



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

June 08, 2012

Mr. Michael Perito  
Vice President, Site  
Entergy Operations, Inc.  
P.O. Box 756  
Port Gibson, MS 39150

SUBJECT: AGING MANAGEMENT PROGRAMS AUDIT REPORT REGARDING THE  
GRAND GULF NUCLEAR STATION, UNIT 1 (TAC NO. ME7493)

Dear Mr. Perito:

By letter, dated October 28, 2011, Entergy Operations, Inc., (or the applicant) submitted an application for renewal of operating license NPF-29 for the Grand Gulf Nuclear Station (GGNS) Unit 1. On February 3, 2012, the staff of the U.S. Nuclear Regulatory Commission (NRC or the staff) completed the on-site audit of aging management programs. The audit report is enclosed.

If you have any questions, please contact me by telephone at 301-415-1045 or by e-mail at [nathaniel.ferrer@nrc.gov](mailto:nathaniel.ferrer@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "N. Ferrer", is written over a horizontal line.

Nathaniel Ferrer, Project Manager  
Projects Branch 1  
Division of License Renewal  
Office of Nuclear Reactor Regulation

Docket No. 50-416

Enclosure:  
As stated

cc: Listserv

Letter to M. Perito from Nathaniel Ferrer dated June 8, 2012.

SUBJECT: AGING MANAGEMENT PROGRAMS AUDIT REPORT REGARDING THE  
GRAND GULF NUCLEAR STATION, UNIT 1 (TAC NO. ME7493)

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RidsNrrDlr Resource

RidsNrrDlrRpb1 Resource

RidsNrrDlrRpb2 Resource

RidsNrrDlrRarb Resource

RidsNrrDlrRapb Resource

RidsNrrDlrRasb Resource

RidsNrrDlrRerb Resource

RidsNrrDlrRpob Resource

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NFerrer

DDrucker

DWrona

DMorey

AWang

RSmith, RIV

BRice, RIV

DMcIntyre, OPA

Mr. Michael Perito  
Vice President, Site  
Entergy Operations, Inc.  
P.O. Box 756  
Port Gibson, MS 39150

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Sincerely,

**/RA/**

Nathaniel Ferrer, Project Manager  
Projects Branch 1  
Division of License Renewal  
Office of Nuclear Reactor Regulation

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As stated

cc w/encl: Listserv

ADAMS Accession No. ML12137a290

OFFICE	LA:RPB1:DLR	PM:RPB1:DLR	BC:RPB1:DLR	PM:RPB1:DLR
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DATE	06/ 04 /12	06/ 05 /12	06/ 06 /12	06/ 08 /12

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**U.S. NUCLEAR REGULATORY COMMISSION**

**OFFICE OF NUCLEAR REACTOR REGULATION, DIVISION OF LICENSE RENEWAL**

Docket No: 050-00416

License No: NPF-29

Licensee: Entergy Operations, Inc.

Facility: Grand Gulf Nuclear Station, Unit 1

Location: Port Gibson, MS (20 miles southwest of Vicksburg, MS)

Dates: January 23, 2012–February 3, 2012

Reviewers: N. Ferrer, Project Manager, Division of License Renewal (DLR)  
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## **Introduction**

The U.S. Nuclear Regulatory Commission (NRC) conducted a 10-day audit at Grand Gulf Nuclear Station, Unit 1 (GGNS, or the plant), in Port Gibson, MS, from January 23 to February 3, 2012. The purpose of this audit was to examine Entergy Operations Inc.'s (the applicant's) aging management programs (AMPs) and related documentation for GGNS and to verify the applicant's claim of consistency with the corresponding AMPs in the "Generic Aging Lessons Learned (GALL) Report—Final Report (NUREG-1801, Revision 2)," issued December 2010. As described in the GALL Report, the NRC staff's (or the staff) evaluation of the adequacy of each generic AMP is based on its review of the following 10 program elements in each AMP: 1) scope of program; 2) preventative actions; 3) parameters monitored or inspected; 4) detection of aging effects; 5) monitoring and trending; 6) acceptance criteria; 7) corrective actions; 8) confirmation process; 9) administrative controls; and 10) operating experience.

Exceptions to the GALL Report AMP elements will be evaluated separately as part of the staff's review of the GGNS license renewal application (LRA) and documented in the staff's safety evaluation report (SER).

The "Standard Review Plan [SRP] for Review of License Renewal Applications for Nuclear Power Plants" (NUREG-1800, Rev. 2, December 2010) provides staff guidance for reviewing an LRA. The SRP allows an applicant to reference in its LRA the AMPs described in the GALL Report. By referencing the GALL Report AMPs, the applicant concludes that its AMPs correspond to those AMPs reviewed and approved in the GALL Report and that no further staff review is required. 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 AMP elements 1–6, and 10 ("scope of program," "preventative actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "operating experience"). These elements of the applicant's AMPs were claimed to be consistent with the GALL Report and were audited against the related elements of the associated AMP described in the GALL Report, unless otherwise indicated in this audit report. Elements 7–9 ("corrective actions," "confirmation process," and "administrative controls"), were audited during the scoping and screening methodology audit conducted January 9–12, 2012, and are evaluated separately. The staff audited all AMPs that the applicant stated were consistent with the GALL Report AMPs.

During this audit, if an applicant took credit for a program in the GALL Report, the staff verified that the plant program contains all the elements of the referenced GALL Report Program. In addition, the staff verified the conditions at the plant were bounded by the conditions for which the GALL Report Program was evaluated.

In performing this audit, the staff examined the applicant's LRA, program-bases documents and related references, interviewed various applicant representatives, and conducted walkdowns of several plant areas. In total, 42 AMPs were reviewed and several breakout (discussion) sessions with applicant representatives were conducted. This report documents the staff's activities during this audit.

### **LRA AMP B.1.2, Aboveground Metallic Tanks**

Summary of Information in the Application. The LRA states that AMP B.1.2, “Aboveground Metallic Tanks,” is a new program that is consistent with the program elements in GALL Report AMP XI.M29, “Aboveground Metallic Tanks.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walkdowns of the condensate storage tank and fire water storage tanks. The staff also conducted an independent database search of the applicant’s operating experience database using the keywords: “coating,” “corrosion,” “corrosive,” “cracking,” “crevice,” “damage,” “degradation,” “flaw,” “indication,” “loss of material,” “microbiological,” “perforation,” “pitting,” “rust,” “tank,” and “wastage.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LR006	Aging Management Program Evaluation Report Non-Class 1 M11echanical	Revision 1, 10/26/2011
2. CR-GGN-2001-00098	Fire Water Storage Tank Moisture Seal Inspection	01/22/2001
3. CR-GGN-2008-02080	Coatings Inspection of Fire Water Storage Tanks A and B	04/29/2008
4. CR-GGN-2009-01916	Inspection of A and B FWST	04/09/2009
5. CR-GGN-2007-01032	Unidentified Small Pieces of Steel Identified on Floor of Condensate Storage Tank during Vacuuming Operations	03/14/2007
6. WO-GGN-00069971	Condensate Storage Tank Internal Inspection	10/30/2007
7. CR-GGN-2007-00238	External Inspections of Fire Water Storage Tanks A and B	01/18/2007
8. CR-GGN-2002-02404	Holiday Testing A Fire Water Storage Tank	11/13/2002
9. CR-GGN-2008-01980	Inspection of B Fire Water Storage Tank	04/22/2008
10. CR-GGN-2010- 08584	Condensate Storage Tank Base Seal Leaks	12/13/2010
11. CR-GGN-2002- 02340	Holiday Testing B Fire Water Storage Tank	11/05/2002
12. CR-GGN-2002- 02357	Further Holiday Testing Results B Fire Water Storage Tank	11/06/2002
13. CR-GGN-2006- 00727	Anomalies in Coatings for Division II Diesel Fuel Oil Storage Tank	02/22/2006
14. WO 259472	Repair Condensate Storage Tank Base Seal	Unavailable

During the audit of program elements 1–6, the staff verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP were consistent with the corresponding elements of the GALL Report AMP.

During the audit of the “operating experience” program element, the staff determined that the operating experience that the applicant provided and the staff identified in an independent database search is bounded by industry operating experience (i.e., the applicant or the staff did not identify any previously unknown aging effects). As a result of the review of operating experience and the independent database search, the staff has determined that the LRA AMP may not be sufficient to detect and manage the effects of aging. To obtain the information necessary to determine if the applicant’s operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing requests for additional information (RAIs) for the subjects discussed below.

During the staff’s walkdown of the stainless condensate storage tank, extensive rust stains (i.e., encompassing 360 degrees around the tank) were noted. These rust stains appeared to originate from the tank roof to shell weld. The applicant could not identify the cause of the rust stains on this steel tank. The impact on managing the aging of the tank is uncertain because of the lack of understanding about the cause of the rust stains.

Based on the staff’s review of plant-specific operating experience associated with the fire water storage tanks, there are many condition reports identifying rust stains, coating damage, and holidays on the bottom of the tanks. These adverse conditions were identified during inspections conducted in 2002, 2006, 2007, 2008, and 2009. In addition, during its walkdown, the staff noted several locations on both tanks in which the top edge of the sealant between the tank and tank foundation had separated from the tank surface. These gaps could allow water to enter between the tank bottom and foundation. Given the extensive number of adverse conditions identified and the span of years in which they were discovered, as well as the seal degradation noted during the walkdown, the staff is not clear that one volumetric inspection of the tank bottom within 5 years of the period of extended operation, and then whenever the tank is drained, is sufficient to manage the aging of the fire water storage tanks.

The applicant’s staff identified that the condensate storage tank base seal was leaking in December 2010. The work order to correct this adverse condition currently is not scheduled to be completed until May 2013. Given the length of time that the tank will be susceptible to corrosion because of this leaking seal, the staff is not clear if one volumetric inspection of the tank bottom within 5 years of the period of extended operation, and then whenever the tank is drained, is sufficient to manage the aging of the condensate storage tank.

The staff also audited the description of the LRA AMP provided in the updated final safety analysis report (UFSAR) supplement. The staff verified that it is consistent with the description provided in the Standard Review Plan for License Renewal (SRP-LR).

**Audit Results.** Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements are consistent with the corresponding program elements in GALL Report AMP XI.M29.

Based on this audit, the staff also identified that additional information on operating experience is required before a determination can be made about the sufficiency of the LRA AMP to detect



and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the one provided in the SRP-LR.

### **LRA AMP B.1.3 Bolting Integrity**

Summary of Information in the Application. The LRA states that AMP B.1.3, “Bolting Integrity,” is an existing program, with enhancements, 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. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “bolt,” “degradation,” “corrosion,” “leak,” “cracking,” and “stress.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD06	GGNS License Renewal Project Aging Management Program Evaluation Report Non-Class 1 Mechanical	Revision 1, 10/26/2011
2. GGNS-EP-08-LRD10	GGNS License Renewal Project Operating Experience Review Results–Aging Management Program Effectiveness	Revision 0, 09/13/2011
3. 07-S-09-20	Maintenance Section Procedure Bolt Torquing Safety Related	Revision 1, 01/28/1986
4. 07-S-14-281	General Maintenance Instruction Flanged Connection Bolting Procedure	Revision 13, 04/10/2006
5. 07-S-14-297	General Maintenance Instruction Torquing Requirements for General Maintenance Tasks Safety Related	Revision 8, 07/17/2008
6. CEP-NDE-0901	VT-1 Examination	Revision 4, 07/29/2009
7. CEP-PT-001	ASME Section XI Pressure Testing Program	Revision 303, 05/13/2008
8. CEP-R&R-001	ASME Section XI Repair/Replacement Program	Revision 304, 12/13/2010
9. EN-DC-178	System Walkdowns	Revision 3, 11/30/2010
10. EN-LI-102	Corrective Action Process	Revision 17, 12/08/2011
11. CR-GGN-2002-02619	Corrosion Observed on Studs in SSW Basin, Approximately 5 Feet under Water	12/07/2002
12. CR-GGN-2005-03980	Core Spray Sparger Bolts Found To Be Cracked	09/29/2005

Document	Title/Description	Revision/Date
13. CR-GGN-2001-00667	Temporary Bolts Used on Various Piping	03/17/2001
14. CR-GGN-2010-06017	D1 Standby Diesel Generator Crack on Jacket Water Piping Support at Bolt Hole	08/09/2010

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 verified that the “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. In addition, the staff found that for the “preventive actions” program element, insufficient information was available to determine if it was consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify that this program element is consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subject discussed below.

The “preventive actions” program element of the LRA AMP is not explicitly described in the LRA; however, the AMP states that it is consistent with the GALL Report. The GALL Report AMP recommends preventive measures against the use of high-strength closure bolts (actual yield strength  $\geq 150$  ksi) and includes specific recommended inspections if they are used. The LRA indicates that high-strength closure bolts are used at the plant. However, during the audit the applicant stated that there are no high-strength closure bolts in use at the plant. The staff is not clear that these statements are consistent because the applicant’s statement contradicts what was presented in the LRA.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that the operating experience the applicant provided and the staff’s independent database search are not sufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. To obtain the information necessary to determine if the applicant’s operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the subject discussed below.

