UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 3, 2010

Mr. Thomas Joyce
President and Chief Nuclear Officer
PSEG Nuclear LLC
P.O. Box 236
Hancocks Bridge, NJ 08038

SUBJECT: AUDIT REPORT REGARDING THE HOPE CREEK GENERATING STATION LICENSE RENEWAL APPLICATION (TAC NO. ME1832)

Dear Mr. Joyce:

By letter dated August 18, 2009, Public Service Enterprise Group Nuclear, LLC, submitted an application pursuant to Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR Part 54) for renewal of Operating License NPF-57 for Hope Creek Generating Station. On February 19, 2010, the U.S. Nuclear Regulatory Commission audit team completed the onsite audit of aging management programs. The audit report is enclosed.

If you have any questions, please contact me by telephone at 301-415-2981 or by e-mail at bennett.brady@nrc.gov.

Sincerely,

Bennett M. Brady

Bennett M. Brady, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-354

Enclosure:
As stated

cc w/encl: Distribution via Listserv

September 3, 2010

Mr. Thomas Joyce
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PSEG Nuclear LLC
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Hancocks Bridge, NJ 08038

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Dear Mr. Joyce:

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If you have any questions, please contact me by telephone at 301-415-2981 or by e-mail at bennett.brady@nrc.gov.

Sincerely,
/RA/
Bennett M. Brady, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

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Letter to T. Joyce from B. Brady dated September 3, 2010

SUBJECT: AUDIT REPORT REGARDING THE HOPE CREEK GENERATING STATION LICENSE RENEWAL APPLICATION (TAC NO. ME1832)

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U.S. NUCLEAR REGULATORY COMMISSION

OFFICE OF NUCLEAR REACTOR REGULATION – DIVISION OF LICENSE RENEWAL
AGING MANAGEMENT AUDIT REPORT

Docket No.:	50-354
License No.:	NPF-57
Licensee:	PSEG Nuclear LLC
Facility:	Hope Creek Generating Station
Location:	Alloways Creek Road Hancocks Bridge, New Jersey 08038
Dates:	February 8-19, 2010
Reviewers:	D. Ashley, Sr. Project Manager, Division of License Renewal (DLR) D. Pelton, Branch Chief, DLR R. Auluck, Branch Chief, DLR D. Brittner, Reactor Engineer, DLR D. Nguyen, Electrical Engineer, DLR C. Doutt, Sr. Electrical Engineer, DLR R. Li, Electrical Engineer, DLR A. Sheik, Sr. Structural Engineer, DLR W. Holston, Mechanical Engineer, DLR M. Banic, Engineer, DLR P. Purtscher, Engineer, DCI E. Murphy, Engineer, DCI J. Davis, Advanced Technologies and Laboratories (ATL) W. Pavanich, ATL R. Jackson, ATL E. Patel, ATL D. Naus, Oak Ridge National Laboratory (ORNL) J. Baker, ORNL B. Oland, ORNL K. Axler, Center for Nuclear Waste Regulatory Analysis (CNWRA) J. Mancillas, CNWRA R. Kazban, CNWRA

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Office of Nuclear Reactor Regulation

David L. Pelton, Chief
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Office of Nuclear Reactor Regulation

Introduction

An onsite audit was conducted by the U.S. Nuclear Regulatory Commission (NRC) project team at the Hope Creek Generating Station (HCGS) on February 19, 2010. The purpose of this audit was to examine the applicant's aging management programs (AMPs) for the Hope Creek plant and to verify the applicant's claim of consistency with the corresponding NUREG-1801, "Generic Aging Lessons Learned (GALL) Report" AMPs. Exceptions to the GALL Report AMP elements are evaluated separately as part of the NRC staff's review of the license renewal application (LRA) and documented in the staff's Safety Evaluation Report (SER).

The "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), NUREG-1800, Revision 1, provides the staff guidance for reviewing an LRA. The SRP-LR allows an applicant to reference in its LRA the AMPs described in the GALL Report. If an applicant credits an AMP for being consistent with a GALL Report program, it is incumbent on the applicant to ensure that the plant program contains all of the elements of the referenced GALL Report program. The applicant's determination should be documented in an auditable form and maintained onsite.

During this audit, the staff audited program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria), and program element 10, (operating experience), of the applicant's AMPs. These AMPs were claimed by the applicant to be consistent with the GALL Report. The staff compared the applicant's AMPs to the equivalent elements of the associated AMP described in the GALL Report, unless otherwise indicated in this audit report. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) were audited by another NRC project team during the Scoping and Screening Methodology Audit and are evaluated separately. In addition, the staff verified the conditions at the plant were bounded by the conditions for which the GALL Report program was evaluated.

The staff also examined the applicant's program bases documents and related references for these AMPs and interviewed HCGS representatives to obtain additional clarification related to the AMPs.

LRA AMP B.2.1.1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

In the HCGS LRA, the applicant states that AMP B.2.1.1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, is an existing program that is consistent with the program elements in GALL Report AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the LRA Appendix Section A.2.1.1, Updated Final Safety Analysis Report (UFSAR) Supplement. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "Class 1," "weld," "examination," "ISI," "inspection," "indication," "crack," "flaw," and "internal."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.M1	Salem and Hope Creek Program Basis Document – ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	Revision 1 7/21/2009
N/A	Hope Creek Operating Experience Summary for: Notifications 20341161, 20211152, 20143826, 20141810, 20143882, 20143892, 20139838, 20342133, 20113511; Computer generated reports related to these notifications.	No Revision No. Not dated
HOP03.G03	Hope Creek – Inservice Inspection Program Plan for Third 10-Year Inspection Interval	Revision 0 9/12/2007
ERA-AA-330	Conduct of Inservice Inspection Activities	Revision 7
ERA-AA-330-01	Section XI Pressure Testing	Revision 6
ERA-AA-330-02	Inservice Inspection of Section XI Welds and Components	Revision 6
ER-SH-330-0009	PSEG Nuclear Repair Program Manual for the Control of R and NR Certificates of Authorization	Revision 1 10/1/2008

Based on its review of the listed documents and interview with the applicant, the staff confirmed that the applicant's plant configuration is such that all components specified in applicable ASME Code Section XI, Subsections IWB, IWC, and IWD, examination categories can be inspected and that none have been excluded from inspection based on consideration of the burden upon the licensee that could result if requirements to inspect the component were imposed on the facility. This is consistent with the scope of program described in GALL AMP XI.M1, Element 1.

During the audit of program elements 1-6, the staff found that:

> Elements 1, 2, 3, 5, and 6 (scope of program, preventive actions, parameters monitored or inspected, monitoring and trending, and acceptance criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP; and
>
> Sufficient information was not available to determine whether element 4 (detection of aging effects) of the LRA AMP is consistent with the corresponding element of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element number 4 is consistent with the corresponding element of the GALL Report AMP, the staff indicated that it would consider issuing an RAI for the following subject:

> In element 4 of the LRA AMP the program basis document states that for the current inservice inspection interval risk informed inservice inspection (RI-ISI) alternative requirements apply to Categories B-F, B-J, C-F-1 and C-F-2 piping welds; and the description of the AMP in LRA Section B.2.1.1 states, "The Hope Creek ASME Section XI program also includes a Risk-Informed Inservice Inspection (RI-ISI) program." In the GALL Report AMP, the recommendations in element 4 are based on ASME Code Section XI requirements for examinations as specified for the various component examination categories in IWB-2500, IWC-2500 and IWD-2500. It is not clear to the staff that the statements in the HCGS program basis document and in the LRA are consistent with the recommendations in the GALL Report because it is not clear whether the statements in the LRA AMP and in LRA Section B.2.1.1 refer to only the current ISI interval, which does not carry forward into the period of extended operation, or whether the statements mean that the applicant is proposing in the LRA to continue implementation of alternate methods during the period of extended operation.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of

LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.2 Water Chemistry

In the HCGS LRA, the applicant states that AMP B2.1.2, "Water Chemistry," is an existing program with exceptions that is consistent with the program elements in GALL Report AMP XI.M2, "Water Chemistry." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.2. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions. Issues identified but not resolved in this report are addressed in the SER.

The first exception affects LRA program element 1 (scope) and element 3 (parameters monitored or inspected). In the GALL Report AMP, these program elements recommend that hydrogen peroxide be monitored to mitigate the degradation of structural materials. Alternatively, this program element in the LRA states that the electrochemical corrosion potential (ECP) will be monitored to mitigate the degradation of structural materials.

The second exception affects LRA program element 1 (scope) and element 3 (parameters monitored or inspected). In the GALL Report AMP, this program element recommends that dissolved oxygen is monitored and controlled below levels known to result in loss of material or cracking. Alternatively, this program element in the LRA states that dissolved oxygen is not monitored in the condensate storage tank water, demineralized water storage tank water, spend fuel pool water, and torus water.

The third exception affects LRA program element 1 (scope) and element 3 (parameters monitored or inspected). In the GALL Report AMP, this program element recommends that pH is maintained in accordance with established guidance. Alternatively, this program element in the LRA states pH is not monitored for torus water.

The fourth exception affects LRA program element 1 (scope) and element 4 (detection of aging effects). In the GALL Report AMP, this program element recommends that the aging of standby liquid control (SBLC) system components subject to sodium pentaborate environment relies on control of SBLC poison storage tank water chemistry. Alternatively, this program element in the LRA states that the makeup water to the tank is monitored in lieu of the sodium pentaborate solution in the storage tank.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "chemistry," "corrosion," "pH," "dissolved oxygen," and "cracking."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.M2	Water Chemistry	Revision 2 11/19/2009
BWRVIP-130	BWR Vessel and Internals Project BWR Water Chemistry Guidelines EPRI TR 1008192	No Revision No. 10/2004
BWRVIP-190	BWR Vessel and Internals Project BWR Water Chemistry Guidelines EPRI TR-1016579	No Revision No. 10/2008
CY-AB-120-100	Reactor Water Chemistry	Revision 8 Not dated
HC.CH-TI.ZZ-0012	Chemistry Sampling Frequencies, Specifications and Surveillances	Revision 56 Not dated
CR Number 203400	R14 P220 LLRT-1GSHV-4980/4958 OVER	No Revision No. 10/16/2007

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements. Aspects of program element 1 (scope), element 3 (parameters monitored or inspected), and element 4 (monitoring and trending) of the LRA AMP associated with the exceptions were not evaluated during this audit. Aspects of these program elements that are not associated with the exceptions were evaluated and are described below.

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.3 Reactor Head Closure Studs

In the HCGS LRA, the applicant states that AMP B.2.1.3, "Reactor Head Closure Studs," is an existing program that is consistent with the program elements in GALL Report AMP XI.M3, "Reactor Head Closure Studs." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope of program, preventive actions, parameters monitored/inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.3. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "head stud," "head bolt," "examination," "closure studs," "torque," "preload," "lubricant," "galling," and "tensioner."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.M3	Salem and Hope Creek Program Basis Document for Reactor Head Closure Studs	Revision 2 12/9/2009
Summary No. 100865	Hope Creek Component History Report for RPV Closure Nuts	No Revision No. 12/4/2008
Summary No. 100881	Hope Creek Component History Report for RPV Closure Washers	No Revision No. 12/4/2008
Work Order 70042508	Work Order for Examination, Evaluation and Acceptance or Repair of Hope Creek RPV Head Castle Nut #66	No Revision No. 12/14/2004
HC.MD-FR.KE-0036(Q)	Hope Creek Procedure: Reactor Pressure Vessel Assembly	Revision 14 3/30/2009

Document	Title	Revision / Date
Product V075440	Material Safety Data Sheet for NEV-SZ NUCLEAR NG-8 from Bostik Findley	No Revision No. 9/17/2004
Item No. 51269	Material Safety Data Sheet for N-5000 High Purity Anti-Seize from Loctite	No Revision No. 8/19/2004
Product Name: DAG 156	Material Safety Data Sheet for DAG 156 Graphite in Isopropanol from Acheson Colloids Company	No Revision No. 6/8/2004
CICP Number: 0100-0102	Material Safety Data Sheet for Neolube No. 1 from Huron Industries, Inc.	No Revision No. 1/1/2002

Based on its review of the listed documents and interview with the applicant, the staff confirmed that the applicant does not use thread coatings or lubricants containing molybdenum disulfide (MoS_2) on the reactor head closure studs. Although it is not specifically referenced in GALL AMP XI.M3; NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," includes recommendations that thread lubricants containing MoS_2 not be used because its use increases the likelihood of cracking due to stress corrosion in high strength bolts. The staff finds the applicant's restrictions with regard to use of MO_2 to be consistent with GALL AMP XI.M3, Element 2, which states that preventive actions include use of acceptable surface treatments and stable lubricants.

