing programs to ensure safe, reliable operation of the plant. The Preventative Maintenance and Periodic Surveillance program has been previously submitted as part of the License Renewal Application, and subsequently modified by RAI responses. This program includes periodic assessments of performance and condition monitoring activities and associated goals and preventive maintenance activities performed consistent with 10CFR50.65 requirements. This program credits the Equipment Diagnostic Monitoring program which includes the Infrared Thermography Program. As part of this program Ginna Station performs periodic thermography scans of onsite transformer yard components including transformers in the scope of license renewal (12A, 12B), as well as the upstream circuit breakers (52/75112, 52/76702), disconnect switches, and associated 34.5 kV switchyard bus. A review of a typical thermography image shows that normal temperature rise is less than 10°F above ambient, which confirms the initial assumption that temperatures would be minimal and torque relaxation of bolted connections is not an aging effect requiring management within the period of extended operation.
>
> Administrative controls will be implemented prior to the period of extended operation to ensure that thermographic inspections of 34.5 kV transformer yard components are performed at least once within each refueling cycle while components are energized. These controls will ensure that the inspections will not be canceled or deferred without sufficient analysis and justification. This is consistent with other aspects of the Periodic Surveillance and Preventative Maintenance Program as described in License Renewal Program Basis Document LR-PSPM-PROGPLAN. This program will be revised to clarify that the program includes thermographic inspections of selected components, including transformer yard components.

The staff finds that the use of thermography scans of the onsite transformer yard components, including the switchyard bus, is an acceptable means for monitoring potential aging degradation due to torque relaxation of the bolted electrical connections used in these components. These scans will be conducted under the control of the Periodic Surveillance and Preventive Maintenance program.

On the basis of its review, the staff finds that the applicant has identified the appropriate aging effects for the materials and environments associated with the switchyard bus.

Aging Management Programs

The applicant has credited the following AMPs to manage the aging effects described above for the switchyard bus.

- Periodic Surveillance and Preventive Maintenance Program

The LRA did not credit an AMP for managing the identified aging effects of the switchyard bus. However, as indicated above, in response to staff questions, the applicant has committed (reference item #22 Appendix A of this SER) to the use of thermography scans of the onsite transformer yard components, including the switchyard bus. These scans will be conducted under the control of the Periodic Surveillance and Preventative Maintenance program. This program is reviewed in Section 3.0.3.8 of this SER.

On the basis of its review, the staff finds that the applicant has credited the appropriate AMP to manage the aging effects for the materials and environments associated with the switchyard bus.

3.6.2.4.5.3 Conclusion. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects, and the AMP credited for managing them, for the switchyard bus, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.4.7 High Voltage Insulators

3.6.2.4.8.1 Summary of Technical Information in the Application. The description of the high voltage insulators commodity group can be found in Section 2.5.1 of this SER. LRA Table 2.5.8-1 identifies the system which contains this commodity group, as well as the passive function and aging management references for the commodity group. The aging effects and AMP for the components in this commodity group are provided in LRA Table 3.7-2, item number (3).

Aging Effects

The LRA identified the following applicable aging effects for the high voltage insulators:

- High voltage insulator components (Table 3.7-2, item (3)) –- cracks; loss of material due to corrosion; loss of dielectric strength leading to reduced IR

Aging Management Programs

The LRA did not credit an AMP for managing the identified aging effects of the high voltage insulators.

3.6.2.4.8.2 Staff Evaluation. This section provides the results of the staff's evaluation of the applicant's AMR for the aging effects and the AMP credited for managing the aging effects in high voltage insulators.