The LRA describes corrosion discovered on bolting located in the standby service water (SSW) basin under approximately 5 feet of water. During the audit, the applicant stated that typical inspections conducted to detect loss of material in bolting include system walkdowns and visual indications of leakage. The staff is not clear how corrosion similar to that described in the LRA could be consistently discovered for bolting in submerged environments using the inspection methods described.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M18. The staff also identified certain aspects of the LRA program element “preventive actions,” which will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also identified that additional information on operating experience is required before a determination can be made about the sufficiency of the LRA AMP to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the one provided in the SRP-LR.

#### **LRA AMP B.1.4 Boraflex Monitoring**

**Summary of Information in the Application.** The LRA states that AMP B.1.4, “Boraflex Monitoring,” is an existing program, with enhancements, that is consistent with the program elements in GALL Report AMP XI.M22, “Boraflex Monitoring.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walkdowns of the chemistry laboratory, spent fuel pool, and upper containment pool. The staff also conducted an independent search of the applicant’s operating experience database using the keyword: “degradation.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. 08-S-03-10	Chemical Sampling Program	Revision 048
2. 17-S-02-31	Spent Fuel Pool Poison Specimen Coupon Removal and Inspection	Revision 3
3. ECH-NE-08-00017	BADGER test campaign and GGNS	Revision 1
4. CR-HQN-2010-00777	Unavailable	07/23/2010
5. CR-GGN-2010-05642	Unavailable	07/23/2010
6. SE-2001-0002-R00	50.59	03/31/2001
7. CR-GGN-2007-02482	Unavailable	05/03/2007
8. CR-GGN-1999-00686	Unavailable	07/07/1999
9. CEO-97/00037	GGNS Spent Fuel Rack Criticality Analysis	03/03/1997

Document	Title/Description	Revision/Date
10. HI-992255	Blackness Testing of Boraflex in Selected Spent Fuel Storage Rack Cells of the Grand Gulf Nuclear Station– 7th Measurement Campaign	07/01/1999
11. NEAD SR 99/069.R0	Criticality Safety Analysis of GGNS Fuel Storage Racks for Boraflex Degradation and SPC Atrium 10 Fuel Design	Rev 0
12. NET 272-02	Inspection and Testing of Boraflex Surveillance Coupons 13 and 14 from the Grand Gulf Station	Rev 1, 01/11/2007
13. Not applicable	Letter from Matthew C. Harris, Netco BADGER Test Engineer to Grand Gulf, Notice of Inability to Evaluate Possible 10 CFR 21 Implications, “Re: Decrease in Average BADGER Measured Boraflex B10 Areal Density/Grand Gulf.”	2010

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 verified that the “preventive actions,” “parameters monitored or inspected,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. In addition, the staff found that for the “scope of program,” “detection of aging effects,” and “monitoring and trending,” program elements, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAls for the subjects discussed below.

The staff is not clear if “scope of program” in the documentation includes the Boraflex in the upper containment pool.

The “scope of program” program element of the LRA AMP states that the coupon monitoring program will still be used. The staff is not clear if GGNS still performs the coupon monitoring program and if it will be performed during the period of extended operation. The staff is also unclear if there are enough coupons remaining to support performing the program in the period of extended operation.

The “detection of aging effects” and “monitoring and trending” program elements of the LRA AMP state that the aging and monitoring will be done using RACKLIFE on a frequency of 1 year. Because of GGNS’ operating experience with Boraflex degradation, the staff is asking GGNS to please discuss the frequency of the RACKLIFE predictions.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify previously unknown aging effects). The staff also determined that the operating experience the applicant provided and the staff identified in its independent database search is sufficient for the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that the LRA program elements “preventive actions,” “parameters monitored or inspected,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M22. The staff also identified certain aspects of the LRA program elements “scope of program,” “detection of aging effects,” and “monitoring and trending” in which additional information or evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR

### **LRA AMP B.1.5, Buried Piping and Tanks Inspection**

**Summary of Information in the Application.** The LRA states that AMP B.1.5, “Buried Piping and Tanks Inspection,” is a new program that is consistent with the program elements in GALL Report AMP XI.M41, “Buried and Underground Piping and Tanks.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent database search of the applicant’s operating experience database using the following keywords: “buried,” “cast,” “coating,” “corrosion,” “corrosive,” “crevice,” “damage,” “degradation,” “dug up and dug,” “excavate,” “flaw,” “indication,” “loss of material,” “microbiological,” “perforation,” “pitting,” “rust,” “throughwall,” “underground,” “wrap,” and “wastage.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LR006	Aging Management Program Evaluation Report Non-Class 1 Mechanical	Revision 1, 10/26/2011
2. EN-DC-343	Underground Piping and Tanks Inspection and Monitoring Program	Revision 4
3. 0900596-2	Grand Gulf Nuclear Power Station Native and Interrupted APEC Survey	Revision 1, 04/14/2010
4. CEP-UPT-0100	Underground Piping and Tanks Inspection and Monitoring	Revision 0 10/31/2011
5. SERI-M-404.0	Specification for External Surface Treatment of Underground Metallic Pipe for Nuclear and Non- Nuclear Service	Revision 0 02/02/1989
6. CR-GGN-2001-00239	Cycling Fire Water Jockey Pump	02/12/2001
7. CR-GGN-2008-05718	Underground Water Leak South Side of Rad Waste Building Near Delay Fence	10/09/2008

Document	Title/Description	Revision/Date
8. CR-GGN-2007-03666	INPO Finding Cathodic Protection Testing Frequency for Diesel Fuel Oil Storage Tanks	07/20/2007
9. CR-GGN-2009-04729	INPO AFI Inoperable Cathodic Protection with Limited Piping Inspections	09/16/2009
10. CR-GGN-2011-06725	INPO Performance Deficiency Nonroutine Performance Monitoring of Cathodic Protection Rectifiers	09/26/2011
11. CR-GGN-2006-00327	Frequency of Cathodic Protection Testing for Standby Diesel Fuel Oil Storage Tanks	01/25/2006
12. CR-GGN-2009-00412	Delay in Making the Standby Service Water Cathodic Protection System Operational	01/28/2009
13. CR-GGN-2009-02201	Cathodic Protection Testing by Corppro Found All Four Rectifier Outputs Reading Low	2009
14. CR-GGN-2010-01376	Structural Integrity Associates Cathodic Protection APEC Survey	03/02/2010
15. CR-GGN-2006-00727	Anomalies in Coatings for Division II Diesel Fuel Oil Storage Tank	02/22/2006

During the audit of program elements 1–6, the staff verified that the “parameters monitored or inspected,” program element of the LRA AMP is consistent with the corresponding element of the GALL Report AMP. In addition, the staff found that for the “scope of program,” “preventive actions,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

The “scope of program” program element of the LRA AMP states that it will manage aging for buried and underground piping; however, LRA Section B.1.18, “External Surfaces Monitoring,” states an enhancement to its “detection of aging effects” program element will include underground components within the scope of the External Surfaces Monitoring Program. In addition, during the audit, the staff reviewed a partial list of components that appear to be under the scope of the External Surfaces Monitoring Program instead of the Buried Piping and Tanks Inspection Program. These include the residual heat removal (RHR) pump suction barrels, high-pressure core spray (HPCS) pump suction barrels, and the fuel oil transfer pump discharge stop check valve. The GALL Report AMP recommends that underground components be managed by the Buried and Underground Piping and Tanks Program, which includes recommendations (e.g., protective coatings, inspection locations based on risk, expansion of scope for adverse conditions), which are not included in the External Surfaces Monitoring Program. It is not clear which underground piping components will be age-managed according to the recommendations of GALL Report AMP XI.M41 or AMP XI.M36.

The “preventive actions” program element of the LRA AMP states that the preventive actions of the program will be consistent with NUREG-1801; however, CR-GGN-2006-00727 stated that the Division II diesel fuel oil storage tank coatings had anomalies. The staff is not clear if these anomalies result in the coatings not meeting the recommendations of AMP XI.M41 and if, therefore, they should be stated as an exception and justified by the applicant.

The “preventive actions” program element of the LRA AMP states that the preventive actions of the program will be consistent with NUREG-1801. However, the staff identified during its audit six condition reports spanning from 2006 through 2011 that cite significant gaps in cathodic protection system performance. The GALL Report AMP recommends that a cathodic protection be installed, monitored, annually tested, and potential differences and current measurements be trended to identify changes in the effectiveness of the system in mitigating corrosion. It is not clear if the cathodic protection system is being operated according to AMP XI.M41 recommendations because plant-specific operating experience indicates a long period of significant degraded performance of the cathodic protection system. This issue also affects the consistency of the “monitoring and trending” program element.

The “preventive actions” program element of the LRA AMP states that the preventive actions of the program will be consistent with NUREG-1801. However, during its audit the staff could not verify that (a) steel in-scope systems were coated, (b) initial backfill specifications were consistent with recommendations in AMP XI.M41, and (c) that in-scope stainless steel components were coated, or, if they had not been coated, if sufficient soil samples were obtained demonstrating that the soil environment would not result in aging of the external surfaces of the piping. The GALL Report AMP recommends that coatings be provided (stainless steel piping is not required to be coated if soil conditions will not degrade the external surfaces of the piping) and backfill to be consistent with SP0169-2007 and RP0285-2002.

The “detection of aging effects” program element of the LRA AMP states that the detection of aging effects of the program will be consistent with NUREG-1801. However, EN-DC-343, “Underground Piping and Tanks Inspection and Monitoring Program,” section 5.[1] states: “[i]n general, inspections should be performed at the segments that have the highest risk ranking as determined above.” The GALL Report AMP recommends that buried and underground piping inspection locations are selected based on risk. The staff is not clear if the “in general” and “should be” modifiers in EN-DC-343 are consistent because they could lead to the selection of lower-risk inspection locations based on criteria not presented to the staff.

The “acceptance criteria” program element of the LRA AMP states that the acceptance criteria of the program will be consistent with NUREG-1801. During the audit, the staff reviewed Report 0900596-2, “Grand Gulf Nuclear Power Station Native and Interrupted APEC Survey, Revision 1,” dated April 14, 2010. This report demonstrated that 93 percent of the in-scope buried piping was receiving adequate cathodic protection; however, the only acceptance criterion was a 100mV of cathodic polarization between the piping and soil. The GALL Report AMP recommends that the criteria for pipe-to-soil potential be consistent with paragraph 6.2.2.3.3 of NACE SP0169-2007, which states that the use of excessive polarization potential can result in coating disbondment. Given that the staff was unable to verify if the applicant has an upper limit on cathodic protection pipe-to-soil potentials, an RAI is necessary.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did

not identify any previously unknown aging effects). The staff also determined that the operating experience provided by the applicant and identified by the staff's independent database search is insufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. As described above, an RAI will be developed related to the number and span in years of conditions adverse to quality associated with the cathodic protection system.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that the UFSAR supplement was consistent with the SRP-LR; however, given the number and span in years of conditions adverse to quality associated with the cathodic protection system, the staff will consider issuing an RAI requesting the applicant to upgrade its UFSAR to reflect the use, testing, and monitoring of the cathodic protection system.

Audit Results. Based on this audit, the staff verified that the LRA program element "parameters monitored or inspected" is consistent with the corresponding program element in GALL Report AMP XI.M41. The staff also identified certain aspects of LRA program elements "scope of program," "preventive actions," "detection of aging effects," "monitoring and trending," and "acceptance criteria" that require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also identified that additional information on operating experience is required before a determination can be made on the sufficiency of the LRA AMP to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

#### **LRA AMP B.1.6, BWR CRD Return Line Nozzle**

Summary of Information in the Application. The LRA states that AMP B.1.6, "BWR [Boiling-Water Reactor] Control Rod Drive (CRD) Return Line Nozzle Program," 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. Issues identified but not resolved in this report will be addressed in the SER.

Audit Activities. During the audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent database search of the applicant's operating experience database using the following keywords: "capped," "dissimilar metal," "return line," "stress corrosion cracking," and "nozzle."