During the audit of program elements 1-6, the staff found that:

> Elements 1, 2, 3, 5, and 6 (scope of program, preventive actions, parameters monitored/inspected, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP; and
>
> Sufficient information was not available to determine whether element 4 (detection of aging effects) of the LRA AMP was consistent with the corresponding element of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element number 4 is consistent with the corresponding element of the GALL Report AMP, the staff indicated that it would consider issuing an RAI for the following subject:

> In its review of element 4 of the LRA AMP, the staff found that the applicant performs volumetric (not volumetric and surface) examination of reactor head closure studs when they are removed from the reactor vessel flange. In the GALL Report AMP, element 4 states that Examination Category B-G-1 for pressure-retaining bolting greater than 2 inches diameter in reactor vessel specifies surface and volumetric examination of studs when they are removed from the reactor vessel. It is not clear to the staff that these statements are consistent because the applicant does not routinely perform surface examinations of reactor vessel head closure studs when they are removed from the vessel flange.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and

The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

Verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.4 BWR Vessel ID Attachment Welds

In the HCGS LRA, the applicant states that AMP B.2.1.4, "BWR Vessel ID Attachment Welds," is an existing program that is consistent with the program elements in GALL Report AMP XI.M4, "BWR Vessel ID Attachment Welds." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.4. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "cracking," "SCC," "jet pump," "weld," "indication," and "flaw."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
GALL AMP XI.M4	BWR Vessel ID Attachment Welds	Revision 1 2001

Document	Title	Revision / Date
HCGS LRA A2.1.4	BWR Vessel ID Attachment Welds	No Revision No. 8/18/2009
HCGS LRA B2.1.4	BWR Vessel ID Attachment Welds	No Revision No. 8/18/2009
HC-PBD-AMP-XI.M4	BWR Vessel ID Attachment Welds Program Basis Document	Revision 2 12/10/09
BWRVIP-48-A	BWR Vessel and Internals Project Vessel ID Attachment Weld Inspection and Flaw Evaluation Guide	June 2004 Not dated
ER-AB-331	BWR Internals Program Management	Revision 7 Not dated
ER-AB-331-1001	BWR Internals Program	Revision 3 Not dated
ER-AA-330-002	Inservice Inspection of Section XI Welds and Components	Revision 7 Not dated
OU-AA-122	Qualification and Certification of Nondestructive Exam Personnel	Revision 2 Not dated

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.5 BWR Feedwater Nozzle

In the HCGS LRA, the applicant states that AMP B.2.1.5, "BWR Feedwater Nozzle," is an existing program that is consistent with the program elements in GALL Report AMP XI.M5, "BWR Feedwater Nozzle." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.5. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "nozzle," "flaw," "cracking," and "indication."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
Notification No. 20411563	Evaluate N5A N2G & N2H for welding flaws found during ISI outside Section XI exam area	No Revision No. 4/22/2009
Notification No. 20211152	Indication found in N2K nozzle to safe end weld	No Revision No. 1/14/2004
HC-PBD-AMP-XI.M5	BWR Feedwater Nozzle Program Basis Document	Revision 2 12/10/2009
HC-PBD-AMP-XI.M5	Outage ISI Summary Report 2004 (RF12)	No Revision No. 4/26/2005
HC-PBD-AMP-XI.M5	Outage ISI Summary Report 1998 (RF7)	No Revision No. 3/12/1998
NUREG-0619	BWR Feedwater Nozzle and CRD Return Line Nozzle Cracking	Nov. 1980 Not dated
BWROG GE-NE-523-A71-0594-A	Alternative BWR Feedwater Nozzle Inspection Requirements	Revision 1 5/2000
Letter to NRC	Results of BWR Feedwater Nozzle examinations HCGS Docket 50-354	No Revision No. 10/4/1988
N/A	HCGS ISI Program Plan Third Ten-year Inspection Interval	No Revision No. 12/20/1986
ER-AA-330-002	Procedure Inservice Inspection of Section XI Welds & Components	Revision 6 Not dated

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.6 BWR CRD Return Line Nozzle

In the HCGS LRA, the applicant states that AMP B.2.1.6, "BWR Control Rod Drive Return Line Nozzle," is an existing program that is consistent with the program elements in GALL Report AMP XI.M6, "BWR Control Rod Drive Return Line Nozzle." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.8. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "cracking," "SCC," "nozzle," "indication," and "flaw."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
GALL AMP XI.M6	BWR Control Rod Drive Return Line Nozzle	Revision 1 2001
HCGS LRA A2.1.6	BWR Control Rod Drive Return Line Nozzle	No Revision No. 8/18/2009
HCGS LRA B2.1.6	BWR Control Rod Drive Return Line Nozzle	No Revision No. 8/18/2009
HC-PBD-AMP-XI.M6	BWR Control Rod Drive Return Line Nozzle Basis Document	Revision 2 12/10/2009
NUREG-0619	BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking	No Revision No. Nov. 1980
NRC IN 2004-08	Reactor Coolant Pressure Boundary Leakage Attributable to Propagation of Cracking in Reactor Vessel Nozzle Welds	No Revision No. 4/22/2004
Notification No. 20411563	Evaluate N5A N2G & N2H for welding flaws found during ISI outside Section XI exam area	No Revision No. 4/22/2009
Notification No. 20211152	Indication found in N2K nozzle to safe end weld	No Revision No. 1/14/2004

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.7 BWR Stress Corrosion Cracking

In the HCGS LRA, the applicant states that AMP B.2.1.7, "BWR Stress Corrosion Cracking," is an existing program that is consistent with the program elements in GALL Report AMP XI.M7, "BWR Stress Corrosion Cracking." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.7. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "cracking," "SCC," "indication," and "flaw."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
GALL AMP XI.M7	BWR Stress Corrosion Cracking	Revision 1 2001
HCGS LRA A2.1.7	BWR Stress Corrosion Cracking	No Revision No. 8/18/2009
HCGS LRA B2.1.7	BWR Stress Corrosion Cracking	No Revision No. 8/18/2009
HC-PBD-AMP-XI.M7	BWR Stress Corrosion Cracking Program Basis Document	Revision 2 12/8/2009

Document	Title	Revision / Date
Notification No. 20211152	Indication found in N2K nozzle to safe end weld	No Revision No. 1/14/2004
Notification No. 2025554	SIL 624 Stress Corrosion Cracking	No Revision No. 4/6/2000
Notification No. 20060956	SIL 462 R1 Hand Hole Cracking	No Revision No. 3/29/2001
GL 88-01	NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping	No Revision No. 1/25/1988
N/A	Print out from Site database on Hydrogen Injection Availability from Current and Previous refueling cycles	No Revision No. Not dated
OU-AA-122	Qualification and Certification of Nondestructive Exam Personnel	Revision 2 Not dated

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.8 BWR Penetrations

In the HCGS LRA, the applicant states that AMP B.2.1.8, "BWR Penetrations," is an existing program that is consistent with the program elements in GALL Report AMP XI.M8, "BWR Penetrations." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.8. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "cracking," "SCC," "indication," and "flaw."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
GALL AMP XI.M8	BWR Penetrations	Revision 1 2001
HCGS LRA A2.1.8	BWR Penetrations	No Revision No. 8/18/2009
HCGS LRA B2.1.8	BWR Penetrations	No Revision No. 8/18/2009
HC-PBD-AMP-XI.M8	BWR Penetrations Basis Document	Revision 2 12/8/2009
BWRVIP-49-A	BWRVIP, Instrument Penetration Inspection and Flaw Evaluation Guidelines	No Revision No. March 2002
N/A	Print out from Site database on Hydrogen Injection Availability from Current and Previous refueling cycles	No Revision No. Not dated
Notification No. 20211152	Indication found in N2K nozzle to safe end weld	No Revision No. 1/14/2004
OU-AA-122	Qualification and Certification of Nondestructive Exam Personnel	Revision 2

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.9 BWR Vessel Internals

In the HCGS LRA, the applicant states that AMP B.2.1.9, "BWR Vessel Internals," is an existing program that is consistent with the program elements in GALL Report AMP XI.M9, "BWR Vessel Internals." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.9. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "cracking," "SCC," "weld," "indication," "flaw," and "jet pump."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
ER-AB-331-101	BWR Reactor Internals Program	Revision 3 Not dated
Notification No. 20411396	Steam Dryer Support Ring Indications	No Revision No. 4/22/2009
Notification No. 20280742	Indication on steam dryer weld BV-5	No Revision No. 4/18/2006
Notification No. 202574	2 indications on steam dryer weld CH-7a	No Revision No. 4/17/2006
Notification No. 20280947	Steam dryer damage to lower guide	No Revision No. 4/20/2006
Notification No. 20279888	Jet pump wedge wear on JP#2	No Revision No. 7/13/2006
Notification No. 20279979	Jet pump wedge Stellite indications on JP#6	No Revision No. 4/14/2006
HCR-13-IVVI-06-1 & HCR-13-IVVI-06-2	Jet pump indications	No Revision No. 4/2006
HCR14-104342-7	Refuel Outage 14 IVVI Summary	No Revision No. 10/2007
EPRI 1016577	BWRVIP-198, BWRVIP Inspection Trends, 2008 Update	No Revision No. 10/2008
Order 70097073	Steam dryer Support Ring Indications	No Revision No. 4/23/2009

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.10 Thermal Aging and Neutron Embrittlement of CASS

In the HCGS LRA, the applicant states that AMP B.2.110, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)," is an existing program that is consistent with the program elements in GALL Report AMP XI.M10, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.10. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "cracking," "SCC," "CASS," "indication," and "flaw."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
GALL AMP XI.M13	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	Revision 1 2001
HCGS LRA A2.1.10	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	No Revision No. 8/18/2009
HCGS LRA B2.1.10	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	No Revision No. 8/18/2009
HC-PBD-AMP-XI.M13	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program Basis Document	Revision 1 7/22/2009

Document	Title	Revision / Date
LR-N05-0337	Letter from PSEG to NRC, ISI Inspection Activities – 90 day report, Thirteenth Refueling Outage HCGS Docket No. 50-354	No Revision No. 8/8/2006
RA-08-030	Letter from Oyster Creek NGS to NRC License Renewal Commitment Docket No. 50-219	No Revision No. 4/9/2008
OU-AA-122	Qualification and Certification of Nondestructive Exam Personnel	Revision 2 Not dated

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.11 Flow Accelerated Corrosion

In the HCGS LRA, the applicant states that AMP B2.1.11, "Flow Accelerated Corrosion (FAC)," is an existing program that is consistent with an exception to the program elements in GALL Report AMP XI.M17, "Flow-Accelerated Corrosion." To verify this claim of consistency, the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive

actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.11. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions. Issues identified but not resolved in this report are addressed in the SER.

The one exception affects the LRA program element 1 (scope of program) and element 4 (detection of aging effects). In the GALL Report AMP, these program elements recommend using the EPRI guidelines contained in Nuclear Safety Analysis Center-202L-R2, "Recommendations for an Effective Flow Accelerated Corrosion Program" (NSAC-202L-R2), to assure that the structural integrity of all carbon steel lines and valve bodies containing single-phase and two-phase high-energy fluids is maintained. In the LRA, the applicant states that the FAC AMP is based on the EPRI guidelines found in NSAC-202L-R3.

During its audit, the staff reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using keywords: "flow accelerated corrosion," "FAC," and "corrosion."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
NSAC-202L	Recommendations for an Effective Flow Accelerated Corrosion Program	Revision 2 4/1999
NSAC-202L	Recommendations for an Effective Flow Accelerated Corrosion Program	Revision 3 12/2006
EPRI 1013012	Determining Piping Wear Caused by Flow-Accelerated Corrosion form Single-Outage Inspection Data	Revision 0 3/2006
ER-AA-430	Conduct of Flow Accelerated Corrosion Activities	No Revision No. 80096881-1201
ER-AA-430-1001	Guidelines for Flow Accelerated Corrosion Activities	No Revision No. 80096881-1202

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program. Aspects of the program elements 1 and 4 (scope of program and detection of aging effects) of the LRA AMP associated with exceptions were not evaluated during this audit. Aspects of these program elements that are not associated with the exceptions were evaluated and are described below.

During the audit of program elements 1-6, the staff found that:

> Elements 2 (preventive actions), 3 (parameters monitored or inspected), 5 (monitoring and trending), and 6 (acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP;

> Elements 1 (scope of program) and 4 (detection of aging effects) of the LRA AMP were not strictly consistent with the corresponding elements of the GALL Report AMP but sufficient information was available to allow the staff to determine that these elements of the LRA AMP are equivalent to the corresponding elements of the GALL Report AMP.