Aging Effects

- High voltage insulator components (Table 3.7-2, item (3))

The discussion in LRA Table 3.7-2, item (3), *High Voltage Insulators,* is essentially identical to that provided in LRA Table 3.7-2, Item (2) *Switchyard Bus*, identified in SER Section 3.6.2.4.5.2 above. Consistent with the switchyard bus issue, it appears that the activities performed by RG&E's Energy Delivery Department may be controlling the aging effects of the high voltage insulators as well. If so, that program should be included under license renewal in accordance with the requirements of 10 CFR 54.21(a)(3). The applicant was, therefore, asked to describe the ten attributes of the high voltage insulators AMP consistent with the guidance provided in BTP RLSB-1 of the staff's license renewal SRP (NUREG-1800).

The applicant provided its response to the staff questions in a letter dated May 23, 2003, and in a subsequent letter dated July 11, 2003, responding to a followup staff clarification question. The July 11, 2003, response stated that an AMR had been performed for the high voltage insulators within the scope of license renewal at the Ginna station. The response provided the following paragraph based on this AMR.

> Various airborne materials such as dust, and industrial effluents can contaminate insulator surfaces.

> The buildup of surface contamination is gradual and is normally washed away by rain; the glazed insulator surface aids this contamination removal. Surface contamination can be a problem in areas where there are greater concentrations of airborne particles such as near facilities that discharge soot or near the seacoast where salt spray is prevalent. Ginna is located next to a fresh water lake, in a rural, non-industrial area with moderate rainfall where airborne contaminants are comparatively low. There are no facilities in the area that discharge airborne particles that could buildup on the insulators and cause flashover or otherwise adversely impact the intended function. Consequently, the rate of contamination buildup on the insulators is not significant, and would be washed away by normal precipitation if present. A review of industry and plant operating experience identified IN 93-95, *Storm-Related Loss of Offsite Power Events Due to Salt Buildup on Switchyard Insulators.* A review of IN 93-95 concluded that salt buildup is not a valid stressor for high voltage insulators at Ginna Station. Therefore, surface contamination is not an aging effect requiring management for high voltage insulators at Ginna. Visual inspections of the insulators provide confirmatory evidence for this conclusion.

The applicant followed this up with a discussion of the contamination aging mechanism.

> In this case, operating experience provides significant information about the aging mechanisms related to contamination of the high voltage insulators. This degradation mechanism is one that could manifest itself over a short period of time (possibly one year) if conditions for such degradation exist. With more than 30 years of operating experience, a lack of contamination indicates that high voltage insulators do not become contaminated at Ginna Station. At this time, there is no reason to believe that there will be a change in environment that could suddenly permit or contribute to insulator contamination. Therefore for this aging mechanism, operating experience and a lack of exhibited aging effects provides a strong basis to conclude that aging management for high voltage insulators is not required.

The staff agrees with the applicant that, for this aging mechanism, operating experience and a lack of exhibited aging effects provide a basis to conclude that aging management for high voltage insulators is not required. The staff therefore finds that, based on the applicant's discussion of its AMR performed on the high voltage insulators, aging management of these insulators at Ginna is not required.

On the basis of its review, the staff finds the applicant has identified the appropriate aging effects for the materials and environments associated with high voltage insulator components.

Aging Management Programs

The LRA did not credit an AMP for managing the identified aging effects of the high voltage insulators. However, as indicated above, the staff finds that, based on the applicant's discussion of its AMR performed on the high voltage insulators, aging management of these insulators at Ginna is not required.

3.6.2.4.8.3 Conclusion. On the basis of its review, the staff concludes that the applicant has adequately identified the aging effects for the high voltage insulators, such that there is reasonable assurance that the component intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.3 Evaluation Findings

On the basis of its review, pending satisfactory resolution of Open Item 3.6-1 and Confirmatory Item 3.6-1, the staff concludes that the applicant has adequately identified the aging effects, and the AMPs credited for managing the aging effects, for the electrical and I&C system, such that

there is reasonable assurance that the component intended functions will be maintained consistent with the CLB during the period of extended operation. The staff also reviewed the applicable UFSAR Supplement program descriptions and concludes that the UFSAR Supplement for Ginna provides an adequate program description of the AMPs credited for managing aging effects, as required by 10 CFR 54.21(d).