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



### Relevant Documents Reviewed

Document	Title/Description	Revision/Date
1. AECM 83-0234	Response to NUREG-0619	04/20/1983
2. GGNS-EP-08-LRD05	Aging Management Program Evaluation Report, Class 1 Mechanical	Revision 1 10/26/2011
3. GGNS-EP-08-LRD06	Aging Management Program Evaluation Report Non Class 1 Mechanical-Water Chemistry Control-BWR	Revision 1 10/25/2010
4. CEP-ISI-102	ASME Section XI, Division 1 Inservice Inspection Program	Revision 1 12/14/2009
5. CEP-RR-001	ASME Section XI Repair/Replacement Program	Revision 304 12/09/2010
6. EN-LI-102	Entergy Corrective Action Process	Revision 17 12/08/2011
7. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness	Revision 0 09/13/2011
8. LO-WTGGN-2004-0001	Work Tracking “PCN will Change the Inspection Frequency of the N10-KC Weld from Once every 10 years to Once Every 4th Re-fueling Outage”	07/29/2004
9. NTR#0357-000-2003	Ultrasonic Examination Summary Sheet–Examination Results (Procedure No. PDT-UT-10)	03/08/2004
10. NDEN 0270-042-2006	AREVA UT Examination Summary Sheet (Procedure 54-ISI-835, Rev. 10)	03/29/2007
11. NDEN 270-040-2006	RPV Nozzle Inner Radius Region Ultrasonic Examination Summary Sheet (Procedure 54-ISI-850, Rev. 06)	04/04/2007
12. CR-GGN-2003-02978	Condition Report–Written To Track Pilgrim CR-PNP-2003-03719, “Leak Discovered in Reactor Vessel Penetration. CRD Return Nozzle N10 Cap Has Thru Wall Pressure Boundary Leakage”	10/09/2003

During the audit of program elements 1–6, the staff verified that the “preventive actions” program element of the LRA AMP is consistent with the corresponding element of the GALL Report AMP. For the “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

LRA Section B.1.6 states that the BWR Control Rod Drive (CRD) Return Line Nozzle Program is an existing program that manages cracking of the CRD return line nozzle. In comparison, GALL Report AMP XI.M6, “BWR Control Rod Drive Return Line Nozzle,” states that this program is a condition monitoring program based on the staff’s recommended position in NUREG-0619, “BWR Feedwater Nozzle and Control Rod Driven Return Line Nozzle Cracking,” issued November 1980, for thermal fatigue, and the program is also intended to address stress-corrosion cracking (SCC) discussed in NRC Information Notice 2004-08, “Reactor Coolant Pressure Boundary Leakage Attributable to Propagation of Cracking in Reactor Vessel Nozzle Welds.” IN 2004-08 addresses cracking because of SCC stress of capped CRD return lines. In addition, the

“parameters monitored or inspected” program element of GALL Report AMP XI.M6 indicates that the AMP manages the effects of cracking on the intended function of the reactor vessel, the CRD return line nozzle, and for capped nozzles, nozzle caps, and cap-to-nozzle welds. GALL Report AMP XI.M6 states that for the volumetric ultrasonic test (UT) examinations performed in accordance with this AMP, the AMP monitors and evaluates signals that may indicate the presence of a planar flaw (crack). During the audit and in interviews with plant personnel, the staff noted that the CRD return line was capped to prevent cracking because of cyclic loading. The staff also noted that the applicant’s current inservice inspection plan includes the CRD return line nozzle in its scope and sample population. However, the current inservice inspection plan does not have a specific inspection schedule for the capped CRD return line, which indicates that the capped CRD return line is not selected for inspections during the current inservice inspection interval. Therefore, the staff was concerned that the lack of a specific inspection schedule for this component does not ensure adequate detection and management of cracking because of SCC of the capped CRD return line.

During the audit of the “operating experience” program element, the staff determined that the operating experience the applicant provided and the staff’s independent database search is bounded by industry operating experience (i.e., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that the operating experience provided by the applicant and identified by the staff’s independent database search is sufficient for the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. However, as noted above, it is not clear if the LRA AMP will be implemented during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that the LRA program element “preventive actions,” is consistent with the corresponding program element in GALL Report AMP XI.M6. The staff also identified certain aspects of LRA program elements “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria,” for which additional information or evaluations is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

#### **LRA AMP B.1.7, BWR Feedwater Nozzle**

**Summary of Information in the Application.** The LRA states that AMP B.1.7, “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. Issues identified but not resolved in this report are addressed in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent database

search of the applicant's operating experience database using the following keywords: "feedwater nozzle," "cracks," "NUREG-0619," "N4," "81-11," and "NE-523-A71-0594."

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

Relevant Documents Reviewed		
Document	Title/Description	Revision/Date
1. GGNS-EP-08-LRD05	Aging Management Program Evaluation Report Class 1 Mechanical–BWR Feedwater Nozzle	Revision 1
2. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness for BWR Feedwater Nozzle	Revision 0
3. CEP-ISI-102	ASME Section XI, Division I Inservice Inspection Program–GGNS Appendix B	Revision 1
4. CEP-RVI-001	Reactor Vessel Internals Management Program Plan– Appendix N (Feedwater Spargers)	Revision 4
5. NUREG 0619	BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking	Revision 0
6. SIR-97-035	Fracture Mechanics Evaluation for the Feedwater Nozzles	Revision 0
7. GE NE-523-A71-0594-A	Alternate BWR Feedwater Nozzle Inspection Requirements	Revision 1

During the audit of program elements 1–6, the staff verified that "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During its audit, the staff noted that the program-basis document of the applicant's BWR Feedwater Nozzle Program referenced SIR-97-035, Rev. 0, *Fracture Mechanics Evaluation for the Feedwater Nozzles*, which is a plant-specific fracture mechanics evaluation that was performed to support the use of the inspection guidelines in accordance with General Electric (GE) NE-523-A71-0594, Revision 1. The staff noted that the fracture mechanics analysis performed was based on the 40-year projections of the startup/shutdown transients and scram events. However, the applicant did not identify this analysis as a time-limited aging analysis (TLAA) in the LRA in accordance with 10 CFR 54.21(c)(1). The staff will consider this issue in conjunction with the review of LRA Section 4.1, "Identification of Time-Limited Aging Analyses."

During the audit of the "operating experience" program element, the staff determined 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). The staff also determined that 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 the effects of aging during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing RAIs for the subject discussed below.

The staff noted that the program-basis document stated that the program manages cracking of the BWR feedwater nozzle using periodic inspection in accordance with the GE NE-523-A71-0594, Revision 1, which is consistent with the recommendation of GALL Report AMP XI.M5. However, both LRA Sections A.1.7 and B.1.7 state that this program augments the examinations specified in the American Society of Mechanical Engineers (ASME) Code Section XI, with the recommendation of GE NE-523-A71-0594, "Alternate BWR Feedwater Nozzle Inspection Requirements." The staff noted that the description in these two sections do not identify the correct revision of the GE NE-523-A71-0594 report.

Audit Results. Based on this audit, the staff verified that LRA program elements "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" are consistent with the corresponding program elements in GALL Report AMP XI.M5.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

In addition, the staff will consider issuing an RAI in conjunction with the review of LRA Section 4.1, "Identification of Time-Limited Aging Analyses," related to fracture mechanics evaluation for feedwater nozzles.

### **LRA AMP B.1.8, BWR Penetrations**

Summary of Information in the Application. The LRA states that AMP B.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. Issues identified but not resolved in this report will be addressed in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent database search of the applicant's operating experience database using the following keywords: "crack," "penetration," "nozzle," "stub," "stress corrosion," "CRD," "RPV," and "SCC."

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

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LR05	Aging Management Program Evaluation Report Class 1 Mechanical, Section 4.3, BWR Penetrations	Revision 1, 10/26/2011
2. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness, Section 3.1.3, BWR Penetrations Program	Revision 10, 09/13/2011
3. GGNS-EP-08-LRD02	Operating Experience Review Report–AERM	Revision 0, 09/16/2011
4. CEP-ISI-102	Program Section for ASME Section XI Division 1 Inservice Inspection Program	Revision 2, 12/14/2009
5. CEP-R&R-001	ASME Section XI Repair/Replacement Program	Revision 304, 12/13/2010
6. CEP-RVI-001	Reactor Vessel Internal Management (RVIM) Program Plan	Revision 4, 01/13/2011
7. EN-DC-130	Entergy Reactor Vessel Internals Management (RVIM) Program	Revision 1, 06/01/2010
8. SEP-RVI-002	Grand Gulf Reactor Vessel Internals (RVI) Inspection Program Plan	Revision 0, 05/17/2010
9. CR-GGN-2009-01767	In Response to OE 28233–IGSCC of An Instrument Nozzle Safe-End Requiring Structural Weld Overlay Repair	04/03/2009
10. GNRO-2007/00046	Inservice Inspection Summary Report, Grand Gulf Nuclear Station Unit 1, Docket No. 50-416, License No. NPF-29	7/10/2007

During the audit of program elements 1–6, the staff verified that “scope of program,” “preventive actions,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. For the “parameters monitored or inspected” program element, insufficient information was available to determine if it was consistent with the corresponding program element of the GALL Report AMP. To obtain the information necessary to verify if this program element is consistent with the corresponding program element of the GALL Report AMP, the staff will consider issuing an RAI for the subject discussed below.

The “parameters monitored or inspected” program element of the applicant’s program described in the site documentation (AMP Evaluation Report GGNS-EP-08-LR05, Revision 1) indicates that the applicant’s program relies on BWRVIP-47-A and ASME Section XI, Table IWB 2500-1, to manage cracking of the CRD housing and incore-monitoring housing (ICMH) penetrations. The “program monitored or inspected” program element of GALL Report AMP XI.M8 recommends inspections for cracks in accordance with the guidelines of BWRVIP-47-A and the requirements of the ASME Code, Section XI, Table IWB 2500-1, to manage the aging effect of these penetrations. In detail, Section 3.2.5, “Other Inspections,” in BWRVIP-47-A indicates that the BWRVIP has determined that removing or dismantling of internal components for the purpose of performing inspections is not warranted to ensure safe operation; however, on occasion, utilities may have access to the lower plenum because of maintenance activities that are not part of normal refueling outage activities. BWRVIP-47-A further states that, in such

cases, utilities will perform a visual inspection to the extent practical. In contrast, during the audit the staff noted that the site documentation (Program Plan CEP-RVI-001, Revision 4) for the reactor vessel internals program indicates that the baseline inspections for the CRD housing do not require access to the lower plenum area and currently no additional inspections are recommended beyond the baseline inspections. In comparison, the site documentation indicates that if access is gained to the lower plenum (areas below the core plate), accessible areas of the incore flux monitor housing, guide tubes, and the guide tube stabilizer should be inspected by the VT-3 method. However, it is not clear if these additional inspections for the incore flux monitor housing are applied to the incore monitoring housing penetrations included in the scope of this program. Based on the foregoing discussion, the staff needs additional information to clarify if the applicant's implementation of the "parameters monitored or inspected" program element is consistent with the guidance described in Section 3.2.5, "Other Inspections," of BWRVIP-47-A, which is referenced in the GALL Report AMP.

During the audit of the "operating experience" program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing an RAI for the subject discussed below.

SRP-LR, Table 3.0-1, provides an example of the summary descriptions of aging management programs for the UFSAR supplement. The summary description for the BWR Penetrations Program in SRP-LR, Table 3.0-1, states that the program includes inspection and flaw evaluation in conformance with the guidelines of staff-approved BWR vessel and internal project documents BWRVIP-47-A, BWRVIP-49-A, and BWRVIP-27-A, to ensure the long-term integrity and safe operation of BWR vessel-internal components. In contrast with SRP-LR, Table 3.0-1, the applicant's summary description of the BWR Penetration Program for the UFSAR supplement does not include a specific reference to relevant BWRVIP documents for the program. The staff found that the applicant's summary description for the UFSAR supplement may not be adequate to ensure program effectiveness because of the omission of specific references to relevant BWRVIP documents for this program. Similarly, LRA Section B.1.8 does not include a specific reference to the relevant BWRVIP documents for the program. Therefore, the staff needs clarification on why the UFSAR supplement and LRA Section B.1.8 do not include specific references to relevant BWRVIP documents for the BWR Penetrations Program.

In addition, the staff audited the applicant's responses to BWRVIP applicant action items related to the BWR Penetrations Program. The staff found that insufficient information was available to determine if the applicant's responses to BWRVIP applicant action items were adequate. To

obtain the information necessary to verify the sufficiency of the applicant's responses to the applicant action items, the staff will consider issuing an RAI for the subject discussed below.

In Appendix C to its LRA, the applicant indicated that the core plate differential pressure and standby liquid control ( $\Delta P/SLC$ ) lines inside the reactor vessel have no license renewal intended function and are not subject to aging management review. The applicant also indicated that there is thus no fatigue TLAA applicable to GGNS in BWRVIP-27-A. During the audit, the staff noted that the site documentation for the reactor vessel internals program plan indicates that the design for the  $\Delta P/SLC$  penetration uses an Alloy 600 stub tube set into the bottom head and welded to an Alloy 600 housing. In comparison to the applicant's claim that the  $\Delta P/SLC$  lines inside the reactor vessel have no license renewal intended function, the  $\Delta P/SLC$  penetration, nozzle and safe-end assembly is part of the reactor coolant pressure boundary. Therefore, it is not clear why no fatigue TLAA is applicable to these components, even though the intended function of this penetration assembly is the reactor coolant pressure boundary. In addition, the staff noted that LRA Table 4.3-2 identifies the liquid control- $\Delta P$  nozzle as a component that is subject to the fatigue TLAA. Based on the foregoing review, the staff needs to resolve the apparent conflict between the applicant's claim that no fatigue TLAA is applicable to GGNS in BWRVIP-27-A and the applicant's aging management review results in LRA Table 4.3-2, which indicates that the liquid control- $\Delta P$  nozzle is a component subject to the fatigue TLAA.

**Audit Results.** Based on this audit, the staff verified that LRA program elements "scope of program," "preventive actions," "detection of aging effects," "monitoring and trending," and "acceptance criteria" are consistent with the corresponding program elements in GALL Report AMP XI.M8. The staff also identified certain aspects of LRA program element "parameters monitored or inspected" and BWRVIP applicant action items of the LRA AMP, for which additional information or evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

#### **LRA AMP B.1.9, BWR Stress Corrosion Cracking**

**Summary of Information in the Application.** The LRA states that AMP B.1.9, "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. Issues identified but not resolved in this report will be addressed in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent database search of the applicant's operating experience database using the following keywords: "cracking," "stress corrosion," "SCC," "nozzle," "thermal sleeve," and "88-01."