The basis for the staff's determination that elements 1 (scope of program) and 4 (detection of aging effects) of the LRA AMP are equivalent to the corresponding GALL Report AMP is that NSAC-202L-R3 is essentially equivalent to NSAC-202L-R2 and provides an equivalent function of managing the FAC AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.12 Bolting Integrity

In the HCGS LRA, the applicant states that AMP B.2.1.12, "Bolting Integrity," is an existing program with enhancement and exception that is consistent with the program elements in GALL Report AMP XI.M18, "Bolting Integrity." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement, LRA Section A.2.1.12. For the Bolting Integrity Program, the audit report also considers specific recommendations in the GALL Report related to program element 7 (corrective actions). More general GALL Report recommendations related to program elements 7-9 (corrective actions, confirmation process,

and administrative controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions. Issues identified but not resolved in this report are addressed in the SER.

The one enhancement affects LRA program element 7 (corrective actions). This enhancement expands on the existing program element by modifying the existing program to state that the following bolting materials should not be reused: a) Galvanized bolts and nuts; b) ASTM A490 bolts; c) Any bolt and nut tightened by the turn of the nut method.

In LRA Section A.5, License Renewal Commitment List, Commitment Number 12, the applicant committed to implement this enhancement prior to the period of extended operation.

The one exception affects LRA program element 5 (monitoring and trending). In the GALL Report AMP, this program element recommends that if bolting connection for pressure retaining components (not covered by ASME Section XI) is reported to be leaking, then it may be inspected daily, and that if the leak rate does not increase the inspection frequency may be decreased to biweekly or weekly. Alternatively, this program element in the LRA states that the applicant uses its Corrective Action Program to determine an appropriate inspection frequency for identified leaks in bolting connections.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "bolt," "nut," "preload," "torque," "leak," "thread," and "gasket."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.M18	Program Basis Document – Bolting Integrity	Revision 2 12/15/2009
OU-AA-335-014	VT-1 Visual Examination	Revision 0 Not dated
OU-AA-335-015	VT-2 Visual Examination	Revision 0 Not dated
SH.MD-GP.ZZ-0022	Bolt Torquing and Bolt Sequence Guidelines	Revision 4 6/10/2009
ER-AA-5400-1002	Buried Piping Examination Guide	Revision 1 Not dated
ER-SH-330-0009	PSEG Nuclear Repair Program Manual	Revision 1 Not dated
HCGS Notification 20190648	Bolt Missing on Base Plate of Pipe Support	No Revision No. 5/20/2004
HCGS Notification 20195446	Diesel Generator Lube Oil Leak from Strainer	No Revision No. 7/01/2000
HCGS Notification 20028454	RWCU Pump Flange Found Leaking	No Revision No. 5/02/2000

The staff noted that the applicant's program basis document for AMP B.2.1.12 states that the Bolting Integrity Program follows published EPRI NP-5769 guidelines for safety-related bolting, with the exceptions noted in NUREG 1339, and that material procurement, use of approved lubricants and sealants, proper torquing for preload control, and leakage evaluations are in accordance with applicable EPRI NP-5769 and TR-104213 recommendations. Because these EPRI guidance documents are referenced in GALL AMP XI.M18, Elements 1 and 2, the staff finds the applicant's incorporation of guidance from these documents into its Bolting Integrity Program to be acceptable.

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements. Aspects of program element 5 (monitoring and trending) of the LRA AMP associated with the exception were not evaluated during this audit. Aspects of these program elements that are not associated with the exception were evaluated and are described below

During the audit of program elements 1-6, the staff found that:

> Elements 3, 4, 5, and 6 (parameters monitored/inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP; and
>
> Sufficient information was not available to determine whether elements 1 and 2 (scope of program, and preventive actions) of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element numbers 1 and 2 are consistent with the corresponding elements of the GALL Report AMP, the staff indicated that it would consider issuing RAIs for the following subjects:

> In its description of the LRA AMP, the applicant states that component support and structural bolting are managed as part of the Structures Monitoring Program, crane and hoist bolting is managed as part of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program, aging management of heating and ventilation bolted joints is managed by the External Surfaces Monitoring Program, and bolting in a buried environment is managed by the Buried Piping Inspection Program. In the GALL Report AMP, element 1 states that the program covers bolting within the scope of license renewal, including 1) safety-related bolting, 2) bolting for nuclear steam supply system (NSSS) component supports, 3) bolting for other pressure retaining components, including non-safety related bolting, and 4) structural bolting (actual measured yield strength ≥150 ksi). Also, in the GALL Report AMP, element 2 states that selection of bolting material and use of lubricants and sealants is in accordance with the guidelines of EPRI NP-5769 and the additional recommendations in NUREG-1339, and that bolting replacement activities include proper torquing and application of appropriate preload based on EPRI documents. It is not clear to the staff that the applicant's statement about the LRA AMP is consistent with the recommendations of the GALL Report AMP because it is not clear to the staff that all recommendations credited with managing the aging effects of bolting in the elements of GALL AMP XI.M18 are included in other programs that the applicant credits with managing aging effects of bolting. Also, it is not clear to the staff how procurement,

control of lubricants and sealants, application of appropriate preloads, and proper torquing of bolts are incorporated in the other programs credited by the applicant because those programs primarily involve inspection activities.

During the audit of program element 10 (operating experience), the staff found that:

The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e. no previously unknown aging effects were identified by the applicant or the staff); and

The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

Verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.13 Open-Cycle Cooling Water System

In the HCGS LRA, the applicant states that AMP B2.1.13, "Open-Cycle Cooling Water System," is an existing program that is consistent with the program elements in GALL Report AMP XI.M20, "Open-Cycle Cooling Water System." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.13. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent

database search of the applicant's operating experience database using the keywords: "corrosion," "microbiological corrosion," "MIC," and "chemistry."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.M20	Open-Cycle Cooling Water Program	Revision 2 10/9/2009
CY-AA-120-410	Circulating/Service Water Chemistry	Revision 2 Not dated
CY-AA-120-4110	Raw Water Chemistry Strategic Plan	No Revision No. Not dated
ER-AA-340-1002	Service Water Heat Exchanger Inspection Guide	Revision 3 Not dated
ER-AA-2030	Conduct of Plant Engineering Manual, Step 4.5.2, Step 4.6.5, Attachment 4.	Revision 8 Not dated
S1.OP-PM.SW-0001	Flush of Emergency Diesel Generator SW Supply Header	Revision 1 Not dated
SC.MD-PM.CC-0002	Component Cooling Heat Exchangers 11, 21 and 22 Internal Inspection (6Y)	Revision 13 Not dated
Operator Training Presentation	Performance Monitoring-Equipment Reliability due to Aging and Degradation	Revision 0 12/16/2009
ER-AA-340	GL 89-13 Implementing Procedure	Revision 4 Not dated
CR Number 20156978	25SW Pump Base Drain Has Thru Wall Leak	No Revision No. 8/28/2003
CR Number 20192157	SW Leakage From Valve and Corrosion	No Revision No. 4/20/2005
CR Number 20204610	22SW522 & 523 Have Sever Corrosion	No Revision No. 9/23/2004

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

Based on this audit the staff:

Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.14 Closed-Cycle Cooling Water System

In the HCGS LRA, the applicant states that AMP B2.1.14, "Closed-Cycle Cooling Water System," is an existing program with enhancements and an exception that is consistent with the program elements in GALL Report AMP MI.X21, "Closed-Cycle Cooling Water System." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program element 3 (parameters monitored or inspected), element 4 (detection of aging effects) and element 5 (monitoring and trending). This enhancement expands on the existing program element by adding new recurring tasks for enhancing the performance monitoring of the Closed-Cycle Cooling Water System.

The second enhancement affects LRA program element 3 (parameters monitored or inspected), element 4 (detection of aging effects) and element 5 (monitoring and trending). This enhancement expands on the existing program element by adding new tasks for enhancing the performance monitoring of the Chilled Water System.

The third enhancement affects LRA program element 3 (parameters monitored or inspected), element 4 (detection of aging effects) and element 6 (acceptance criteria). This enhancement expands on the existing program element by adding a one time inspection of selected Closed-Cycle Cooling Water program components in stagnant flow areas to confirm the effectiveness of the Closed-Cycle Cooling Water Program.

The fourth enhancement affects LRA program element 3 (parameters monitored or inspected), element 4 (detection of aging effects) and element 6 (acceptance criteria). This enhancement expands on the existing program element by adding a one time inspection of selected Closed-Cycle Cooling Water Program chemical mixing tanks and associated piping to confirm

the effectiveness of the Closed-Cycle Cooling Water Program on the interior surfaces of the tanks and associated piping.

The fifth enhancement affects LRA program element 2 (preventive action), element 4 (detection of aging effects) and element 5 (monitoring and trending). This enhancement expands on the existing program element by implementing a pure water control program for the plant auxiliary building chilled water system, which is part of the Control Area Chilled Water System. This program will comply with the pure water control program in accordance with EPRI TR 1007820.

The sixth enhancement affects LRA program element 3 (parameters monitored or inspected), element 4 (detection of aging effects) and element 5 (monitoring and trending). This enhancement expands on the existing program element by adding a one-time inspection of selected Control Area Chilled Water System components to confirm the effectiveness of the Closed-Cycle Cooling Water program.

The first exception affects LRA program elements 2-5 (preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending). In the GALL Report AMP, these program elements recommend the use of EPRI Closed Cooling Water Chemistry Guidelines, TR-107396 Revision 0. Alternatively, the applicant has indicated that the Closed-Cycle Cooling Water System Program is based on Revision 1 of this document, which was published in 2004 and is cited as EPRI TR-1007820.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "corrosion," "pH," "chloride," and "chemistry."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.M21	Closed-Cycle Cooling Water Program	Revision 2 12/14/2009
HC.OP-ST.KJ-0001	Emergency Diesel Generator 1XG400 Operability Test	Revision 67 Not dated
HC.OP-IS.EG-0001	Safety Auxiliaries Cooling Pump Surveillances–A SACS Pump XP210-Inservice Test	Revision 30 Not dated
HC.CH-TI.ZZ-0012	Chemistry Sampling Frequencies, Specifications and Surveillance	Revision 55 Not dated
CY-AA-120-400	Closed Cooling Water Chemistry	Revision 11 Not dated
CY-AA-120-4000	Closed Cooling Water Chemistry Strategic Plan	Revision 4 Not dated
EPRI TR 1007820	Closed Cooling Water Chemistry Guideline	Revision 1 4/2004
Operator Training Presentation	Performance Monitoring-Equipment Reliability Due to Aging and Degradation	Revision 0 12/16/2009
CR Number 20223872	Corrosion Inside Cooler 1AVH401	No Revision No. 5/7/2006

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements. Aspects of program elements 2-6 (preventative actions, parameters monitored or inspected, monitoring and trending, acceptance criteria) of the LRA AMP associated with the exception were not evaluated during this audit. Aspects of these program elements that are not associated with the exception were evaluated and are described below.

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope, preventative actions, parameters monitored or inspected, monitoring and trending, acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.15 Inspection of Overhead Load, Refueling

In the HCGS LRA, the applicant states that AMP B2.1.15 "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems," is an existing program with enhancements that is consistent with the program elements in GALL Report AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection

of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.15. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program element 1 (scope of program) and element 3 (parameters monitored or inspected). This enhancement expands on the existing program element by adding visual inspection of structural components and structural bolts for loss of material due to general corrosion, pitting, and crevice corrosion and structural bolting for loss of preload due to self-loosening.

The second enhancement affects LRA program element 1 (scope of program) and element 3 (parameters monitored or inspected). This enhancement expands on the existing program element by adding the requirement for visual inspection of the rails and the rail system for loss of material due to wear.

The third enhancement affects LRA program element 6 (acceptance criteria). This enhancement expands on the existing program element by requiring evaluation of significant loss of material due to corrosion for structural components and structural bolts, and significant loss of material due to wear of rail in the rail system.

In Appendix A, Table A-5 of the LRA, Commitment No.13, the applicant committed to implement these enhancements prior to the period of extended operation.

During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "heavy load," "handling," "polar crane," and "overhead."

During the interview, the staff requested clarification on whether structural bolting, which is inspected as part of this program, is also included in the Bolting Integrity Program. The applicant responded that the structural bolting associated with the overhead handling systems is not included in the Bolting Integrity Program, and that the Bolting Integrity Program states that some bolting is included in other AMPs including this one. The staff was satisfied with the response.