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

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LR05	Aging Management Program Evaluation Report Class 1 Mechanical, Section 4.4, BWR Stress Corrosion Cracking	Revision 1, 10/26/2011
2. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness, Section 3.1.4	Revision 10, 09/13/2011
3. GGNS-EP-08-LRD02	Operating Experience Review Report–AERM	Revision 0, 09/16/2011
4. CEP-ISI-102	Program Section for ASME Section XI, Division 1 Inservice Inspection Program	Revision 2, 12/14/2009
5. CEP-R&R-001	ASME Section XI Repair/Replacement Program	Revision 304, 12/13/2010
6. CR-GGN-2008-03784	During a Review of the ISI Outage Scope It was Determined that Two Reactor Vessel Nozzle Welds That are Required To Be Inspected in RF16 Were Not Included in RF16 scope	07/30/2008
7. EC# 0000002058	Replace the Existing Carbon Steel 4-inch-DBB-11 Piping of HPCS System from Downstream of Orifice Q1E22-D001 to MOV Q1E22-F012 with Stainless Steel Material for FAC Item 659 (E22-007)	Revision 000, 10/25/2007
8. Not applicable	Grand Gulf Nuclear Station Unit 1, Docket No. 50-416, License No. NPF-29, Generic Letter 88-01, AECM-88/0153	08/08/1988
9. Not applicable	Grand Gulf Nuclear Station Unit 1, Docket No. 50-416, License No. NPF-29, Response to Generic Letter 88-01, Supplement 1	06/05/1992
10. GNRO-2009/00004	Inservice Inspection Summary Report, Grand Gulf Nuclear Station Unit 1, Docket No. 50-416, License No. NPF-29	01/19/2009
11. GNRO-2007/00046	Inservice Inspection Summary Report, Grand Gulf Nuclear Station Unit 1, Docket No. 50-416, License No. NPF-29	7/10/2007

During the audit of program elements 1–6, the staff verified that the “preventive actions,” “parameters monitored or inspected,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. For the “scope of program” and “detection of aging effects” “program elements, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

The “scope of program” program element of GALL Report, AMP XI.M7, “BWR Stress Corrosion Cracking,” states that the program is applicable to all BWR piping and piping



welds made of austenitic stainless steel and nickel alloy that are 4 inches or larger in nominal diameter containing reactor coolant at a temperature above 93 degrees Celsius (200 degrees Fahrenheit) during power operation, regardless of code classification. In comparison, LRA Section B.1.9 states that the BWR Stress Corrosion Cracking Program is an existing program that manages cracking of the reactor coolant pressure boundary (RCPB) using preventive measures, inspection, and flaw evaluation. Based on the program scope described in the LRA, it is not clear if the scope of the applicant's BWR Stress Corrosion Cracking Program includes piping and piping welds regardless of ASME Code classification, consistent with the GALL Report.

LRA Section B.2.1.7 states that this program implements the program delineated in NUREG-0313, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," Revision 2, and Generic Letter (GL) 88-01, "NRC Position on Intergranular Stress Corrosion Cracking in BWR Austenitic Stainless Steel Piping," dated January 25, 1988, and its Supplement 1, dated February 4, 1992. During the audit, the staff noted that the site documentation related to AMP consistency evaluation indicates that the applicant's "detection of aging effects" program element is credited to manage cracking of the following components, as well as piping and piping welds: (1) stainless steel thermal sleeves and nickel alloy thermal sleeve extensions of reactor vessel nozzles (i.e., recirculation inlet, core spray inlet and RHR/LPCI nozzles), and (2) stainless steel pump casings, valve bodies, and thermowells. However, it is not clear what inspections are performed on these components (thermal sleeves, thermal sleeve extensions, pump casings, valve bodies, and thermowells) as part of the applicant's BWR Stress Corrosion Cracking Program in view that the inspections described in the GALL Report are mainly based on the guidance in GL 88-01 that addresses inspections of piping and piping welds.

During the audit of the "operating experience" program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing an RAI for the subject discussed below, in connection with the concern related to the "scope of program" program element.

As described above in the concern related the "scope of program" program element, LRA Section A.1.9 (UFSAR supplement) does not clearly indicate whether or not the scope of the applicant's program includes all relevant piping and piping welds regardless of code classification, consistent with the GALL Report.

**Audit Results.** Based on this audit, the staff verified that LRA program elements "preventive actions," "parameters monitored or inspected," "monitoring and trending," and "acceptance

criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M7. The staff also identified certain aspects of LRA program elements “scope of program” and “detection of aging effects” that require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

### **LRA AMP B.1.10, BWR Vessel ID Attachment Welds**

Summary of Information in the Application. The LRA states that AMP B.1.10, “BWR Vessel ID Attachment Welds,” is an existing program that is consistent with the program elements in GALL Report AMP X1.M4, “BWR Vessel ID Attachment Welds.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report are addressed in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent database search of the applicant’s operating experience database using the following keywords: “cracking,” “wear,” “hold down,” “core spray,” “attachment welds,” “steam dryer,” and “jet pump.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD05	Aging Management Program Evaluation Report Class 1 Mechanical–BWR Vessel ID Attachment Welds	Revision 1
2. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness for BWR Vessel ID Attachment Welds	Revision 0
3. BWRVIP-48-A	Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines	06/2004
4. CEP-ISI-102	ASME Section XI, Division I Inservice Inspection Program– GGNS Appendix B	Revision 2
5. CEP-RVI-001	Reactor Vessel Internals Management Program Plan–Appendix O (ASME Section XI Vessel Attachments)	Revision 4
6. SEP-RVI-002	Grand Gulf Reactor Vessel Internals Inspection Program Plan–Appendix O (Section XI Vessel Attachments)	Revision 0
7. CR-GGN-2008-05004	IVVI inspection of the Steam Dryer Lifting Lug (220-degree) in RF16	09/26/1988
8. CR-GGN-2007-01283	IVVI Inspection of the Steam Dryer Lifting Lug during RF15	03/27/2007

During the audit of program elements 1–6, the staff verified that “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and

trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing RALs for the subject discussed below.

The staff noted that the AMP manages cracking in structural welds using inspection and flaw evaluation in accordance with BWRVIP-48-A. However, the UFSAR supplement in Section A.1.10 does not identify BWRVIP-48-A as the applicable industry standard.

Audit Results. Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M4.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

#### **LRA AMP B.1.11, BWR Vessel Internals**

Summary of Information in the Application. The LRA states that AMP B.1.11, “BWR Vessel Internals,” is an existing program, with enhancements, 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. Issues identified but not resolved in this report are addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “cast,” “stress corrosion cracking,” “steel,” “bolt,” “nickel alloy,” “embrittlement,” and “jet pump.”

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

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision / Date</b>
1. LRA B.1.11	BWR Vessel Internals	06/22/2011
2. NUREG-1801 XI.M9	BWR Vessel Internals	Revision 2, 12/2010
3. SEP-RVI-002	Grand Gulf RVI Inspection Program Plan	Revision 0
4. BWRVIP-234	Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steels for BWR Internals	12/2009
5. NUREG/CR-4513	Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems	Revision 1, 05/1994
6. BWRVIP-84	Guidelines for Selection and Use of Materials for Repairs to BWR Internal Components	10/2000
7. RCA Report #93-55	Metallurgical Evaluation of Failed Jet Pump Hold-Down Beam	11/1993
8. BWRVIP-138	Updated Jet Pump Beam Inspection and Flaw Evaluation Guidelines	Revision 1 12/2008
9. GGNS-EP-08-LRD 10	Inspection Report Showing Wedge Rod Wear	Revision 0
10. BWRVIP-41	BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines	Revision 1, 09/2005

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 verified that the “preventive actions,” “parameters monitored or inspected,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. In addition, the staff found that for the “scope of program,” “detection of aging effects,” and “monitoring and trending,” program elements, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

The “scope of program” program element of the LRA AMP states, “[a]pplicable industry standards and staff-approved BWRVIP documents are used to delineate the program.” The GALL Report AMP recommends listing all of the relevant documents. Without an explicit list, the staff is not clear that these statements are consistent. In addition, the LRA AMP does not include the enhancement in the “scope of program” program element and also claims to be consistent with BWRVIP-139-A for inspection and evaluation of the steam dryer. The plant is installing a new steam dryer that is substantially different from the current dryer. The staff asked for the enhancement to be added to the “scope of program” element and questioned whether the new steam dryer is still within the scope of the BWRVIP-139-A recommendations.

The “detection of aging effects” program element of the LRA AMP states that the enhancement will inspect a portion of the susceptible components determined to be limiting from the standpoint of thermal aging embrittlement, neutron fluence, and crack susceptibility. The GALL Report AMP includes the same general recommendations but adds supplemental inspections on 100 percent of the accessible, susceptible components, unless the component is loaded in compression. The staff is not clear that these statements are consistent because the applicant’s enhancement is not specific about how the susceptible components will be determined and which ones will be inspected.

The “monitoring and trending” program element was not included in the LRA AMP enhancement. The enhancement does include re-inspection if cracking is detected in the initial inspections, but it did not specify a frequency. The GALL Report AMP states that the re-inspections are scheduled in accordance with the applicable NRC-approved BWRVIP guidelines. The staff is not clear that these statements are consistent because the applicant’s enhancement is not specific on the details for re-inspection.

During the audit of the “operating experience” program element, the staff determined that the operating experience provided by the applicant and identified by the staff’s independent database search is not bounded by industry operating experience (i.e., previously known aging effects were not identified by the applicant). The staff also determined that 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 the effects of aging during the period of extended operation. To obtain the information necessary to determine if the applicant’s operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing an RAI for the subject discussed below.

The applicant has listed the inspection history for the current steam dryer at GGNS. There is no mention of operating experience at other plants with similar steam dryers. The staff is concerned that the replacement steam dryer at Grand Gulf, which will be installed in May 2012, may develop cracking similar to what occurred in 2010 for the steam dryers at the Susquehanna nuclear site.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing RAIs for the subject discussed below.

The description of the enhancement to the LRA AMP is copied into the UFSAR supplement. The description of the enhancement should be modified to reflect the issues discussed in the RAIs related to “scope of program,” “detection of aging effects,” and “monitoring and trending,” program elements.

Audit Results. Based on this audit, the staff verified that LRA program elements “preventive actions,” “parameters monitored or inspected,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M9. The staff also identified certain aspects of LRA program elements “scope of program,” “detection of aging effects,” “monitoring

and trending,” and “operating experience” that require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also identified that additional information on operating experience is required before a determination can be made on the sufficiency of the LRA AMP to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

### **LRA AMP B.1.12 Compressed Air Monitoring**

Summary of Information in the Application. The LRA states that AMP B.1.12, “Compressed Air Monitoring,” is an existing program, with enhancements, 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. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent search of the applicant's operating experience database using the following keywords: “rust,” “steel,” “corrosion,” “loss of material,” “through wall,” “dew point,” “air start,” “desiccant,” “air dryer,” “accumulator,” “air tank,” “dryer tower,” “compressor,” “after cooler,” “instrument air,” “automatic depressurization,” and “diesel generator.”

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

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD06	GGNS License Renewal Project Aging Management Program Evaluation Report Non-Class 1 Mechanical	Revision 1, 10/26/2011
2. GGNS-EP-08-LRD10	GGNS License Renewal Project Operating Experience Review Results—Aging Management Program Effectiveness	Revision 0, 09/13/2011
3. 08-S-03-10	Chemistry Procedure Chemistry Sampling Program Safety Related	Revision 48, 01/20/2011
4. 08-S-03-21	Chemistry Procedure Sampling Instrument Air, Emergency Diesel Starting Air and ADS Air Systems	Revision 6, 02/27/1996
5. EN-LI-102	Corrective Action Process	Revision 17, 12/08/2011
6. GGNS-MS-38	Quality Standard for Instrument Air System and Diesel Generator Starting Air	Revision 2, 04/24/2006
7. CR-GGN-1996-00231	D1 Diesel Generator Air Start Valve Pitting	10/24/1996
8. CR-GGN-2002-00283	Inaccessible Blowdown Locations	02/13/2002

Document	Title/Description	Revision/Date
9. CR-GGN-2010-01458	Check Valve Discoloration from Moisture Carry-Over	03/05/2010
10. CR-GGN-1999-00905	Errors Identified in Mechanical Standard GGNS-MS-38	08/19/1999
11. CR-GGN-2003-02430	Rust Found During the Diesel Generator Air Internal Tank Inspection	08/20/2003

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 verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. In addition, the staff found that for the “detection of aging effects” and “monitoring and trending” program elements, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

The “detection of aging effects” program element of the LRA AMP states in enhancement 2 to the LRA AMP that periodic and opportunistic inspections of accessible internal surfaces of piping and components will be conducted. The GALL Report AMP recommends that periodic visual inspections of critical component internal surfaces be performed for signs of loss of material because of corrosion. The staff is not clear that these statements are consistent because the enhancement does not identify the “detection of aging effects” as a program element affected. It is also not clear what type of components will be inspected or the specific inspection type and frequency that will be used.

The “monitoring and trending” program element of the LRA AMP states in enhancement 2 to the LRA AMP that periodic and opportunistic inspections of accessible internal surfaces of piping and components will be conducted. The GALL Report AMP recommends trending practices such as reviewing results for unusual, long-term, or adverse conditions and trends. The staff is not clear that these statements are consistent because the LRA AMP and enhancement to the “monitoring and trending” program element do not describe any trending practices recommended for this program.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the

information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing RAls for the subjects discussed below.