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
Crane Manufactures Association of America, Inc, CMAA Specification No. 70	Specifications for Electrical Overhead Traveling Cranes	No Revision No. 1970
ASME/ANSI B30.2	Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top running Trolley Hoist)	No Revision No. 1976

Document	Title	Revision / Date
ASME/ANSI B30.10	Hooks	No Revision No. 2005
ASME/ANSI B30.11	Monorails and Under hung Cranes	No Revision No. 2004
ASME/ANSI B30.16	Overhead Hoists (Under hang)	No Revision No. 2003
NUREG-0612	Control of Heavy Loads at Nuclear Power Plants, U.S. Nuclear Regulatory Commission	No Revision No. 1980
NRC Bulletin 96-02	Movement of Heavy Loads Over the Spent Fuel, over Fuel in the Reactor Core, or Over Fuel in the Reactor Core, or Over Safety-Related Equipment	No Revision No. 4/11/1996
SH-PBD-AMP-XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No Revision No. 2009

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements.

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e. no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.16 Compressed Air Monitoring

In the HCGS LRA, the applicant states that AMP B2.1.16, "Compressed Air Monitoring," is an existing program that is consistent with the program elements in GALL Report AMP XI.M24, "Compressed Air Monitoring." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.16. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "corrosion," "rust," and "piping."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.M24	Compressed Air Monitoring	Revision 2 12/16/2009
NRC Generic Letter 88-14	Instrument Air Supply Problems Affecting Safety-related Components.	Revision 0 8/8/1988
HC.IC-GP.ZZ-0069	Dew Point Test	Revision 9 Not dated
HC.OP-LR.GS-0100	GS Accumulator and Check Valve Leakage Rate Testing	Revision 0 Not dated
INPO SOER 88-01	Instrument Air System Failures	No Revision No. 5/18/1988
EPRI TR-108147	Compressor and Instrument Air System Maintenance Guide Revision to NP-7079	No Revision No. 5/18/1988
CR Number 20048702	#1 SAC 11ST108 INTCLR VLV Corrosion	No Revision No. 11/30/2000
CR Number 20093958	Replace/Repair Underground 1 ½" Station Air Piping	No Revision No. 03/14/2002

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope, preventative actions, parameters monitored or inspected, monitoring and trending, acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and

The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.17 Fire Protection

In the HCGS LRA, the applicant states that AMP B2.1.17, "Fire Protection," is an existing program with enhancements and an exception that is consistent with the program elements in GALL Report AMP XI.M26, "Fire Protection." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement, Section A.2.1.17. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program element 3 (parameters monitored or inspected), element 4 (detection of aging effects), element 5 (monitoring and trending), and element 6 (acceptance criteria). This enhancement expands on the existing program elements by providing additional inspection guidance to identify degradation of fire barrier walls, ceilings, and floors for aging effects, such as cracking, spalling and loss of material caused by freeze-thaw, chemical attack, and reaction with aggregates.

The second enhancement affects LRA program element 3 (parameters monitored or inspected), element 4 (detection of aging effects), element 5 (monitoring and trending), and element 6 (acceptance criteria). This enhancement expands on the existing program elements by

providing specific guidance for examining exposed external surfaces of the fire pump diesel fuel oil supply line for corrosion during pump tests.
In Appendix A, Table A-5 of the LRA, in Commitment No. 17, the applicant committed to implement these enhancements prior to the period of extended operation.

The first exception affects LRA program element 3 (parameters monitored or inspected) and element 4 (detection of aging effects). In the GALL Report AMP, this program element recommends a visual inspection and function test of the Halon and carbon dioxide (CO_2) systems every six months. Alternatively, this program element in the LRA states that the Halon and Carbon Dioxide fire suppression systems currently undergo functional testing every refueling cycle (18-months).

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "seal rupture," "fire degradation," and "diesel fire pump."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.M26	Program Basis Document – GALL Program XI.M26	Revision 1, 8/21/2009
HC.FP-SV.ZZ-0056 (F)	Fire Barrier Inspection	Revision 4 Not dated
HC.FP-SV.ZZ-0026 (F)	Flood and Fire Barrier Penetration Seal Inspection	Revision 4 Not dated
HC.FP-SV.ZZ-0078 (F)	Drywall Fire Barrier Inspection	Revision 2 Not dated
HC.FP-SV.ZZ-0027 (F)	Class 1 Fire Door Inspection and Operability Test	Revision 6 Not dated
HC.FP-SV.ZZ-0028 (F)	Class 1 Fire Damper Visual Inspection	Revision 2 Not dated
HC.FP-ST.KC-0006 (F)	Fire Pump Capacity Test	Revision 9 Not dated
HC.FP-ST.KC-0021 (F)	CO_2 System Operability and Partial Discharge Test	Revision 11 Not dated
HC.FP-ST.KC-0048 (F)	Halon System Air Flow Test	Revision 3 Not dated
FP-AA-005	Fire Protection Surveillance and Periodic Test Program	Revision 0 Not dated

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements. Aspects of program element 3 (parameters monitored or inspected) and program element 4 (detection of aging effects) of the LRA AMP associated with the exception were not evaluated during this audit. Aspects of these program elements that are not associated with the exception were evaluated and are described below.

During the audit of program elements 1-6, the staff found that:

> Elements 1, 2, 3, and 5 (scope of program, preventive actions, parameters monitored/inspected, and monitoring and trending) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP; and
>
> Sufficient information was not available to determine whether elements 4 and 6 (detection of aging effects and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element numbers 4 and 6 are consistent with the corresponding elements of the GALL Report AMP, the staff indicated that it would consider issuing RAIs for the following subjects:

> In element 4 of the GALL AMP, it states that visual inspections of the halon/CO_2 fire suppression system detect any sign of added degradation, such as corrosion, mechanical damage, or damage to dampers. In element 6 of the GALL AMP it states that any signs of corrosion and mechanical damage of the Halon/CO_2 fire suppression system are not acceptable. However, based on a review of the Program Basis Document that references procedure HC.FP-ST.KC-0021 (F), it was not clear if the applicant performs the visual inspection nor was it clear what acceptance criteria are used.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined; and
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.18 Fire Water System

In the HCGS LRA, the applicant states that AMP B2.1.18, "Fire Water System," is an existing program with enhancements and exceptions that is consistent with the program elements in GALL Report AMP XI.M-27, "Fire Water System." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.18. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions. Issues identified but not resolved in this report are addressed in the SER.
The first enhancement affects LRA program elements 2-6 (preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria). This enhancement expands on the existing program elements to inspect selected portions of the water based fire protection system piping located aboveground and exposed to the fire water internal environment by non-intrusive volumetric examinations, and that these inspections shall be performed prior to the period of extended operation and will be performed every 10 years thereafter.

The second enhancement affects LRA program element 4 (detection of aging effects). This enhancement expands on the existing program elements to replace or perform 50-year sprinkler head inspections and testing using the guidance of NFPA-25 "Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems" (2002 Edition), Section 5-3.1.1. These inspections will be performed by the 50-year inservice date and every 10 years thereafter.

In Appendix A, Table A-5 of the LRA, in Commitment No. 18, the applicant committed to implement these enhancements prior to the period of extended operation.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "biofouling," and "MIC."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.M27	Program Basis Document, Fire Water System	Revision 1 Not dated

Document	Title	Revision / Date
HC.FP-ST.KC-0008 (F)	Fire Main Flow Test	Revision 1 Not dated
HC.FP-ST.KC-0004 (F)	Class 1 Fire Suppression Water System Flush	Revision 4 Not dated
HC.FP-ST.KC-0006 (F)	Fire Pump Capacity Test	Revision 9 Not dated
HC.FP-PM.KC-0036(Z)	Fire Hydrant Inspection	Revision 7 Not dated
FP-AA-005	Fire Protection Surveillance and Periodic Test Program	Revision 0 Not dated
ND.FP-ST.FS-0037 (Q)	Fire Hose Service Test and EP Equipment Inspection	Revision 1 Not dated

The staff asked the applicant to clarify whether gasket inspections are performed as part of the fire hose inspection. The applicant clarified that gaskets are considered short-lived components, because if the fire hose leaks during the hydrotest, the gasket is inspected and replaced if degraded. The staff considers this to be consistent with the GALL AMP.

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements.

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.19 Aboveground Steel Tanks

In the HCGS LRA, the applicant states that AMP B.2.1.19, "Aboveground Steel Tanks," is an existing program with enhancements that is consistent with the program elements in GALL Report AMP XI.M29, "Aboveground Steel Tanks." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.19. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program elements 4, 5, and 6 (detection of aging effects, monitoring and tending, and acceptance criteria). This enhancement expands on the existing program element by adding ultrasonic inspection of the Fire Water Storage Tanks. The enhancement is provided to measure corrosion of bottom surfaces on those specific tanks, which are mounted on concrete pads, where visual inspection is not practicable due to inaccessibility.

The second enhancement affects LRA program elements 2, 4, 5, and 6 (preventive actions, detection of aging effects, monitoring and tending, and acceptance criteria). This enhancement expands on the existing program element by adding removal of insulation to facilitate effective visual inspection of the Fire Water Storage Tank surfaces. Note that the Fire Water Storage Tanks in-scope at the Hope Creek Generating Station are isolated from their concrete foundation by a fiber pad. Hence, the subject AMP does not specify inspection of the interface between the steel and concrete foundation.

In A.2.1.19 of the LRA, the applicant committed to implement these enhancements prior to the period of extended operation.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "corrosion," "tank," and "steel."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.M29	Program Basis Document Aboveground Steel Tanks	Revision 1 8/18/2009
Notification 20122414	External Coating Breakdown Identified	No Revision No. 11/21/2002

Document	Title	Revision / Date
OU-AA-335-015	VT-2 Visual Examination	Revision 0 Not dated
SH-RA-IS.ZZ-0109(Q)	Storage Tank Integrity Testing	Revision 4 12/12/2001
No document number (Presentation)	Performance Monitoring - Equipment Reliability Due to Aging and Degradation	Revision 0 12/16/2009

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements.

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.20 Fuel Oil Chemistry

In the HCGS LRA, the applicant states that AMP B.2.1.20, "Fuel Oil Chemistry," is an existing program with enhancements and exceptions that is consistent with the program elements in GALL Report AMP XI.M30, "Fuel Oil Chemistry." To verify this claim of consistency, the staff

audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.20. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program element 1 (scope of program), element 2 (preventive actions), element 3 (parameters monitored or inspected), and element 4 (detection of aging effects). This enhancement provides equivalent requirements for fuel oil purity and fuel oil testing, as described by the Standard Technical Specifications.

The second enhancement affects LRA program element 1 (scope of program), element 2 (preventive actions), element 3 (parameters monitored or inspected), and element 7 (corrective actions). This enhancement requires the addition of biocides, stabilizers and corrosion inhibitors as determined by fuel oil sampling or inspection activities.

The third enhancement affects LRA program element 1 (scope of program), element 2 (preventive actions), element 3 (parameters monitored or inspected), and element 7 (corrective actions). This enhancement requires internal inspection of Diesel Fire Pump Fuel Oil 280-gallon tank (T-565) using visual inspections and ultrasonic thickness examination of tank bottom.

The fourth enhancement affects LRA program element 1 (scope of program), element 2 (preventive actions), element 3 (parameters monitored or inspected), and element 4 (detection of aging effects). This enhancement provides quarterly water and sediment multilevel sampling on the Diesel Fuel Oil Storage Tanks identified in A.2.1.20, in accordance with ASTM D2709.

The fifth enhancement affects LRA program element 1 (scope of program), element 2 (preventive actions), element 3 (parameters monitored or inspected), and element 4 (detection of aging effects). This enhancement provides internal inspection of the Diesel Fuel Oil Storage Tanks identified in A.2.1.20 using visual inspections and ultrasonic thickness examination of tank bottoms.

The sixth enhancement affects LRA program element 1 (scope of program), element 3 (parameters monitored or inspected), element 4 (detection of aging effects), element 5 (monitoring and trending), and element 6 (acceptance criteria). This enhancement provides quarterly particulate sampling of the Diesel Fire Pump Fuel Oil 280-gallon tank (T-565), in accordance with modified ASTM 2276-00 Method A. The modification consists of using a filter with a pore size of 3.0 microns instead of 0.8 microns.

The seventh enhancement affects LRA program element 1 (scope of program), element 3 (parameters monitored or inspected), and element 4 (detection of aging effects). This enhancement verifies the absence of any significant aging effects of each of the 550-gallon Diesel Fuel Oil Day Tanks, by performing a one-time inspection.

In Appendix A, Table A.5 of the LRA, in Commitment No. 20, the applicant committed to implement these enhancements prior to the period of extended operation.