Table 3.0-1 of the SRP-LR states that the UFSAR supplement for the Compressed Air Monitoring Program should include a summary description of the program, which includes preventive monitoring, inspections, and the applicant's crediting of its response to NRC GL 88-14, "Instrument Air Supply System Problems Affecting Safety-Related Equipment," dated August 8, 1988, and ISA-S7.0.1-1998 as guidance for testing and monitoring air quality and moisture. LRA Section A.1.12, Compressed Air Monitoring Program, does not include a summary description of the program; instead, it only includes a description of the planned enhancements.

**Audit Results.** Based on this audit, the staff verified that LRA program elements "scope of program," "preventive actions," "parameters monitored or inspected," and "acceptance criteria" are consistent with the corresponding program elements in GALL Report AMP XI.M24. The staff also identified certain aspects of LRA program elements "detection of aging effects," and "monitoring and trending," which will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

#### **LRA AMP B.1.13, Containment Inservice Inspection-IWE**

**Summary of Information in the Application.** The LRA states that AMP B.1.13, "Containment Inservice Inspection-IWE," is an existing program that is 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. Issues identified but not resolved in this report will be addressed in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted a walkdown of the containment to inspect the general condition of the liner plate. The staff also conducted an independent database search of the applicant's operating experience database using the following keywords: "containment," "liner plate," and "suppression pool."

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



### Relevant Documents Reviewed

Document	Title/Description	Revision/Date
1. LRA Section B.1.13	Containment Inservice Inspection–IWE	Not applicable
2. GGNS-EP-08-LRD07	GGNS License Renewal Project, Aging Management Program Evaluation Report Civil/Structural	Revision 0
3. GGNS-EP-08-LRD02	GGNS License Renewal Project, Operating Experience Review Report–AERM	Revision 0
4. CR-GGN-1998-01235	Condition Report	Unavailable
5. CR-GGN-2003-02290	Condition Report	Unavailable
6. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness	Revision 0

During the audit of program elements 1–6, the staff verified that the “detection of aging effects,” and “monitoring and trending,” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. For the “scope of program,” “preventive actions,” “parameters monitored or inspected” and “acceptance criteria” program elements insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAls for the subjects discussed below.

The LRA AMP states that the Containment Inservice Inspection–IWE Program is consistent with the program described in the GALL Report AMP XI.S1. The GALL Report AMP states that the ASME Code, Section XI, Subsection IWE, and the additional requirements specified in 10 CFR 50.55a(b)(2) constitute an existing mandated program applicable to managing aging of steel containments, steel liners of concrete containments, and other containment components for license renewal. The staff is not clear that these statements are consistent because Section 3.2 of the GGNS License Renewal Project, Aging Management Program Evaluation Report Civil/Structural for the Containment Inservice Inspection (CII)–IWE, states that the requirements of IWA-2210 are not applicable to Subsection IWE visual examinations per IWE-2100.

The LRA AMP states that the Containment Inservice Inspection–IWE Program is consistent with the program described in the GALL Report AMP XI.S1. The GALL Report AMP recommends that the Containment Inservice Inspection–IWE Program be implemented in accordance with the ASME 2004 edition, as approved in 10 CFR 50.55a. The 10 CFR 50.55a (g)(4) regulations require that inservice inspection of components and system pressure tests conducted during successive 120-month inspection intervals must comply with the requirements of the latest edition and addenda of the Code referenced in the 10 CFR 50.55a, which states 12 months before the start of the 120 months inspection interval. The staff is not clear that these statements are consistent because Section 3.2 of the GGNS License Renewal Project, Aging Management Program Evaluation Report Civil/Structural for the Containment Inservice Inspection (CII)–IWE, states that IWE examination satisfies the requirements of the Code, 1998 edition with 1999 and 2000 addenda, 2001 edition with 2003 addenda, and the 2004 edition.

The LRA AMP states that the Containment Inservice Inspection–IWE Program is consistent with the program described in the GALL Report AMP XI.S1. GALL Report,

AMP XI.S1, Section 2, "preventive actions," recommends the selection of high-strength bolting material installation torque or tension and the use of lubricants and sealants to be in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the

additional recommendations of NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," issued June 1990, to prevent or mitigate degradation and failure. Section 3.2 of the GGNS License Renewal Project, Aging Management Program Evaluation Report Civil/Structural for Containment Inservice Inspection (CII)–IWE, states that molybdenum disulfide lubricant previously was used in the torquing process during construction and maintenance activities. However, this document does not identify any plan for inspecting high-strength bolts previously torqued using molybdenum disulfide lubricant.

The LRA AMP states that the Containment Inservice Inspection–IWE Program is consistent with the program described in the GALL Report AMP XI.S1. GALL Report, AMP XI.S1, Section 3, "parameters monitored or inspected," states that pressure-retaining surfaces of the containment should be inspected for evidence of corrosion, cracking, and wear. However, during the audit, the applicant informed the staff that the drywell and weir wall liner plates between elevations 93 ft. and 117 ft., which are located in the suppression pool, and the steel drywell head have not been examined during the life of the plant. Therefore, the staff plans to request the reasons for this inconsistency.

The LRA AMP states that the Containment Inservice Inspection–IWE Program is consistent with the program described in the GALL Report AMP XI.S1. GALL Report, AMP XI.S1, Section 6, "acceptance criteria" states that material loss exceeding 10 percent of the nominal containment wall thickness, or material loss predicted to exceed 10 percent of the nominal wall thickness before the next examination, are documented. Such areas are accepted by engineering evaluation or corrected by repair or replacement in accordance with IWE-3122. However, during the audit, the staff reviewed documentation indicating that flaws or degradation that exceeded 10 percent of the nominal wall thickness and accepted by engineering evaluation were not reexamined during the next inspection period, in accordance with IWE-3122 and IWE-2420(b). Therefore, the staff plans to request the reasons for this inconsistency.

During the audit of the "operating experience" program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements "detection of aging effects," and "monitoring and trending," are consistent with the corresponding program elements in GALL Report AMP XI.S1. The staff also identified certain aspects of LRA program

elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” and “acceptance criteria,” that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

#### **LRA AMP B.1.14 Containment Inservice Inspection–IWL**

Summary of Information in the Application. The LRA states that AMP B.1.14, “Containment Inservice Inspection–IWL,” is an existing program that is consistent with the program elements in GALL Report AMP XI.S2, “ASME Section XI, Subsection IWL.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted two walkdowns (January 31, 2012 and February 1, 2012) to inspect the general conditions of the concrete containment structure sections (cylindrical and dome) from different elevations. The staff also conducted an independent database search of the applicant’s operating experience database using the following keywords: “concrete,” “spalling,” and “containment.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. LRA Section B.1.14	Containment Inservice Inspection–IWL	Not applicable
2. Drawing, C-1000	Unit 1 Containment Civil Structural General Arrangement and Sections	Revision 4
3. Drawing, C-1047A	Unit 1-Containment Concrete & Misc. Steel Plan at EL. 208 ft.–10 inches	Revision 19
4. Drawing, C-1046A	Unit 1-Containment Concrete & Misc. Steel Plan at EL. 184 ft. – 6 inches	Revision 8
5. Drawing, C-1045A	Unit 1-Containment Concrete & Misc. Steel Plan at EL. 16,110 inches and EL. 170 ft.-0”	Revision 8
6. Drawing, C-1044A	Unit 1-Containment Concrete & Misc. Steel Plan at EL. 135 ft.–4 inches and EL. 147 ft.-7 inches	Revision 15
7. Report, GGNS-CS-08-AMC01	GGNS “License Renewal Project, AMR of the Containment Building”	Revision 0
8. Report, GGNS-EP-08-LRD10	O/E Review Report–AMP	Revision 0
9. Condition Report, CR-GGN-2001-00210	O/E Condition Report	01/25/2001
10. Condition Report, CR-GGN-2010-06182	O/E Condition Report: U-1 AB 139 Spalling on Containment Wall Near Conduit 1AERM141–The Areas are Not Deep Enough to Expose Rebar. No effect on the Integrity of the Structure WR 210239 for Repair	08/18/2010

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
11. Procedure, 17-S-01-6	Engineering Personnel Qualification and Certification	Revision 7
12. Procedure, EN-DC-112	Engineering Change and Project Initiation Process	Revision 4
13. Procedure, EN-DC-178	System Walkdown	Revision 3
14. Procedure, EL-LI-102	Corrective Action Process	Revision 17
15. Procedure, CEP-R&R-001 ASME	Section XI Repair/Replacement Program	Revision 304
16. Procedure, CEP-ISI-102 ASME	Section XI, Division 1 Inservice Inspection Program	Revision 2
17. Procedure, CEP-CISI-102 ASME	Section XI, Division GGNS Containment Inservice Inspection Program	Revision 1
18. Procedure, CEP-CII-004	General and Detailed Visual Examinations of Concrete Containments	Revision 302
19. Procedure, CEP-NDE-0903	VT-3 Examination	Revision 5
20. GGNS Inspection Report	QIPN0411-000-2006	2006
21. GGNS Entergy Letter to the NRC	Request for Authorization of Alternative Examination of Section IWL of ASME Code Regarding VT-1C and VT-3C Visual Examination Requirements	03/30/2000
22. GGNS Entergy Letter to the NRC	Request No CEP-IWE/IWL-001 Use of Subsequent ASME Code Edition and Addenda for Visual Containment Examination	10/27/2004
23. GGNS Entergy Letter to the NRC	Supplement to Request No. CEP-IWE/IWL-001 Use of Subsequent ASME Code Edition and Addenda for Visual Containment Examinations	12/7/2004
24. GGNS IWL Health Report	Cornerstone Rollup–Containment Inservice Inspection (CISI)	10/11/2010

During the audit of program elements 1–6, the staff verified that the “scope of program,” “preventive actions,” “detection of aging effects,” and “monitoring and trending,” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. However, the applicant stated that the ASME Section XI Examination Category L-B, L2.30, “Anchorage Hardware and Surrounding Concrete,” was a required examination category in “program description” and “scope of the program” element of the LRA. For the “parameters monitored or inspected” and “acceptance criteria” program elements insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program element of the GALL Report AMP, the staff will consider issuing RAIs for the subject discussed below.

The “parameters monitored or inspected” program element of the LRA AMP only identifies ACI 349.3R as the criteria for the concrete containment surface examination. The GALL Report, AMP XI.S2, ASME Section, Subsection IWL, Section 3, “Parameters Monitored or Inspected,” states that IWL-2510 of ASME Section XI Code specifies that concrete surfaces are examined for conditions indicative of degradation, such as those defined in ACI 201.1R and ACI 349.3R. The staff is not clear if the guidance provided in the ACI 201.1R is used for concrete inspection and documentation.

The “acceptance criteria” program element of the LRA AMP refers to recording and screening criteria in the applicant’s fleet procedure of CEP-CII-004, Rev. 302. The GALL Report, AMP XI.S2, ASME Section, Subsection IWL, Element 6, “acceptance criteria,” states that quantitative acceptance criteria based on the “evaluation criteria” provided in Chapter 5 of ACI 349.3R may be used to augment the qualitative assessment of the responsible engineer. It is unclear to the staff if acceptance criteria in Chapter 5, “Evaluation Criteria,” of ACI 349.3R provide the basis to establish general structural conditions of containment structure.

During the audit, the staff could not confirm if the GGNS IWL Program ASME Code requirement is consistent with the GALL Report ASME Code recommendation of the 2004 Edition of Section XI. Furthermore, it was not clear to the staff which edition and addenda of the ASME Section XI Code was used during the GGNS IWL program inspection.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that the operating experience provided by the applicant and identified by the staff’s independent database search is insufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. To obtain the information necessary to determine if the applicant’s operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing an RAI for the subject discussed below.

During the walkdown of GGNS containment structure on January 31, 2012, the staff could not determine if the steel support plates embedded in the containment concrete structure are inspected as part of the IWL Program.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR. However, the applicant stated in the LRA that the ASME Section XI Examination Category L-B, L2.30, “Anchorage Hardware and Surrounding Concrete,” as a required examination category.

Audit Results. Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “detection of aging effects,” and “monitoring and trending” are consistent with the corresponding program elements in GALL Report AMP XI.S1. The staff also identified certain aspects of LRA program elements “parameters monitored or inspected” and “acceptance criteria,” that require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also identified that additional information on operating experience is required before a determination can be made about the sufficiency of the LRA AMP to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

### **LRA AMP B.1.15, Containment Leak Rate**

Summary of Information in the Application. The LRA states that AMP B.1.15, "Containment Leak Rate Program," 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. Issues identified but not resolved in this report will be addressed in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walkdowns of the Auxiliary (containment) Building at elevations 208 feet to inspect the spent fuel pool, at elevation 120 feet to inspect the equipment hatch and the suppression pool. The staff also conducted an independent database search of the applicant's operating experience database using the following keywords: "Appendix J," "leak rate," and "vibration."

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

#### **Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision / Date</b>
1. GGNS-EP-08-LRD07	Aging Management Program Evaluation Report (Civil/Structural) – Leak Rate	Revision 0, 08/11/2011
2. GGNS-EP-08-LRD10	Operating Experience Review Results - Aging Management Program Effectiveness	Revision 0, 08/11/2011
3. Unavailable	Grand Gulf Nuclear Station, Civil Structural, Design Criteria Manual	Revision 1, 05/04/1989
4. 06-ME-1M61-V-0001-0002	Surveillance Procedure LLRT Low Flow Air Using Low Flow Rotameter Panel or River Bend Volumetric Leak Rate Monitor (Safety Related)	Revision 110, 07/10/2008
5. 06-ME-1M10-O-0002	Continuous Use - Surveillance Procedure Containment Integrated Leak Rate Test (Safety related)	Revision 105, 11/16/2010
6. 06-ME-1M10-O-0002	Continuous Use - Surveillance Procedure Containment Integrated Leak Rate Test (Safety related)	Revision 105, 11/16/2010
7. 04-1-05-M61-2	LLRT Alignment Instructions Containment Electrical Penetrations (Safety related)	Revision 0, 12/17/2009
8. 04-1-05-M10-1	Reference Use - LLRT Alignment Instructions Containment Hatch, Fuel Transfer Tube Door and Bellows Penetration (Safety Related)	Revision 0 12/14/2009
9. 17-S-05-1	Guideline for LLRT Program for the Appendix J Program	Revision 109, 04/04/2008
10. 06-ME-1M61-V-0003	LLRT Low Pressure Water	Revision 104 01/23/2008
11. 06-ME-1M61-V0004	LLRT High Pressure Water	Revision 103 06/27/2006
12. 06-ME-1M23-V-0002	Personnel Airlock LLRT Local Leak Rate Test	Revision 114 12/16/2010
13. 06-ME-1M23-R-0001	Personnel Airlock Door Seal Air System Leak Test	Revision 112 1/13/2010

Document	Title/Description	Revision / Date
14. 06-ME-1M23-V-0001	Containment and Drywell Airlock Seal Leak Test	Revision 107 04/04/2008
15. CR-GGN-2010-03287	Condition Report, Corrective Action, Admin, Operability, Assignments, Reportability: LLRT Failure of Penetration 39	05/04/2010
16. CR-GGN-2010-02994	Condition Report, Corrective Action, Admin, Operability, Assignments, Reportability: LLRT Failure of G36-F101	05/01/2010
17. CR-GGN-2009-05644	Condition Report, Corrective Action, Admin, Operability, Assignments, Reportability: 1P52F105 LLRT Degradation/off Scale Readings	10/26/2009
18. CR-GGN-2010-05577	Condition Report, Corrective Action, Admin, Operability, Assignments, Reportability: MSIV Thermowells, Flow Induced Vibration	07/20/2010
19. CR-GGN-2010-00455	Condition Report, Corrective Action, Admin, Operability, Assignments, Reportability: Vent Valve P41F184A Vibration	01/24/2011
20. LO-GLO-2009-00092	Corrective Action and Due date Extension: Tracking Basis Requirements	11/10/2009- 01/09/2010
21. CR-GGN-2010-02994	Corrective Action and Due date Extension: Engineer's Knowledge vs Systematic Approach	11/10/2009- 02/22/2010
22. CR-GGN-2010-01204	Condition Report, Corrective Action, Admin, Operability, Assignments, Reportability: Cyclic Loading of valve SP41F155A	02/24/2010
23. CR-GGN-2010-04887	Condition Report, Corrective Action, Admin, Operability, Assignments, Reportability: Drywell Bypass	06/08/2010
24. Bechtel Drawing 9645-C-1002-A	Grand Gulf Unit I – Containment Liner Plate: Developed EL Outside AZ 180°-0°	Revision 11, 06/22/1973
25. Bechtel Drawing 9645-C-1002-B	Grand Gulf Unit I – Containment Liner Plate: Developed EL Outside AZ 360°-180°	Revision 11, 06/19/1973

During the audit of program elements 1-6, the staff verified that the “preventive actions,” “parameters monitored or inspected,” and “detection of aging effects,” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. For the “scope of program,” “monitoring and trending,” and “acceptance criteria,” program elements insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below:

For “scope of program,” program element which should include all containment pressure boundary components the staff noted that the Technical Specifications indicate for 10 CFR Part 50 Appendix J testing the leakage rate program is implemented with approved exemptions. The staff plans to request the applicant to identify all excluded/exempted components from the 10 CFR Part 50 Appendix J testing and state how it plans to manage the aging effects for the exempted/excluded components.

For “monitoring or trending,” program element the staff noted a discrepancy between the GALL Report, the Containment Leak Rate basis document, and the information yielded

by the operating experience database on this program element. It is not clear how the applicant monitors and trends LLRTs for the period of extended operation. The staff plans to request a clarification on the GGNS monitoring and trending methodology used to establish the station's LLRT frequency.

For its program description, "monitoring and trending," and "acceptance criteria," program elements the staff noted a discrepancy between the LRA, its basis document, and the Grand Gulf Nuclear Station Unit 1, Technical Specifications regarding standards to be followed for the 10 CFR Part 50 Appendix J, Option B testing. The staff plans to request a clarification which standards will be followed for leak rate testing during the period of extended operation; the RG 1.163, NEI 94-01, and the referenced ANSI/ANS 56.8, or the station's Technical Specification (TS) referenced Amendment 135. It is not clear whether Amendment 135 is consistent to the GALL Report XI.S4.

During the audit of the "operating experience" program element, the staff determined 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). The staff also determined that 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 the effects of aging. In order to obtain the information necessary to determine whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the subject(s) discussed below:

Following a review of the applicant's operating experience database, and the LRA "operating experience," program element, it was not clear whether the applicant properly monitors and sets the administrative leakage rate limits for Type B and C pressure boundary components. It is not clear whether the applicant sets limits at the onset of component degradation or at the onset of failure. It is also not clear how the applicant distinguishes which components to repair, evaluate, and defer.

Following a review of the applicant's operating experience database, and the LRA "operating experience," program element the staff noted that the Containment Leak Rate Program lacks effectiveness in its implementation. The staff plans to request the applicant to identify measures to be taken to improve the program's effectiveness prior to the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR Supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR Supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing an RAI for the subject discussed below.

The staff plans to ask an RAI stating the standards to be followed for the 10 CFR Part 50 Appendix J LRT testing as implemented in the Containment Leak Rate Program.

**Audit Results.** Based on this audit, the staff verified that the LRA program elements "preventive actions," "parameters monitored or inspected," and "detection of aging effects" are consistent



with the corresponding program elements in GALL Report AMP XI.S4. The staff also identified certain aspects of LRA program elements “scope of program,” “monitoring and trending,” and “acceptance criteria” that require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also identified that additional information on operating experience is required before a determination can be made about the sufficiency of the LRA AMP to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

### **LRA AMP B.1.16, Diesel Fuel Monitoring**

Summary of Information in the Application. The LRA states that AMP B.1.16, “Diesel Fuel Monitoring,” is an existing program, with enhancements, 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. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walkdowns of the diesel fuel oil tanks. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “tank,” “oxidation,” and “corrosion.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD06	Aging Management Program Evaluation Report Non-Class 1 Mechanical	Revision 1
2. GGNS-EP-08-LRD10	Operating Experience Review Results Aging Management Program Effectiveness	Revision 0
3. 06-CH-1P75-Q-0055	Surveillance Procedure Division I Standby Diesel Generator Fuel Oil Tank A003A Viscosity, Insolubles, Water and Sediment Safety Related	Revision 108 11/28/2007
4. 06-CH-1P75-Q-0056	Surveillance Procedure Division II Standby Diesel Generator Fuel Oil Tank A003B Viscosity, Insolubles, Water and Sediment Safety Related	Revision 110 11/28/2007
5. 06-CH-1P81-Q-0057	Surveillance Procedure Division III Standby Diesel Generator Fuel Oil Tank A001 Viscosity, Insolubles, Water and Sediment Safety Related	Revision 108 11/28/2007
6. 06-CH-SP64-Q-0039	Surveillance Procedure Fire Water System Diesel Fuel Oil Viscosity, Insolubles, Water and Sediment Safety Related	Revision 104 01/13/2005

Document	Title/Description	Revision/Date
7. 06-CH-1P75-O-0002	Surveillance Procedure Division III Standby Diesel Generator Fuel Oil Tank Cleaning and Inspection Safety Related	Revision 106 11/2/2006
8. 06-ME-1P75-Q-0001	Surveillance Procedure Removal of Water From Diesel Generator Fuel Oil Storage Tank Safety Related	Revision 106 01/26/2011
9. 06-ME-1P81-O-0002	Surveillance Procedure HPCS Diesel Generator Fuel Oil Storage Tank Cleaning and Inspection Safety Related	Revision 105 11/2/2006
10. 08-S-03-10	Chemistry Procedure Chemistry Sampling Program Safety Related	Revision 048 01/20/2011
11. 08-S-03-11	Chemistry Procedure Diesel Fuel Oil Sampling Safety Related	Revision 021 03/25/2010
12. 08-S-03-14	Chemistry Procedure Diesel Fuel Additions to Plant Systems Safety Related	Revision 024 01/28/2009
13. CR-GGN-2008-05139	Leak Rate on Penetration 49 valve 1G36-F106	2008
14. CR-GGN-2007-05702	Microbial Growth in Diesel Fuel Oil Day Tank	2007
15. CR-GGN-2008-02080	Fire Water Storage Tank Degradation	04/29/2008

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 verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing RAIs for the subject discussed below.

The UFSAR supplement description contained in the SRP-LR provides an acceptable program description for the GALL Report AMP XI.M30. The LRA does not specify the industry standards used in the program. Specifying the applicable industry standards used for the program ensures that there is adequate description of the critical elements for the program to provide assurance that it will be properly executed during the period of extended operation.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M30.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

### **LRA AMP B.1.17, Environmental Qualification (EQ) Of Electric Components**

**Summary of Information in the Application.** The LRA states that AMP B.1.17, “Environmental Qualification (EQ) Of Electric 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. Issues identified but not resolved in this report will be addressed in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walkdowns of the containment building. The staff also conducted an independent database search of the applicant’s operating experience database using the following keywords: “cable,” “equipment qualification,” and “cracking.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD08	LRA Appendix B.1.17 Environmental Qualification Of Electric Components	Revision 1
2. GGNS-EP-08-LRD02	Operating Experience Review Report	Revision 0, 09/16/2011
3. Not applicable	EQ Health Report	Q4-2011 Q3-2011 Q2-2011 Q1-2011 Q2-2010 Q2-2009 Q2-2008 Q2-2007 Q2-2006
4. GLO-2010-0018CA-03	Environmental Qualification Program Assessment	12/14/2009
5. QA-4-2004-ENS-1	Quality Assurance Audit Report	03/01/2004
6. FTK-ESPP-G00017	Maintain the Environmental Qualification Program	Revision 3, 10/07/2011
7. FTK-ESPP-G00018	Maintain an EQ File	Revision 3, 10/07/2011

Document	Title/Description	Revision/Date
8. Calculation No: EC-Q1B21-90025	Qualified Life of the MSIV Limit Switches	01/17/2012
9. CR-ggn-2010-01537	Specification E100.0 Rev. 6 Temperature Curve Set 12 for the Auxiliary Building Appears To Be in Error	03/09/2010
10. CR-GGN-2003-03436	Several Area Temperatures in the Auxiliary Building Exceed Their Equipment Qualification Limit	11/21/2003
13. NPF-29	Tech Spec: Containment Systems	Not applicable
14. Drawing FSK-E 422E035.0	Electrical Containment Penetrations	Revision 7

During the audit of program elements 1–6, the staff verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria,” are consistent with the corresponding program elements in GALL Report AMP X.E1.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR

#### **LRA AMP B.1.18, External Surfaces Monitoring**

**Summary of Information in the Application.** The LRA states that AMP B.1.18, “External Surfaces Monitoring,” is an existing program, with enhancements, that is consistent with the program elements in GALL Report AMP XI.M36, “External Surfaces Monitoring of Mechanical Components.” To verify this claim of consistency, the staff audited the LRA AMP. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent database search of the applicant’s operating experience database using the following keywords:

“coating,” “corrosion,” “cracking,” “crevice,” “damage,” “loss of material,” “degradation,” and “pitting.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

Relevant Documents Reviewed		
Document	Title/Description	Revision/Date
1. GGNS-EP-08-LRD06	Aging Management Program Evaluation Report Non-Class 1 Mechanical	Revision 1, 10/26/2011
2. GGNS-EP-08-LRD10	Operating Experience Review Results Aging Management Program Effectiveness	Revision 1, 09/13/2011
3. EN-DC-178	System Walkdowns	Revision 3, 11/30/2011
4. EN-DC-159	System Monitoring Program	Revision 6, 09/30/2011
5. CR-GGN-2009-05672	Scale and Rust on Valve Bonnet during Valve Inspection	10/27/2009
6. CR-GGN-2006-03600	Piping is Pitted from Corrosion and Portions of Piping Needs Replacing	09/14/2006
7. CR-GGN-2009-02100	System Engineering Walkdown, Loss of Coating was Discovered	04/12/2009
8. CR-GGN-2006-00671	NRC Identified Several Valves with Severe Corrosion	02/17/2006
9. CR-GGN-2010-06655	SSW Piping is Experiencing Light Surface Corrosion	09/09/2010

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 verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “operating experience” are consistent with the corresponding program elements in GALL Report AMP XI.M36. The staff’s

evaluation of aspects of the program elements associated with enhancements that are not necessary for consistency will be addressed in the SER.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

### **LRA AMP B.1.19, Fatigue Monitoring**

Summary of Information in the Application. The LRA states that AMP B.1.19, "Fatigue Monitoring," is an existing program, with enhancements and an exception, that is consistent with the program elements in GALL Report AMP X.M1, "Fatigue Monitoring." To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER. This audit report also does not consider the sufficiency of exceptions, which also will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent search of the applicant's operating experience database using the following keywords: "fatigue cracking," "cyclic loading," and "fatigue cycles."