The first exception affects LRA program element 1 (scope of program), element 3 (parameters monitored or inspected), element 4 (detection of aging effects), and element 6 (acceptance criteria). The GALL Report AMP requires periodic sampling of tanks in accordance with the manual sampling standards of ASTM D 4057-95 (2000). The applicant stated that the 280-gallon Diesel Fire Pump Fuel Oil Tank (T-565) samples are single point samples obtained from the tank drain line located off of the bottom of the tank. This sample is not in accordance with the manual sampling standards as described in ASTM D 4057. The applicant further stated that for fuel oil storage tanks of less than 159 cubic meters spot sampling recommendations in ASTM D 4057-95 (2000) include a single sample from the middle (a distance of one-half of the depth of liquid below the liquid's surface). The 280-gallon Fire Pump Day Tanks are 1.06 cubic meters so the spot sampling recommendations in ASTM D 4057 are applicable. Although the actual sample location for tanks is lower than prescribed by the ASTM D 4057 standard, the sample results are more likely to capture contaminants, water, and sediment, thus making this a conservative sample location for fuel oil containments. Additionally, the applicant stated that the diesel generator is run on a weekly basis (taking suction from the bottom of the tank) and significant stratification is unlikely in such a small tank that is mixed weekly.

The second exception affects LRA program element 1 (scope of program), element 2 (preventive actions), element 3 (parameters monitored or inspected), element 4 (detection of aging effects), element 5 (monitoring and trending), and element 6 (acceptance criteria). The GALL Report AMP requires periodic sampling, draining, cleaning, and internal inspection of tanks, to reduce the potential for loss of material by exposure to fuel oil contaminated with water and microbiological organisms. The applicant stated that multilevel sampling, tank bottom draining, cleaning, and internal inspection of the 550-gallon diesel fuel oil day tanks (1A-T-404, 1B-T-404, 1C-T-404 and 1D-T-404) is not periodically performed. Instead, the applicant stated that fuel oil from the 550-gallon day tanks is recirculated back to the 26,500-gallon storage tanks quarterly. To confirm the absence of any significant aging effects, the applicant will perform a one-time inspection of each of the 550-gallon day tanks and the condition will be entered into the corrective action process for resolution.

The third exception affects LRA program element 1 (scope of program), element 2 (preventive actions), element 3 (parameters monitored or inspected), element 5 (monitoring and trending), and element 6 (acceptance criteria). The GALL Report AMP requires the additions of biocides, stabilizers, and corrosion inhibitors to prevent degradation of the fuel oil quality. The HCGS Fuel Oil Chemistry AMP does not require the addition of biocides, stabilizers, and corrosion inhibitors, but instead requires their use only in response to test results that indicate biocides, stabilizers, and corrosion inhibitors are needed.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "MIC," "microbiological," "pitting," "corrosion," and "tank."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
HC.CH-AP.ZZ-0041, Revision 12	Hope Creek Generating Station Diesel Fuel Oil Testing Program	No Revision No. 80096881-2202
HC.CH-SA.ZZ-0011, Revision 18	Diesel Fuel Oil Sampling	No Revision No. 80096881-2203
N/A	Enhance procedures to include the addition of biocides to minimize biological activity, stabilizers to prevent biological breakdown of the diesel fuel, or corrosion inhibitors to mitigate corrosion as determined by fuel oil analysis activities.	No Revision No. 80096881-22XX
N/A	One-time Internal Inspection of 1A-T-404 - 550-gallon Diesel Fuel Oil Day Tank	No Revision No. 80096881-22XX
N/A	One-time Internal Inspection of 1B-T-404 - 550-gallon Diesel Fuel Oil Day Tank	No Revision No. 80096881-22XX
N/A	One-time Internal Inspection of 1C-T-404 - 550-gallon Diesel Fuel Oil Day Tank	No Revision No. 80096881-22XX
N/A	One-time Internal Inspection of 1D-T-404 - 550-gallon Diesel Fuel Oil Day Tank	No Revision No. 80096881-22XX
7524 Order 30172014	T-565 – 92D Sample & Analyze Diesel Fuel Oil (IAW HC.CH-SA.ZZ-0011 & HC.CH-AP.ZZ-0041)	No Revision No. 80096881-2221

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements. Aspects of program elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP associated with the exceptions were not evaluated during this audit. Aspects of program elements not associated with the exceptions were evaluated and are described below.

During the audit of program elements 1-6, the staff found that:

> Element 5 (monitoring and trending) and element 6 (acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP; and
>
> Elements 1 (scope of program), 2 (preventive actions), 3 (parameters monitored or inspected), and 4 (detection of aging effects) of the LRA AMP were not strictly consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element numbers 1-6 are consistent with the corresponding elements of the GALL Report AMP, the staff indicated that it would consider issuing an RAI for the following subject:

> During the staff review of the enhanced sampling procedures for the main fuel oil storage tank, the diesel fire pump fuel oil storage tanks, and the diesel fuel oil storage tanks, it was noted that the procedures state that if a significant amount of water (greater than two ounces per gallon of fuel) is present, then a Notification per the Corrective Action Plan should be submitted. However, it is not clear how the person performing the testing will be able to complete the analysis with the current level of detail provided in the procedure. For example, with the main fuel oil storage tank, it was unclear how the tester would be able to discern two ounces of water in a 10-gallon sample. With the diesel fire pump fuel oil storage tank sample, it was unclear what level of water was

rejectable, given that only a one liter sample was specified to be drawn. Based on this information, the staff requested that the applicant provide clarification how there is reasonable assurance that the analyses to be performed in the enhanced procedures will be performed correctly.

During the audit of program element 10 (operating experience), the staff found that:

The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and

The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

Verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.21 Reactor Vessel Surveillance

In the HCGS LRA, the applicant states that AMP B.2.1.21, "Reactor Vessel Surveillance," is an existing program with enhancements that is consistent with the program elements in GALL Report AMP XI.M31, "Reactor Vessel Surveillance." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.21. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit.

The first enhancement affects LRA program element 6 (acceptance criteria). This enhancement expands on the existing program element by implementing the BWRVIP-116, "BWR Vessel and

Internals Project integrated Surveillance Program (ISP) Implementation for License Renewal," including the conditions specified by the NRC in its Safety Evaluation dated February 24, 2006.

The second enhancement affects LRA program element 4 (detection of aging effects). This enhancement expands on the existing program element by describing the actions the licensee will undertake if plant operations exceed either the limitations specified in RG 1.99, Rev. 1, or the surveillance data that are to determine the Upper Shelf Energy or P-T limits. In addition, if all the surveillance capsules are removed, the enhancement describes the actions the licensee will undertake, which could include reinstituting an active surveillance for HCGS.

In LRA Section A.5, License Renewal Commitment List, Commitment Number 21, the applicant committed to implement this enhancement prior to the period of extended operation.

During its audit, the staff reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "degradation," "flaw," "weld," and "reactor vessel."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
N/A	Title 10 Code of Federal Regulations (CFR), Chapter 50, Appendix H	No Revision No. 1/1/2009
N/A	NRC Regulation Guide 1.99	Revision 1 Not dated
BWRVIP-116	BWR Vessel and Internals Project integrated Surveillance Program (ISP) Implementation for License Renewal	No Revision No. 7/2003
GALL AMP XI.M31	Reactor Vessel Surveillance	Revision 1 2001
HCGS LRA A2.1.21	Reactor Vessel Surveillance	No Revision No. 8/18/2009
HCGS LRA B2.1.21	Reactor Vessel Surveillance	No Revision No. 8/18/2009

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements.

During the audit, the staff found that:

> Elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e. no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.22 One-Time Inspection

In the HCGS LRA, the applicant states that AMP B.2.1.22, "One-Time Inspection Program," is a new program that is consistent with the program elements in GALL Report AMP XI.M32, "One-Time Inspection." The applicant committed to implementing this program prior to the period of extended operation in License Renewal Commitment 22 of LRA Section A.5, License Renewal Commitment List. To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.22. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "loss of material," "stress corrosion cracking," "fouling," "MIC," "microbiological," "rust," "pitting," "microbiological corrosion," "corrosion," "internal surface corrosion," and "weld."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.M32	One-Time Inspection – Program Basis Document	Revision 2 Not dated
LRA Section B.2.1.22	HCNGS LRA, Appendix B, One-Time Inspection	No Revision No. Not dated
LRA Section A.2.1.22	HCNGS LRA, Appendix A, One-Time Inspection	No Revision No. Not dated
HCGS-SSBD-OTI	Hope Creek One-Time Inspection Sample Basis Document	Revision 0 Not dated

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience identified by the staff's independent database search and supplemented by the applicant is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.23 Selective Leaching of Materials

In the HCGS LRA, the applicant states that AMP B2.1.23, "Selective Leaching of Materials," is a new program that is consistent with the program elements in GALL Report AMP XI.M33, "Selective Leaching of Materials." The applicant committed to implementing this program in the last 10 years of the current term, prior to the period of extended operation in the UFSAR Supplement provided as Appendix A Item A.2.1.23 of the HCGS LRA. To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.23. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "leach," "iron," "copper," and "aluminum."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.M33	Selective Leaching of Materials	Revision 1 7/14/2009
CR Number 20024078	Aluminum Bronze Bolt Torque Values	No Revision No. 3/22/2000

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience identified by the staff's independent database search and supplemented by the applicant is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience identified by the staff's independent database search and supplemented by the applicant is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the applicant has committed to modify the UFSAR Supplement so as to make the program description adequate.

LRA AMP B.2.1.24 Buried Piping

In the HCGS LRA, the applicant states that AMP B.2.1.24, "Buried Piping Inspection," is an existing program with an enhancement that is consistent with the program elements in GALL Report AMP XI.M34, "Buried Piping and Tank Inspection." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.24. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

The one enhancement affects LRA program element 4 (detection of aging effects). This enhancement expands on the existing program element by adding an explicit requirement for at least one inspection of each material type (steel, gray cast iron, and ductile cast iron piping) by either an opportunistic or focused excavation and inspection within ten years prior to entering the period of extended operation and again within the first ten years of the period of extended operation.

In A.2.1.24 of the LRA, the applicant committed to implement the enhancement within ten years prior to entering the period of extended operation and again within the first ten years of the period of extended operation.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "piping," "corrosion," "loss of material," "pitting," "steel," "iron," "underground," and "buried."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
CR 20229886	Determine Rate of Corrosion of Pipe	Revision D 3/24/2005
ER-AA-5400	Buried Piping Program (BPP) Guide Commitment No. 80096880-2001	Revision 1 Not dated
ER-AA-5400-1002	Buried Piping Examination Guide Commitment No. 80096880-2002	Revision 1 Not dated
SA-AA-117	Excavation, Trenching, and Shoring Commitment No. 80096880-2003	Revision 1 Not dated
CR20094719	IGSC in CCW Piping Welds	No Revision No. 3/22/2002

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements.

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.25 External Surfaces Monitoring

In the HCGS LRA, the applicant states that AMP B.2.1.25 "External Surfaces Monitoring," is a new program that is consistent with the program elements in GALL Report AMP XI.M36, "External Surfaces Monitoring." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.25. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "flaw," "corrosion," "inspection," "MIC," "loss of material," "weld," and "rust."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-Xi-M36	External Surfaces Monitoring	Revision 1 7/29/2009
OU-AA-122	Qualification and Certification of Nondestructive Examination (NDE) Personnel	Revision 1 Not dated
ER-AA-2030	Conduct of Plant Engineering Manual	Revision 7 Not dated
CR000080060430	Torus Support Column Pin and Steel Degradation	No Revision No. 4/18/2003
CR000060075899	Tank Surface Rusting/Repaint	No Revision No. 3/14/2007

During the audit of program elements 1-6, the staff found that:

> Elements1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP,

as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.26 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

In the HCGS LRA, the applicant states that AMP B.2.1.26, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," is a new program that is consistent with the program elements in GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.26. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "internal," "surface," and "corrosion."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.M38	Program Basis Document - Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Rev 3 2009
ANSI N-510-1980	Aging Assessment Field Guide	Revision 0 12/2003

Document	Title	Revision / Date
ASME N-1-2008	Testing of Nuclear Air Treatment System	No Revision No. 1980
ASME NQA-1-2008	Quality Assurance Requirements for Nuclear Facility Applications	No Revision No. 2008
ASME N511-2007	In-Service Testing of Nuclear Air Treatment, Ventilation, and Air-Conditioning Systems	No Revision No. 2007
ANSI N45.45.2.6-1978	Qualifications of Inspection, Examination and Testing Personnel for Nuclear Power Plants	No Revision No. 1978

During the audit, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.27 Lubricating Oil Analysis

In the HCGS LRA, the applicant states that AMP B.2.1.27, "Lube Oil Analysis," is an existing program with an exception that is consistent with the program elements in GALL Report AMP XI.M39, "Lubricating Oil Analysis Program." To verify this claim of consistency, the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions,

parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.27. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions. Issues identified but not resolved in this report are addressed in the SER.

The exception affects LRA program element 3 (parameters monitored or inspected). The GALL Report AMP recommends that the flash point be determined for oil in components that do not have regular oil changes. The applicant states that the determination of flash point in lubricating oil is used to indicate the presence of highly volatile or flammable materials in a relatively nonvolatile or nonflammable material, such as found with fuel contamination in lubricating oil. The existing Lubricating Oil Analysis program includes flash point analysis for the in-service emergency diesel generator (EDG) lubricating oil (the only potential application for the introduction of highly volatile or flammable materials) and for all new lubricating oil. The applicant further states that for the remaining components in the scope of the program, determination of flash point is not measured.

During its audit, the staff reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "oil," "pitting," "corrosion," "oxidation," "rust," "leak."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
MA-AA-716-230	Predictive Maintenance Program	No Revision No. 80086881-2701
MA-AA-716-230-1001	Oil Analysis Interpretation Guideline	No Revision No. 80086881-2702
MA-AA-716-230-1004	Lubricant Sampling Guideline	No Revision No. 80086881-2703
MA-AA-716-006	Control of Lubricants Program	Revision 5 80086881-2704
SM-AA-300-1001	Procurement Activities and Responsibilities	Revision 4 80086881-2705

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program. Aspects of program element 3 of the LRA AMP associated with the exception were not evaluated during this audit. Aspects of these elements not associated with the exception were evaluated and are described below.

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.28 ASME Section XI IWE

In the HCGS LRA, the applicant states that AMP B.2.1.28, "ASME Section XI, Subsection IWE," is an existing program with enhancements that are consistent with the program elements in GALL Report AMP XI.S1, "ASME Section XI, Subsection IWE." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.28. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program element 1 (scope of program). This enhancement expands on the existing program element by adding an internal moisture barrier at the junction of the drywell concrete floor and the steel drywell shell prior to the period of extended operation.

The second enhancement affects LRA program element 1 (scope of program). This enhancement expands on the existing program element by adding a revision to the HCGS ASME Section XI, Subsection IWE aging management program implementing documents to

require inspection of the moisture barrier for loss of sealing in accordance with IWE-2500 requirements after it is installed.

The third enhancement affects LRA program element 1 (scope of program). This enhancement expands on the existing program element by adding verification that the reactor cavity seal rupture drain lines are clear from blockage once prior to the period of extended operation and one additional time during the first 10 years of the period of extended operation.

The fourth enhancement affects LRA program element 1 (scope of program). This enhancement expands on the existing program element by adding verification that drains at the bottom of the drywell air gap are clear from blockage once prior to the period of extended operation and one additional time during the first 10 years of the period of extended operation.

The fifth enhancement affects LRA program element 1 (scope of program). This enhancement expands on the existing program element by adding investigation of the source of leakage detected by the reactor cavity seal rupture drain line instrumentation and access its impact on the drywell shell.

The sixth enhancement affects LRA program element 1 (scope of program). This enhancement expands on the existing program element by adding monitoring of the drains at the bottom of the drywell air gap for leakage in the event leakage is detected by the reactor cavity seal rupture drain line instrumentation.

In Appendix B, Subsection B.2.1.28 ASME Section XI, Subsection IWE of the LRA, the applicant committed to implement these enhancements prior to the period of extended operation.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant.

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI-S1, Books 1, 2, and 3	Aging Management Program Basis Document, ASME Section XI, Subsection IWE, GALL Program XI.S1	Revision 2 11/6/2009
SA-PBD-AMP-B.2.1.28, Book 1 of 1	Aging Management Program Results Document, ASME Section XI, Subsection IWE, GALL Program XI.S1	No Revision No. Not dated
Notification Order 70088803	New HCGS Moisture Barrier	No Revision No. Not dated
Notification No. 20245279	Walkdown and Evaluation for IN 2006-01	No Revision No. Not dated
Notification No. 20315604	UT Examination of the Drywell Area	No Revision No. Not dated

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements.

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

In order to obtain the information necessary to verify whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff indicated that it would consider issuing two RAIs for the following subjects:

> Program element 10 for the HCGS ASME Section XI, Subsection IWE aging management program describes water leakage during the 2009 refueling outage from the seal rupture drain line penetration J13 sleeve which is located in the drywell air gap region. Water may be trapped between the concrete and drywell steel below the J13 penetration sleeve since it is located approximately eight feet above the drywell lower air gap drains. This could potentially corrode the drywell steel containment and impact its integrity. Therefore, the staff will consider requesting the applicant to provide plans for determining the root cause and to perform non-destructive examinations (NDE) of the drywell area below the penetration sleeve J13 to demonstrate that water is not trapped in the two inch annular space between the drywell and concrete shield wall.
>
> Program element 10 of the HCGS ASME Section XI, Subsection IWE aging management program describes general corrosion and pitting of the torus shell and deficiencies in the interior coatings identified in 2004 by underwater inspections performed by divers as part of the IWE inspection program. However, the LRA and program basis document do not provide sufficient information for the staff to evaluate and make an assessment regarding the impact of these deficiencies. Therefore, the staff will consider requesting the applicant to provide following additional details of underwater inspections performed during 2004, including extent of degradation due to corrosion and general condition of coating applied to the inside surface of the torus.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

Identified that additional information regarding operating experience is required before an indication regarding the sufficiency of the LRA AMP, as implemented by the applicant, to detect and manage aging can be reached; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.29 ASME Section XI IWF

In the HCGS LRA, the applicant states that AMP B2.1.29, "ASME Section XI, Subsection IWF," is an existing program that is consistent with the program elements in GALL Report AMP XI.S3, "ASME Section XI, Subsection IWF." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.29. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "IN 2009-04," "constant support," and "component support."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.S3	Hope Creek Generating Station Units 1 and 2 and Hope Creek Generating Station ASME Section XI, Subsection IWF	Revision 2 11/06/2009
HOPO3.G03	HCGS ISI Program Plan Hope Creek Generating Station Third Interval,	Revision 0 Not dated
Notification No. 20141931	Supports have medium rust Torus room	No Revision No. Not dated
Notification No. 20140321	Torus Support Column pin and steel degradation	No Revision No. Not dated
Notification No. 20207276	Piping Rupture Condenser; Order No. 70041898, Confirmation #3773029	No Revision No. Not dated

During the audit of program elements 1-6, the staff found that:

> Elements 1 through 6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

In order to obtain the information necessary to verify whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff indicated that it would consider issuing an RAI for the following subject:

> GALL Program XI.M18, Bolting Integrity states that Gall Program XI.S3, "ASME Section XI Subsection IWF" manages inspection of safety related bolting. HCGS station document SH-PBD-AMP–XI.M18 states that the Bolting Integrity AMP follows information as delineated in NUREG-1339, published EPRI NP-5769 guidelines, and industry recommendations. EPRI NP-5769, EPRI TR -104213, and NUREG -1339 recommend inspections for stress corrosion cracking (SCC) to prevent or mitigate degradation and failure of structural bolts with actual yield strength of 150,000 pounds per square inch. However, HCGS LRA Section 3.5.2 states that ASTM A490 bolts, with actual yield strength of 150,000 pounds per square inch, have high resistance to SCC due to their ductility and industry and plant specific operating experience have not identified SCC of ASTM A490 bolts as a concern. The staff will request the applicant to explain the basis for the conclusion that ASTM A490 bolts have resistance to SCC due to their ductility.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Identified that additional information regarding operating experience is required before an indication regarding the sufficiency of the LRA AMP, as implemented by the applicant, to detect and manage aging can be reached; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.30 Appendix J

In the HCGS LRA, the applicant states that AMP B2.1.30, "10 CFR Part 50, Appendix J," is an existing program that is consistent with the program elements in GALL Report AMP XI.S4, "10 CFR Part 50, Appendix J." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.30. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant.

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PDB-AMP-XI.S4	10 CFR Part 50, Appendix J	Revision 2 12/9/2009
Notification 20395653	Unsat. Excessive B CREF Make-up flow	No Revision No. 2009
Order #70075575	R14 LLRT Exceeded IST LIMIT	No Revision No. 04/25/2008
Order #70096871	R15 LLRT Exceeded IST LIMIT	No Revision No. 04/23/2009
Order #70056408	LLRT GB-9531B1 exceeded admin. limit	No Revision No. 04/16/2006
Order #70056413	ABHF-F019 Failed as Found Leak Rate Test	No Revision No. 04/23/2006
Order #70096934	R15 LLRT Exceeded IST Limit	No Revision No. 04/21/2009
Order #70075360	R14 Failed BGFT-F001 Failed as found LLRT	No Revision No. 04/24/2008
NRC IN 92-20	Inadequate Local Leak Rate Testing	No Revision No. 3/3/1992

During the audit of program elements 1-6, the staff found that:

Elements 1-6 (scope of program, preventive action, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

During the audit, the staff asked the applicant about the use of NRC Information Notice (IN) 92-20, specifically concerning the testing of two ply bellows used in the torus of BWR Mark I containments. The applicant stated that HCGS has two ply bellows and has revised the ILRT procedure to incorporate the information from IN 92-20.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.31 Masonry Walls

In the HCGS LRA, the applicant states that AMP B.2.1.31, "Masonry Wall Program," is an existing program with enhancements that is consistent with the program elements in GALL AMP XI.S5, "Masonry Wall Program." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience), and the description as contained in the UFSAR supplement Section A.2.1.31. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program element 1 (scope of program). This enhancement expands on the existing program element by adding the following structures and components: auxiliary boiler building, fire water pump house, masonry wall fire barriers, switchyard, and turbine building.

The second enhancement affects LRA program element 3 (parameters monitored or inspected). This enhancement expands on the existing program element by adding an examination checklist for masonry wall inspection requirements.

The third enhancement affects LRA program element 4 (detection of aging effects). This enhancement expands on the existing program element by specifying an inspection frequency of not greater than five years for the masonry walls.

In A.2.1.31 of the LRA, the applicant committed to implement the enhancement prior to entering the period of extended operation.

During its audit, the staff conducted field walk downs, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "concrete," "corrosion," "cracking," and "masonry."

The table below lists the documents that were reviewed by the staff and found relevant to the onsite audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.S5	Masonry Wall Program, GALL PROGRAM XI.S5 – Masonry Wall Program	Revision 2 Not dated
SH-PBD-AMP-XI.S6	SGS and HCGS Structures Monitoring Program	No Revision No. Not dated
ER-AA-310-1009	Condition Monitoring of Structures	Revision 1 Not dated
NC.DE-TS.ZZ-4302	Analysis and Design of Masonry Walls	Revision 0 Not dated
A-0-ZZ-SEE-1160	Establishment of Requirement for Monitoring the Condition of Structures	Revision 1 Not dated
HCGS UFSAR Section 3.8.4.5.3	Concrete Masonry Walls	Revision 15 10/2006

The staff conducted its onsite audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements.

During the audit, the staff found that:

> Elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and

The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.32 Structures Monitoring

In the HCGS LRA, the applicant states that AMP B.2.1.32, "Structures Monitoring Program," is an existing program with enhancements that is consistent with the program elements in GALL AMP XI.S6, "Structures Monitoring Program." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience), and the description as contained in the UFSAR supplement Section A.2.1.32. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

The enhancements affect LRA program element 1 (scope of program), program element 3 (parameters monitored or inspected), program element 4 (detection of aging effects), and program element 6 (acceptance criteria). In Appendix A of the LRA, the applicant committed to implement these enhancements prior to the period of extended operation.

The first enhancement affects LRA program element 1 (scope of program). This enhancement expands on the existing program element by adding the following structures and components:

Auxiliary boiler building; fire water pump house; shoreline protection dike and sheet piles (RG 1.127); switchyard; turbine building; transmission towers; yard structures (foundations for fire water tanks, manholes, transformer foundations credited SBO); masonry walls, including fire barriers; building penetrations that perform flood barrier, pressure boundary, shelter and protection intended functions; miscellaneous steel (catwalks, vents, louvers, platforms, etc.); pipe whip restraints, jet impingement, and missile shields; ice barriers, trash rack (RG 1.127); panels, racks, cabinets, and other

enclosures; metal-enclosed bus; component supports including electrical cable trays, electrical conduit, tubing, HVAC ducts, instrument racks, battery racks, and supports for piping and components that are not within the scope of ASME Section XI, Subsection IWF; and duct banks that contain safety-related cables and cables credited for SBO and ATWS.