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

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD05	Aging Management Program Evaluation Report Class 1 Mechanical–Fatigue Monitoring Program	Revision 1
2. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness–Fatigue Monitoring Program	Revision 0
3. GGNS MS-40	Mechanical Standard and Technical Support Procedure for ASME Class 1 Components Fatigue Cycle Counting	Revision 2, 07/21/2005
4. EN-LI-102	Corrective Action Process	Revision 17, 12/08/2011
5. CR-GGN-2011-07417	Potential Impact of RIS-2008-30	10/19/2011
6. CR-GGN-2003-00309	Bottom Head Cooldown Rate Limit	01/30/2003
7. LO-GLO-2003-00107	ES Monitoring Assessment	08/21/2003
8. CR-GGN-2003-00703	Discrepancy in PDS Computer Points for Recirculation Loop Suction Temperatures	02/25/2003
9. CR-GGN-2011-08104	FatiguePro Update Shows FW Weldolets are Projected	11/10/2011
10. CR-GGN-2011-01938	During Review of Class 1 Fatigue Documentation for License Renewal, Issues were identified	03/21/2011
11.	Corrective Actions Associated with CR-GGN-2011-01938	04/06/2011

Document	Title/Description	Revision/Date
12. MC-Q1111-90170	Cumulative Operating Fatigue Usage Factors for Reactor Pressure Vessel Components, Class 1 Piping and Containment Penetrations	Revision 0, 07/06/1995
13. MC-Q1111-90170–Supplement 1	Cumulative Operating Fatigue Usage Factors for Reactor Pressure Vessel Components, Class 1 Piping and Containment Penetrations	Revision 0, 06/01/1999
14. MC-Q1111-90170–Supplement 2	Cumulative Operating Fatigue Usage Factors for Reactor Pressure Vessel Components, Class 1 Piping and Containment Penetrations	Revision 0, 12/19/2002
15. MC-Q1111-90170–Supplement 3	Cumulative Operating Fatigue Usage Factors for Reactor Pressure Vessel Components, Class 1 Piping and Containment Penetrations	Revision 0, 12/19/2002
16. SIA Calculation 1000487.301	Grand Gulf Fatigue Pro Data Update through RF017	Revision 0, 05/18/2011
17. SIA Calculation 1000487.302	Review of Counted Transients	Revision 1, 06/20/2011
18. SIA Calculation 1000487.303	Review of Past Cycle Counts for Accuracy	Revision 0, 05/03/2011
19. Not applicable	Grand Gulf Nuclear Station Primary/Secondary Strategic Chemistry Plan	Revision 6, 06/02/2009
20. SIR-96-070	Cycle Counting and Cycle-Based Fatigue Report for the Transient and Fatigue Monitoring System for Grand Gulf Nuclear Station Unit 1	Revision 1, 03/14/2008
21. MC-Q1111-04016	Cumulative Operating Fatigue Usage Factors for Reactor Pressure Vessel Components, Class 1 Piping and Containment Penetration–Updated for Refueling Outage for RF11, RF12, and RF13	Revision 1, 09/10/2004
22. MC-Q1111-07015	Cumulative Operating Usage Factors for Reactor Pressure Vessel Components, Class 1 Piping and Containment Penetration–till RF15	Revision 0, 04/02/2008
23. GEH 0000-0111-6201	Project Task Report, Task T0302: Reactor Vessel Integrity-Stress and Fatigue Evaluation	Revision 0
24. GEH 0000-0094-7642	Project Task Report, Task T0303: RPV Internals Mechanical Evaluation	Revision 0
25. GEH-0000-0113-6155	Recalculation of FW Nozzle CUF for EPU RAI Response	Revision 1

The staff conducted its audit of LRA program elements 1–7, based on the contents of the existing program as modified by the proposed enhancements. Aspects of the “corrective action” program element of the LRA AMP associated with the exception were not evaluated during this audit. Aspects of this program element that are not associated with the exception were evaluated and are described below.

During the audit, the staff verified that the “scope of program,” “preventive actions,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. The staff’s evaluation of aspects of the “corrective actions” program elements associated with the exception will be addressed in the SER. In addition, the staff found that for the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “corrective actions” program elements, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements

are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAs for the subjects discussed below.

The applicant's program description of the LRA AMP states that it tracks the number of critical thermal and pressure transients for selected components, verifies that the

severity of monitored transients are bounded by the design transient definitions for which they are classified, and assesses the effect of the reactor coolant environment on a set of sample critical components. The GALL Report AMP recommends these same aspects for managing cumulative fatigue damage. However, during its audit, the staff noted from its review of the applicant's plant documentation that the LRA AMP includes several monitoring methods. Therefore, it was not clear to the staff, based on the program description, how the LRA AMP manages cumulative fatigue damage.

The "parameters monitored or inspected" program element of the LRA AMP states that the GGNS program monitors the number of occurrences of plant design transients that cause significant fatigue usage. LRA Section 4.3.1 states that the Fatigue Monitoring Program will ensure that the accrued numbers of cycles of all design transients will remain below the numbers of cycles evaluated in the fatigue analyses. The UFSAR, LRA, and implementing procedures indicate several transients with various cycle limits and cycle limits for specific systems and components. The staff noted the GALL Report AMP recommends that the program monitor all plant design transients that cause cyclic strains, which are significant contributors to the fatigue usage factor. The staff is not clear how the applicant's Fatigue Monitoring Program accounts for the various cycle limits and specific system component cycles.

The "detection of aging effects" program element of the LRA AMP states that the program will be enhanced to revise program documents to provide updates of the fatigue usage calculations on an as-needed basis if an allowable cycle limit is approached, or in cases in which a transient definition has been changed, unanticipated new thermal events are discovered, or the geometry of components has been modified. The GALL Report AMP provides the same recommendations for this program element. During its audit, the staff noted in the applicant's implementing procedure that the relation between the different monitoring methods is not apparent and it is not clear if and when updates to calculations will be required for the parameters monitored. Therefore, the staff is not clear what aspects of the program and procedures will be revised to account for this enhancement.

The "monitoring and trending" program element of the LRA AMP and associated plant documentation states that the Fatigue Monitoring Program relies on manual cycle counting, cycle-based fatigue usage updates, partial cycle-based fatigue updates, automatic cycle counting, and stress-based fatigue monitoring. The GALL Report AMP recommends that trending is assessed to ensure that the fatigue usage factor remains below the design limit during the period of extended operation. The staff is not clear on what parameters are being used and how the applicant's program is trending these parameters to ensure that the fatigue usage factor remains below the design limit.

The "corrective actions" program element of the LRA AMP states that the program applies the requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power



Plants and Fuel Reprocessing Plants,” to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities,” through the Corrective Actions Program. The GALL Report AMP recommends repair, replacement, or more rigorous analysis of the component. In addition, it recommends program-scope expansion to include other locations when considering environmental effects. These recommendations are in addition to the requirements of Appendix B to 10 CFR Part 50. The staff is not clear that these statements are consistent because the LRA AMP does not include the additional recommendations of repair, replace, reanalyze, and scope expansion. In addition, it is also not clear if the LRA AMP will continually ensure that the locations managed for effects of reactor water environment will remain as the critical locations for the plant-specific configuration to ensure this aging effect is adequately addressed during the period of extended operation.

During the audit of the “operating experience” program element, the staff determined that the operating experience provided by the applicant and identified by the staff’s independent database search is not bounded by industry operating experience. The staff also determined that 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 the effects of aging. To obtain the information necessary to determine if the applicant’s operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the subjects discussed below.

The “parameters monitored or inspected” program element of the LRA AMP and associated plant documentation states that the applicant’s program currently incorporates the use of stress-based fatigue monitoring. The GALL Report AMP recommends that more detailed monitoring of local pressure and thermal conditions may be performed to allow the actual fatigue usage for the specified critical locations to be calculated. During its audit of the “operating experience” program element, the staff noted that the applicant’s documentation of how it addressed Regulatory Issue Summary (RIS) 2008-30, “Fatigue Analysis of Nuclear Power Plant Components,” dated December 16, 2008, were not clear. In addition, the GALL Report AMP discusses concerns with a methodology that has been used to perform fatigue calculations and as input for on-line fatigue monitoring programs by license renewal applicants or licensees in the current operating term. The staff is not clear how the applicant incorporates stress-based fatigue monitoring into its Fatigue Monitoring Program and how the concerns described in RIS 2008-30 were addressed.

The staff noted that the LRA AMP uses the FatiguePro software and that the “operating experience” program element of the LRA AMP did not address the NRC’s recently issued RIS 2011-14, “Metal Fatigue Analysis Performed by Computer Software,” dated December 29, 2011, which discusses concerns about the implementation of computer software packages used to demonstrate the ability of nuclear power plant components to withstand the cyclic loads associated with plant transient operations.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the

information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing RAls for the subjects discussed below.

The description of how the applicant's Fatigue Monitoring Program manages fatigue was not clear. Specifically, the applicant's program uses several methods of managing fatigue, which were not described in Appendices A and B. As appropriate, in the RAls the staff will consider issuing, the applicant will be requested to update its UFSAR supplement to provide an adequate summary description of how its LRA AMP manages fatigue.

**Audit Results.** Based on this audit, the staff verified that LRA program elements "scope of program," "preventive actions," and "acceptance criteria" are consistent with the corresponding program elements in GALL Report AMP X.M1. The staff's evaluation of aspects of the "corrective actions" program element associated with exception will be addressed in the SER. The staff also identified certain aspects of LRA program elements "parameters monitored or inspected," "detection of aging effects," "monitoring and trending" and "corrective actions" that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also identified that additional information on operating experience is required before a determination can be made about the sufficiency of the LRA AMP to detect and manage the effects of aging. In addition, the staff identified a need for additional information regarding the adequacy of the program description in the UFSAR supplement.

#### **LRA AMP B.1.20, Fire Protection**

**Summary of Information in the Application.** The LRA states that AMP B.1.20, "Fire Protection," is an existing program, with enhancements, 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. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER. Issues identified but not resolved in this report will be addressed in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walkdowns of the fire water pump house, outdoor CO<sub>2</sub> tank, control room, computer and control panel room, and lower cable spreading room. The staff also conducted an independent search of the applicant's operating experience database using the following keywords: "fire," "damage," "degradation," "corrosion," "rust," "tank," and "wrap."

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

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD06	Aging Management Program Evaluation Report–Sections titled Fire Protection and External Surfaces Monitoring	Revision 1
2. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness	Revision 0
3. QA-9-2010-GGNS-1	Quality Assurance Audit Report	For Audit Dates 01/11/2010–02/01/2010
4. 06-ME-SP64-R-1001	PGCC Halon Systems Flow Test	Revision 105, 05/15/2009
5. 06-ME-SP64-SA-0001	Computer and Control Panel Room Halon System Bottle Weight Check and Pressure Check	Revision 106, 08/17/2006
6. 06-OP-SP64-R-0002	10 Ton CO2 Systems, Puff Test	Revision 106, 06/27/2007
7. 06-OP-SP64-R-0022	Computer and Control Panel Room Halon System Functional Test and Flow Test	Revision 106, 10/21/10
8. 06-OP-SP64-D-0044	Fire Door Check	Revision 115, 10/27/2010
9. 06-OP-SP64-R-0047	Fire Rated Assembly Visual Inspection	Revision 113, 08/99/2010
10. 06-OP-SR64-R-0048	Visual Inspection of Fire Wrapped Raceways	Revision 107, 11/29/2006
11. 06-OP-SR64-R-0049	Fire Rated Sealed Penetrations Visual Inspections	Revision 108, 02/08/2011
12. 06-ME-SP64-R-0045	Ventilation System Fire Dampers Inspection	Revision 107, 12/04/2006
13. GLP-FP-FPSS1	Fire Protection System Surveillance Training–Fire Rated Assembly Inspection (course number GLP-FP-FPSS1)	Revision 1
14. GLP-FP-FPSS2	Fire Protection System Surveillance Training–Fire Wrapped Raceways (course number GLP-FP-FPSS2)	Revision 1
15. GLP-FP-FPSS3	Fire Protection System Surveillance Training–Fire Rated Penetration Seals (Course Number GLP-FP-FPSS3)	Revision 1
16. GLP-FP-FPSS5	Fire Protection System Surveillance Training–Fire Door Inspection (Course Number GLP-FP-FPSS5)	Revision 1
17. No Document No	GGNS Fire Protection Program–Health Report (Yellow)	3Q, 2010
18. No Document No	GGNS Fire Protection Program–Health Report (Yellow)	4Q, 2010
19. No Document No	GGNS Fire Protection Program–Health Report (White)	2Q, 2011
20. No Document No	GGNS Fire Protection Program–Health Report (White)	3Q, 2011
21. CR-GGN-2005-05262	Missing Fireproofing on Steel Beam	12/19/2005
22. CR-GGN-2002-00478	Rusted-Out Fire Door Bottom	03/17/2002

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, the staff verified that the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. In addition, the staff found that for the “scope of program” program element, insufficient information was available to determine if it was consistent with the corresponding program element of the GALL Report AMP. To obtain the information necessary to verify if this program element is consistent with

the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

The “scope of program” program element of GALL Report AMP XI.M26, “Fire Protection,” states that the program includes visual inspections of fire barrier penetration seals, walls, ceilings, floors, doors, and other fire-resistant materials that perform a fire barrier function. During its walkdown and review of the applicant’s onsite documentation, the staff noted that the applicant’s fire barrier materials include Thermo-lag and 3M Interam. However, the LRA does not include aging management results for these materials. The staff is not clear why aging management of Thermo-lag and 3M Interam materials is not included in the LRA.