The second enhancement affects LRA program element 3 (parameters monitored or inspected). This enhancement expands on the existing program element by including visual inspections of concrete surfaces around anchors for cracking and spalling.

The third enhancement affects LRA program element 3 (parameters monitored or inspected). This enhancement expands on the existing program element by clarifying that inspections are performed for loss of material due to corrosion and pitting of additional steel components such as embedments, panels and enclosures, doors, siding, metal deck, and anchors.

The fourth enhancement affects LRA program element 3 (parameters monitored or inspected). This enhancement expands on the existing program element by including a one-time inspection of the external stainless steel surfaces of the expansion bellows at condensate storage tank dike for loss of material due to corrosion, within the ten-year period prior to the period of extended operation.

The fifth enhancement affects LRA program element 3 (parameters monitored or inspected). This enhancement expands on the existing program element by requiring inspection of penetration seals, structural seals, and elastomers for degradation (hardening, shrinkage, and loss of strength) that will lead to loss of sealing.

The sixth enhancement affects LRA program element 3 (parameters monitored or inspected). This enhancement expands on the existing program element by requiring monitoring of vibration isolators associated with component supports other than those covered by ASME Section XI, Subsection IWF.

The seventh enhancement affects LRA program element 3 (parameters monitored or inspected). This enhancement expands on the existing program element by adding an examination checklist for masonry wall inspection requirements.

The eighth enhancement affects LRA program element 3 (parameters monitored or inspected). This enhancement expands on the existing program element by enhancing parameters to be monitored for wooden components to include change in material properties, and loss of material due to insect damage and moisture damage.

The ninth enhancement affects LRA program element 4 (detection of aging effects). This enhancement expands on the existing program element by specifying an inspection frequency of not greater than five years for the structures including submerged portions of the service water intake structure.

The tenth enhancement affects LRA program element 4 (detection of aging effects). This enhancement expands on the existing program element by requiring individuals responsible for inspections and assessments for structures to have a Bachelors of Science degree and/or

Professional Engineer license and a minimum of four years experience working on building structures.

The eleventh enhancement affects LRA program element 4 (detection of aging effects). This enhancement expands on the existing program element by performing periodic sampling, testing, and analysis of groundwater chemistry for pH, chlorides, and sulfates on a frequency of five years.

The twelfth enhancement affects LRA program element 4 (detection of aging effects). This enhancement expands on the existing program element by requiring supplemental inspections of the affected in-scope structures within 30 days following extreme environmental or natural phenomena (large floods, significant earthquakes, hurricanes, and tornadoes).

The thirteenth enhancement affects LRA program element 4 (detection of aging effects). This enhancement expands on the existing program element by performing a chemical analysis of ground or surface water in-leakage when there is significant in-leakage or there is reason to believe that the in-leakage may be damaging concrete elements or reinforcing steel.

The fourteenth enhancement affects LRA program element 6 (acceptance criteria). This enhancement expands on the existing program element by including additional acceptance criteria as contained in ACI 349.3R-96.

During its onsite audit, the staff conducted field walk downs, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "boric acid," "concrete," "corrosion," "cracking," "masonry," and "spent fuel pool."

The table below lists the documents that were reviewed by the staff and found relevant to the onsite audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.S6	SGS and HCGS Structures Monitoring Program	Revision3 Not dated
SH-PBD-AMP-XI.S5	SGS and HCGS Masonry Wall Program	Revision2 Not dated
SH-PBD-AMP-XI.S7	SGS and HCGS RG 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plants	Revision 1 Not dated
ER-AA-310-1009	Condition Monitoring of Structures	Revision 1 Not dated
ER-AA-310-1004	Maintenance Rule – Performance Monitoring	Revision 7 Not dated
ER-AA-310	Implementation of the Maintenance Rule	Revision7 Not dated
HC-AMRBD-MEAE	Aging Management Review Basis Document for Materials, Environments, and Aging Effects	No Revision No. Not dated
A-0-Z-SEE-1160	Establishment of Requirement for Monitoring the Condition of Structures	Revision 1 Not dated

The staff conducted its onsite audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements.

During the onsite audit, the staff found that:

> Elements 1, 2, 3, 5, and 6 (scope of program, preventive actions, parameters monitored or inspected, monitoring and trending, and assessment criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP; and
>
> Sufficient information was not available to determine whether element 4 (detection of aging effects) of the LRA AMP was consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element number 4 is consistent with the corresponding elements of the GALL Report AMP, the staff indicated that it would consider issuing an RAI for the following subject:

> Underground reinforced concrete structures and structures in contact with raw water at HCGS are subject to an aggressive environment with chloride levels up to 15,000 ppm that exceed the GALL Report threshold limit for chlorides (< 500 ppm). The applicant stated during the onsite audit that inspection of below-grade structures will be performed only when exposed during plant excavations for construction or maintenance activities. In addition, service water intake structure will be monitored to provide a bounding condition and indicator of the likelihood of concrete degradation for inaccessible portions of concrete structures. It is not clear to the staff how the detection of aging effects will be adequately managed by the measures proposed by the applicant. Therefore, the staff plans to request the applicant to provide more details on how aging effects are detected in the inaccessible areas, since groundwater intrusion has been observed through seismic expansion joints, concrete construction joints, and expansion and shrinkage cracks in the concrete.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The HCGS structural monitoring program inspection history has revealed minor degradation of structural components, but none were significant enough to impact their intended function. Deficiencies identified were evaluated and corrected. Baseline inspections of all structures in the scope of Maintenance Rule were completed in 1997. In 2007 condition monitoring inspections of the Reactor Building were performed and indicated satisfactory results. Some minor rust was found on the torus horizontal restraint end plates that connect to the wall and

minor rust was found on the building floor framing steel, but conditions were found to not warrant immediate repair. Leakage of water from the spent fuel pool has occurred. The water leakage is confined to the gravity drain system and occurs only when the spent fuel pool level is increased above the normal level. In October 2001, the water leakage was identified as coming from the #11 fuel pool line drain. Analysis of the water indicated fuel pool water. Subsequent investigations in 2006 indicated that as the fuel pool level was increased water began to flow from the #11 fuel pool line drain at a rate of about 46 drops per minute with a maximum flow of 54 drops per minute. No observed flow was observed at other drains. Follow-up visual inspections of the north wall of the fuel pool indicated that the wall of the fuel pool from approximately 24" to the water level was satisfactory for continued operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that with enhancements most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report; while identifying certain aspects of LRA program element 4 for which additional information or additional evaluation is required before consistency can be determined;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.33, RG 1.127

In the HCGS LRA, the applicant states that AMP B2.1.33, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants," is an existing program with enhancement that is consistent with the program elements in GALL Report AMP XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.33. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program element 1 (scope of program). This enhancement expands on the existing program element by adding Shoreline Protection and Dike structures.

The second enhancement affects LRA program element 3 (parameters monitored or inspected). This enhancement expands on the existing program element by adding monitoring wooden

components to include change in material properties and loss of material due to insect damage and moisture damage.

The third enhancement affects LRA program element 4 (detection of aging effects). This enhancement expands on the existing program element by: (1) requiring that inspection for submerged concrete structural components be performed by dewatering a pump bay or by a diver if the pump bay is not dewatered; (2) specifying an inspection frequency of not greater than 5 years for in scope structures including submerged portions of the Service Water Intake Structure; and (3) requiring supplemental inspections of the in scope structures within 30 days following extreme environmental or natural phenomena (large floods, significant earthquakes, hurricanes, and tornadoes).

In Appendix A2.1.33 of the LRA, the applicant committed to implement these enhancements prior to the period of extended operation.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant.

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBH-AMP-X1.S7	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Revision 1 7/16/2009
ER-AA-310-1004	Maintenance Rule	Revision 7 Not dated
ER-AA-310-1009	Condition Monitoring of Structures	Revision 1 Not dated
Notification Number 20147242	Safety Concern-Spalled Concrete on SWIS	No Revision No. 6/04/2003

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements.

During the audit, the staff found that:

> Elements 2-6 (preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP; and
>
> Sufficient information was not available to determine whether element 1 (scope of program) of the LRA AMP is consistent with the corresponding elements of the GALL Report AMP.

In order to obtain the information necessary to verify whether the LRA program element 1 is consistent with the corresponding elements of the GALL Report AMP, the staff indicated that it would consider issuing an RAI for the following subject:

In element 1 of the Program Basis Document SH-PBD-AMP-XI.S7, the applicant states there are no HCGS water-control structures that are credited for flood protection. It is not clear that this statement is consistent with Table 2.4.9 of the LRA which indicate parts of the service water intake structure are flood barriers.

During the audit of program element 10 (operating experience), the staff found that:

The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and

The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

Verified that most of the LRA program elements 1-6 are consistent with the corresponding program elements in the GALL Report while identifying certain aspects of LRA program elements 1-6 for which additional information or additional evaluation is required before consistency can be determined;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.34, Protective Coatings

In the Hope Creek LRA, the applicant states that AMP B.2.1.34, "Protective Coating Monitoring and Maintenance Program," is an existing program that is consistent with the program elements in GALL Report AMP XI.S8, "Protective Coating Monitoring and Maintenance Program." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.34. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience

database using the keywords: "cracking," "corrosion," "masonry," "concrete," "leach," and "coating."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
CC-HC-6006	Monitoring the Performance of Service Level I Coating Systems for Hope Creek Generating Station	No Revision No. 80096881-0601

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.35 Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

In the HCGS LRA, the applicant states that AMP B.2.1.35, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements," is a new program that is consistent with the program elements in GALL Report AMP XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.35. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "cable," "degradation," "oxidation," "cracking," and "thermal."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.E1	Aging Management Program Basis Document	Revision 1 07/30/2009
TR-109619	EPRI Guideline for the Management of Adverse Localized Equipment Environments	No Revision No. 06/1999
HC-PBD-AMP-B.2.1.39	Hope Creek Generating Station AMP Results Book	No Revision No. Not dated

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP,

as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.36 Electrical Cables used in Instrumentation

In the HCGS LRA, the applicant states that AMP B2.1.36, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits," is a new program that is consistent with the program elements in GALL Report AMP XI.E2, "Electrical Cables and Connections Not Subject to 10CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits." To verify this claim of consistency, the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.36. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted independent searches of the applicant's operating experience database using the key words: "cable," "degradation," "oxidation," "cracking," and "thermal."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
HC-PBD-AMP-B.2.1.36	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements Used in Instrumentation Circuits	No Revision No. Not dated

Document	Title	Revision / Date
SH-PBD-AMP-XI.E2 Book 1 of 6	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements Used in Instrumentation Circuits	Revision 2 12/18/2009
SH-PBD-AMP-XI.E2 Book 2 of 6	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements Used in Instrumentation Circuits	Revision 2 12/18/2009
SH-PBD-AMP-XI.E2 Book 3 of 6	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements Used in Instrumentation Circuits	Revision 2 12/18/2009

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.37 Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

In the HCGS LRA, the applicant states that AMP B.2.1.37, "Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," is a new program that is consistent with the program elements in GALL Report AMP XI.E3, "Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.37. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "manhole," "duct," "water," "submergence," "cable," "water tree," "electrical tree," "underground," "splice," and, "vault."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.E3	Inaccessible Medium Voltage cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements GALL Program XI.E3	Revision 1 8/04/2009
LS-AA-115	Operating Experience Procedure	Revision 11 Not dated
248405 1	Hope Creek Switching Station Power and Control Duct Plan	Revision 11 2/15/1985
25697	Hope Creek Switching Station Station Power and Control Ducts – Profile Views	Revision 0 3/18/1982
241160	Hope Creek Switching Station 13kV Station Power Ducts – Profile View	Revision 6 6/7/1985
E-1503-0	Electrical Facilities Site - Southwest	Revision 13 1/25/1995
E-1502-0	Electrical Facilities Site – Southeast	Revision 16 7/21/1991
HC-PBD-AMP-B.2.1.37	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements GALL Program XI.E3 AMP Results Book	No Revision No. Not dated
LS-AA-125	Corrective Action Program (CAP) Procedure	Revision 12 Not dated
A-0-ZZ-EDS-0225-0	Class IE Medium Voltage Shielded Power Cable for Use At Hope Creek Generating Station	Revision 0 3/28/1991
05000354/2009004	Hope Creek Generating Station – NRC Integrated Inspection Report	No Revision No. 11/12/2009

Document	Title	Revision / Date
Notification 20420237	SSWP Cables Submerged	No Revision No. 06/15/2009

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience identified by the staff's independent database search and supplemented by the applicant is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience identified by the staff's independent database search and supplemented by the applicant is not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

In order to obtain the information necessary to verify whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff indicated that it would consider issuing an RAI for the following subject:

> The applicant's operating experience and staff walkdown and review of operating experience identified cases of in-scope inaccessible medium voltage cable exposure to significant moisture/cable submergence (i.e., periodic exposure to moisture that lasts more than a few days). Prolonged exposure to significant moisture is inconsistent with GALL AMP XI.E3 including program elements 2, "preventive actions," and 4, "detection of aging effects." Based on operating experience, the applicant's corrective actions with respect to limiting in-scope cables exposure to significant moisture may not be inadequate.

The staff also audited the description of the LRA AMP provided in the LRA UFSAR Supplement, Section A.2.1.37. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR Supplement was an adequate description of the LRA AMP.

In order to obtain the information necessary to verify the sufficiency of the UFSAR Supplement program description, the staff indicated that it would consider issuing an RAI for the following subject:

> LRA UFSAR Supplement Section A.2.1.37 does not include definitions of significant moisture or significant voltage consistent with SRP LR Table 3.6-2 or GALL Report AMP XI.E3, "Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." The lack of these definitions in combination with the applicant's objective of inspection to keep cables infrequently submerged to

minimize exposure to significant moisture may not provide consistency with GALL Report AMP XI.E3.

Based on this audit the staff:

Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;

Identified that additional information regarding operating experience is required before an indication regarding the sufficiency of the LRA AMP, as implemented by the applicant, to detect and manage aging can be reached; and

Identified a need for additional information regarding the adequacy of the program description in the UFSAR Supplement.

LRA AMP B.2.1.38 Metal Enclosed Bus

In the HCGS LRA, the applicant states that AMP B.2.1.38, "Metal Enclosed Bus" is a new program that is consistent with the program elements in GALL Report AMP XI.E4, "Metal Enclosed Bus." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.38. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff conducted a walk down, interviewed the applicant's staff, observed a demonstration of the thermography camera used by the applicant, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "bus," and "corrosion."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
SH-PBD-AMP-XI.E4	Aging Management Program Basis Document	Revision 1 Not dated
MA-AA-716-230-1003	General Guidelines for Thermography Inspections	Revision 3 Not dated
HC-PBD-B.2.1.38	Aging Management Program Results Book	Revision 1 Not dated

During the audit of program elements 1-6, the staff found that:

> Elements 2- 6 (preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP; and
>
> Sufficient information was not available to determine whether element 1 (scope of program) of the AMP was consistent with the corresponding element of the GALL Report; therefore, the staff requested the applicant provide a list of metal enclosed bus in the basis document. The applicant provided the staff with an itemized list of the in-scope metal enclosed bus. The staff found this description to be consistent with the description provided in the GALL Report and, therefore, acceptable.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.2.1.39 Electrical Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

In the HCGS LRA, the applicant states that AMP B.2.1.39, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," is a new program with an exception that is consistent with the program elements in GALL Report AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers

program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.2.1.39. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. This audit report does not consider the sufficiency of exceptions. Issues identified but not resolved in this report are addressed in the SER.

The one exception affects LRA program element 1 (scope of program), element 3 (parameters monitored or inspected), element 4 (detection of aging effects), and element 5 (monitoring and trending.) The applicant stated that the exception to GALL Report AMP XI.E6 is based on draft interim staff guidance LR-ISG-2007-02 issued for public comment September 7, 2007. Subsequent to the applicant's LRA, the staff issued LR-ISG-2007-02 for staff and public use on December 23, 2009 (74 FR 68287). Therefore, the staff review of LRA AMP B2.1.39 is based on the guidance provided by LR-ISG-2007-02 and GALL Report AMP XI.E3.

During its audit, the staff conducted walkdowns, interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "cable," "connection," "bolt," "loose," "electrical," "corrosion," "termination," "resistance," "generic letters," "bulletins," "regulatory issue summaries," "licensee event reports," "event notifications," "inspection findings," "inspection reports," and "thermography."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
NUREG 1801	Generic Lessons Learned (GALL) Report Chapter X, "Time-Limited Aging Analysis Evaluation of Aging Management Programs Under 10 CFR 54.21(c)(1)(iii)," AMP X.E1, "Environmental Qualification of Electric Components."	Vol. 2, Revision 1 9/2005
MA-AA-716-230-1003	Thermography Program Guide	Revision 3 Not dated
LR-ISG-2007-02	Changes to Generic Aging Lessons Learned (GALL) Report Aging Management Program (AMP) XI.E6, "Electrical Cable Connections Not Subject to 10CFR 50.49 Environmental Qualification Requirements"	No Revision No. 12/23/2009
HC-SSBD-E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Sample Basis Document	Revision A Draft Not dated
SH-PBD-AMP-XI.E6	Program Basis Document - Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements – GALL Program XI.E6	Revision 1 7/30/2010
HC-PBD-AMP-B.2.1.39	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements - GALL Program XI.E6 AMP Results Book	No Revision No. Not dated
LS-AA-125	Corrective Action Program (CAP) Procedure	Revision: 12 Not dated

The staff conducted its audit of LRA program elements 1-6 based on the contents of the new program. Aspects of program element 1 (scope of program), element 3 (parameters monitored

or inspected), element 4 (detection of aging effects), and element 5 (monitoring and trending), of the LRA AMP which are associated with the exceptions were not evaluated during this audit. Aspects of these program elements that are not associated with the exceptions were evaluated and are described below.

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

In order to obtain the information necessary to verify whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff indicated that it would consider issuing an RAI for the following subject:

> The operating experience examples referenced by the applicant in LRA Section B.2.1.39 conclude that the effects of aging and aging mechanisms are being adequately managed. The applicant stated that these examples provide objective evidence that the aging management program, acceptance criterion, and the corrective action process will be effective in resolving problems prior to loss of function. However, it is not clear based on the applicant's discussion that the included examples are representative of operating experience in that the search methodology and criteria are not discussed. (For example, operating databases searched, connection types, time frame, and connection stressors including application, loading and environment).

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in SRP-LR Table 3.6-2 as modified by ISG-ISG-2007-02 and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report AMP;
>
> Identified that additional information regarding operating experience is required before an indication regarding the sufficiency of the LRA AMP, as implemented by the applicant to detect and manage aging, can be reached; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.3.1.1 Metal Fatigue of Reactor Coolant Pressure Boundary

In the HCGS LRA, the applicant states that AMP B3.1.1, "Metal Fatigue of Reactor Coolant Pressure Boundary," is an existing program with enhancements that is consistent with the program elements in GALL Report AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.3.1.1. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

The first enhancement affects LRA program element 3 (parameters monitored or inspected). This enhancement expands on the existing program element to include additional transients beyond those defined in the Technical Specifications and the UFSAR, and expanding the fatigue monitoring program to encompass other components identified to have fatigue as an analyzed aging effect, which require monitoring.

The second enhancement affects LRA program elements 1, 2, 3, 5, and 6 (scope of program, preventive actions, parameters monitored or inspected, monitoring and trending, and acceptance criteria). This enhancement expands on the existing program element to use software program to automatically count transients and calculate cumulative usage on select components.

The third enhancement affects LRA program elements 2, 3, 5, and 6 (preventive actions, parameters monitored or inspected, monitoring and trending, and acceptance criteria). This enhancement expands on the existing program element to address the effects of the reactor coolant environment on component fatigue life by assessing the impact of the reactor coolant environment on a sample of critical components for the plant identified in NUREG/CR-6260.

In Appendix A, Section A.5 of the LRA, the applicant committed to implement these enhancements prior to the period of extended operation.

During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "fatigue," "cooling," and "steam generator."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
HC-PBD-AMP-X.M1	Program Basis Document, Metal Fatigue of Reactor Coolant Pressure Boundary	Revision 2 12/14/2009
HC.MD-ST.KJ-0001(Q)	Diesel Generator Technical Specification Surveillance and Preventive Maintenance	Revision 39 4/1/2002
000020157696	PM Notification	No Revision No. 9/4/2003
000020285565	PM Notification	No Revision No. 5/23/2006
VTD 320114	Vendor Technical Document	Revision 3 6/4/2007
HC-34Q-301	Analysis for Hope Creek Core Spray Nozzle	Revision 0 5/29/2007
0800118.323	Benchmark Calculation for the Hope Creek FatiguePro Stress-Based Fatigue Locations	Revision 1 12/3/2009
0800118.302	60 Year Plant Cycle Duty Projection	Revision 2 10/13/2009
0800118.307	Environmental Fatigue Evaluation of Selected NUREG/CR-6260 Components Based on Existing Analyses	Revision 2 10/30/2009
0800118.310	ASME Code Confirmatory Fatigue Evaluation of Reactor Core Spray Nozzles (N5A and N5B)	Revision 2 10/30/2009

The staff conducted its audit of LRA program elements 1-6 based on the contents of the existing program as modified by the proposed enhancements.

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

Several instances of operating experience not in the LRA were discussed with members of the applicant's engineering staff. This included examples of applicable industry experience review (ref. 3 and 5 in the above table) and revision on the reactor vessel fatigue analysis due to increase in the high pressure coolant injection (HPCI) injections beyond the design cycle assumption (ref. 4 and 6 in the above table).

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report;

Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging; and

Verified that the description provided in the UFSAR Supplement is an adequate description of the program.

LRA AMP B.3.1.2 EQ Electrical

In the HCGS LRA, the applicant states that AMP B.3.1.2, "Environmental Qualification (EQ) of Electrical Components," is an existing program that is consistent with the program elements in GALL Report AMP X.E1, "Environmental Qualification (EQ) of Electric Components." To verify this claim of consistency the staff audited the LRA AMP. This audit report considers program elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) and program element 10 (operating experience) and the description of the program as contained in the UFSAR Supplement Section A.3.1.2. Program elements 7-9 (corrective actions, confirmation process, and administrative controls) are audited as part of the scoping and screening methodology audit. Issues identified but not resolved in this report are addressed in the SER.

During its audit, the staff interviewed the applicant's staff, and reviewed onsite documentation provided by the applicant. The staff also conducted an independent database search of the applicant's operating experience database using the keywords: "EQ," "qualification," "environmental," "electrical," "cable," component," "connection," and "termination."

The table below lists the documents which were reviewed by the staff and were found relevant to the audit. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document	Title	Revision / Date
NUREG 1801	Generic Lessons Learned (GALL) Report Chapter X, "Time-Limited Aging Analysis Evaluation of Aging Management Programs Under 10 CFR 54.21(c)(1)(iii)," AMP X.E1, "Environmental Qualification of Electric Components."	Vol. 2, Revision 1 09/2005
Regulatory Guide 1.89	Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants	Revision 1 11/20/2008
SH-PBD-AMP-X.E1	Program Basis Document Environmental Qualification (EQ) of Electrical Components	Revision 1 08/07/2009

Document	Title	Revision / Date
NC.DE-PS.ZZ-0002(Q)	Programmatic Standard – Environmental Qualification Program Salem and Hope Creek Generating Stations	Revision 1 06/24/2004
HC-PBD-AMP-B.3.1.2	Environmental Qualification (EQ) of Electric Components GALL Program X.E1 AMP Results Book	No Revision No. Not dated
N/A	Quarter 4th – Year 2009 – Station Hope Creek Performance Health Report – Performance Indicators	No Revision No. Not dated
LS-AA-115	Operating Experience Procedure	Revision: 11 Not dated

During the audit of program elements 1-6, the staff found that:

> Elements 1-6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria) of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of program element 10 (operating experience), the staff found that:

> The operating experience provided by the applicant and identified by the staff's independent database search is bounded by industry operating experience (i.e., no previously unknown aging effects were identified by the applicant or the staff); and
>
> The operating experience provided by the applicant and identified by the staff's independent database search is sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage aging effects during the period of extended operation.

Applicant operating experience reviewed included quarterly EQ program health reports dating from 2006 through 2009, EQ self assessments dated 7/5/1999, 12/27/2002 and 12/23/2003, basis document operating experience including work orders, corrective actions, EQ program updates and improvements including benchmarking. An independent review of the applicant's operating experience database was also performed by the staff.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found this description to be consistent with the description provided in the SRP-LR and, therefore, acceptable.

Based on this audit the staff:

> Verified that LRA program elements 1-6 are consistent with corresponding program elements in the GALL Report;
>
> Verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage; and
>
> Verified that the description provided in the UFSAR Supplement is an adequate description of the program.