The “scope of program” program element of GALL Report AMP XI.M26, “Fire Protection,” states that the program manages aging effects on the intended functions of the halon and CO<sub>2</sub> fire suppression systems. During its walkdown and review of the applicant’s onsite documentation, the staff noted that the CO<sub>2</sub> fire suppression system includes an outdoor CO<sub>2</sub> tank. However, the LRA does not include aging management results for this tank. The staff is not clear why aging management of the CO<sub>2</sub> tank is not included in the LRA.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing an RAI for the subject(s) discussed below.

SRP-LR Table 3.0-1 states that the Fire Protection Program includes functional tests of fire-rated doors to ensure that their operability is maintained. LRA Section A.1.20, “Fire Protection Program,” discusses only visual inspections of components with a fire barrier intended function.

Audit Results. Based on this audit, the staff verified that LRA program elements “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M26. The staff also identified certain aspects of LRA program element “scope of program” that require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the

effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

### **LRA AMP B.1.21, Fire Water System**

Summary of Information in the Application. The LRA states that AMP B.1.21, “Fire Water System,” is an existing program, with enhancements, that is consistent with the program elements in GALL Report AMP XI.M27, “Fire Water System.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walkdowns of the fire water storage tanks, the three fire water pumps (two diesel and one electric), and the fire water protection systems within the control building. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “through-wall,” “piping,” “degradation,” and “inspection.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD06	GGNS License Renewal Project, Aging Management Program Evaluation Report, Non-Class 1 Mechanical, Fire Water System	Revision 1
2. 04-S-01-P64-1	Plant Operations Manual, Continuous Use, System Operating Instruction, Fire Protection Water System, Safety Related	Revision 056
3. 06-ME-SP64-R-0016	Plant Operations Manual, Continuous Use, Surveillance Procedure, Unit 1 Fire Hose Check, Safety Related	Revision 105
4. 06-OP-SP64-A-0012	Plant Operations Manual, Surveillance Procedure, Annual Yard Fire Hydrant Flow Check, Safety Related	Revision 106
5. 06-OP-SP64-R-0019	Plant Operations Manual, Continuous Use, Surveillance Procedure, Sprinkler Systems Functional Tests, Safety Related	Revision 106
6. 06OPSP64-R-0019-01	Sprinkler System Functional Test	10/23/2009
7. 06OPSP64-A-0012	Annual Yard Fire Hydrant Flow Check	09/12/2010
8. CR-GGN-2009-01916	Fire Water Storage Tank Inspection	04/09/2009
9. CR-GGN-2006-03054	Fire Hose Station reel, Auxiliary Building	08/08/2006

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. During the audit, the staff verified that the “preventive actions,” “parameters monitored or inspected,” “detection of aging

effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. In addition, the staff found that for the program description and “scope of program” program element, insufficient information was available to determine if it was consistent with the corresponding program element of the GALL Report AMP. To obtain the information necessary to verify if this program element is consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

The LRA AMP does not include a comprehensive program description stating what type of inspections are performed (e.g., visual examinations of external and internal surfaces, hydrant flow tests, piping flow tests, flushing, and system performance tests), what type of preventive activities are included (e.g., pressure monitoring), or that activities are performed in accordance with applicable National Fire Protection Association (NFPA) codes, such as NFPA 25. The GALL Report AMP recommends that the program description include a detailed list of what components are included in the program and how—with reference to specific inspections and tests—aging management will be accomplished. The staff is not clear that these statements are consistent because the LRA AMP’s program description does not include a comprehensive list of the activities that will be used to detect aging.

The “scope of program” program element of the LRA AMP includes aging management of the buried fire main piping and sprinkler heads. However, there are no aging management review (AMR) items for the buried fire main (cement-lined piping) or sprinkler heads in the LRA that are being managed for aging using the Fire Water System program. The GALL Report recommends that all the components within the scope of the AMP be included in AMR items. It is not clear to the staff that these statements are consistent because the items within the scope of the program are not fully reflected as being managed by the program in the AMR items.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing an RAI for the subject discussed below.

The UFSAR supplement provided in LRA Section A.1.21 does not include a comprehensive description of the program that states what type of inspections are performed (including visual examinations of external and internal surfaces, hydrant flow tests, piping flow tests, flushing, and system performance tests), what type of preventive activities are included (system pressure monitoring), or that activities are performed in accordance with applicable NFPA codes.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M27. The staff’s evaluation of aspects of the program elements associated with enhancements that are not necessary for consistency will be addressed in the SER. The staff also identified certain aspects of LRA program element “scope of program” that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

### **LRA AMP B.1.22 Flow-Accelerated Corrosion**

**Summary of Information in the Application.** The LRA states that AMP B.1.22, “Flow-Accelerated Corrosion,” is an existing program, with an enhancement, that is consistent with the program elements in GALL Report AMP XI.M17, “Flow-Accelerated Corrosion.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “cavitation,” “erosion,” “flow accelerated,” “impingement,” and “through-wall.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. EN-DC-315	Flow Accelerated Corrosion Program	Revision 4, 08/20/2010
2. GGNS-EP-08-LRD06	AMP Evaluation Report Non-Class 1 Mechanical	Revision 1, 10/26/2011
3. GGNS-EP-08-LRD10	Operating Experience Review Results–AMP Effectiveness, Section 3.1.1.17, Flow Accelerated Corrosion	Revision 0, 09/13/2011
4. MC-Q1111-08011	Evaluation of RF 16 Flow Accelerated Corrosion Wall Thickness Data	Revision 0 07/29/2009
5. MC-Q1111-10003	Evaluation of RF 17 Flow Accelerated Corrosion Wall Thickness Data	DRAFT, 05/04/2010
6. EPRI 1018428	BWRVIP-205, Bottom Head Drain Line Inspection and Evaluation Guidelines	11/2008
7. ENTGGG072-GGNS-FAC-007	ENERCON CHECWORKS SFA Model Verification & Validation and Pass 2 Analysis	04/26/2010

Document	Title/Description	Revision/Date
8. 0700.104-10	CSI Technologies, FAC System Susceptibility Evaluation	10/20/2009
9. 0700.104-11	CSI Technologies, FAC Susceptible Non-Modeled Program	10/20/2009
10. CR-GGN-2010-02797	Gouge Downstream of 1E12F064C, RHR "C" Min Flow to Suppression Pool	04/28/2010
11. GGNS-EP-08-LRD06	Aging Management Program Evaluation Report Non-Class 1 Mechanical, Section 4.8 Flow-Accelerated Corrosion	Revision 1 10/25/2011
12. GGNS-EP-08-LRD10	Operating Experience Review Results—Aging Management Program Effectiveness, Section 3.1.17, "Flow Accelerated Corrosion"	Revision 0 09/13/2011
13. GGNS-MS-46	Program Plan for Monitoring Internal Erosion/Corrosion in Moderate Energy Piping Components (Safety-Related)	Revision 3 06/27/2002

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 verified that the "preventive actions," "parameters monitored or inspected," and "acceptance criteria" program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. In addition, the staff found that for the "scope of program," "detection of aging effects," and "monitoring and trending" program elements, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

GGNS-EP-08-LRD06, Section 4.8.A, states that this program is credited in systems that include the reactor coolant system pressure boundary, residual heat removal, reactor core isolation cooling and nonsafety-related systems affecting safety-related systems. However, Report MC-Q1111-08011 appears to show that this program also manages wall thinning in the low-pressure core spray and high-pressure core spray systems. Based on this, the scope of the program is not clear to the staff and may not be reflected in the LRA program basis documents.

EN-DC-315, Section 5.11, "Components Failing to Meet Initial Screening Criteria," states that a condition report shall be generated when "significant wall thinning," as defined in the procedure, is detected. However, a search of condition reports generated during recent outages only identified condition reports in which wall thinning was identified below the minimum acceptable wall thickness, and none were identified for "significant wall thinning," which would be a precursor condition when wall thickness is slightly above the minimum acceptable value. The staff is not clear that aging effects were being identified, and documented in the corrective action program, consistent with the program documents.

CR 2003-02331 discusses a through-wall leak in the standby service water system and states that the item is in the MS-46 program for erosion corrosion monitoring. GGNS-MS-46, "Program Plan for Monitoring Internal Erosion/Corrosion in Moderate Energy Piping Components (Safety-Related)," states that it covers moderate energy systems, which include standby service water, component cooling water, and fire protection systems, and defines erosion corrosion as wall thinning because of flow-accelerated corrosion or erosion mechanisms. The staff is not clear if MS-46 is a



separate program that monitors wall thinning for flow-accelerated corrosion and how it integrates with the flow-accelerated corrosion program described in the LRA.

MC-Q-1111-08011, Section 4.0, "Assumptions," states that for systems that only operate part-time, it is acceptable to use the grid-synchronized hours in calculating the projected life because it provides a valid relative measure of wear for whatever number of hours each system actually has operated, since these systems are expected to operate in the future in a manner similar to how they operated in the past. Notes within the document indicated that it was assumed that the reactor core isolation cooling system operated 12 hours per year. For this and other systems that only operate part time, it was unclear to the staff whether it was appropriate to use the normally applied 10 percent safety factor because relatively small increases in operating times could "consume" all of the uncertainty being applied in the 10 percent safety factor and not leave any margin for the other uncertainties (i.e., ultrasonic testing inaccuracies).

During the audit of the "operating experience" program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging. To obtain the information necessary to determine if the applicant's operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the subjects discussed below.

MC-Q1111-08011, "Evaluation of RF16 Flow-Accelerated Corrosion Wall Thickness Data," Item 809, states that the reactor water cleanup bottom head drain lines are an operating experience issue, and that BWRVIP-205, "Bottom Head Drain Line Inspection and Evaluation Guidelines," November 2008, changed GGNS from Category B to Category C, which requires an inspection within two outages. BWRVIP-205 was not included in LRA Appendix C, "Response to BWRVIP Applicant Action Items," and it is unclear to the staff if the inspections prescribed in BWRVIP-205 will be performed and if they are being tracked under the Flow-Accelerated Corrosion Program or the Reactor Vessel Internals Management Program.

MC-Q1111-08011, "Evaluation of RF16 Flow-Accelerated Corrosion Wall Thickness Data," Item 355 and Item 553, identified that the measured wall thickness was less than the minimum wall thickness. While the inspection scope was increased appropriately based on the calculated wear rates, the need to repair these components appears to have occurred several outages ago, and the staff questioned the effectiveness of the program because the planned inspections typically are scheduled to identify wall thinning and to repair or replace components before minimum wall thickness criterion is violated.

CR2010-00823 described an error EPRI reported in its CHECWORKS model software in which the wrong hours were used to calculate the predicted wear. The resolution to the condition report stated that CHECWORKS is only one of the tools that the flow-accelerated corrosion engineer used to determine component wear. It was unclear to

the staff what other methods are used to determine component wear, if there are errors in the CHECWORKS software.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “preventive actions,” “parameters monitored or inspected,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M17. The staff also identified certain aspects of LRA program elements “scope of program,” “detection of aging effects,” and “monitoring and trending” that require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also identified that additional information on operating experience is required before a determination can be made about the sufficiency of the LRA AMP to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

### **LRA AMP B.1.23, Inservice Inspection**

**Summary of Information in the Application.** The LRA states that AMP B.1.23, “Inservice Inspection,” 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. Issues identified but not resolved in this report will be addressed in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “cracking,” “leak,” “flaw,” “failure,” “degradation,” and “weld.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. CEP-ISI-102	Inservice Inspection Program	Revision 1 12/14/2009
2. LO-WTG GGN-2004-001	Change of Inspection Frequency of N-10 Nozzle	07/30/2005
3. CEP-RR-001	ASME Section XI Repair/Replacement Program	12/09/2010
4. NDEN 270-042-2006	UT Examination Summary Sheet	04/06/2007
5. NDEN 270-040-2006	RPV Nozzle Inner Radius Region, UT Examination Summary Sheet	04/07/2007
6. CR-GGN-2003-02978	Operating Experience Tracking Pilgrim Leakage Discovered in CRD Return Nozzle	10/09/2003
7. GNRO-2003/00022	BWR Feedwater Nozzle Inservice Inspection Report	Revision 0

8. GGNS-EP-08-LRD10	Operating Experience Review Results, Aging Management Program Effectiveness	Revision 0 09/13/2011
9. GGNS-EP-08-LRD05	Aging Management Program Evaluation Report, Class 1 Mechanical	Revision 1 10/26/2011
10. GGNS-EP-08-LRD03	TLAA and Exemption Evaluation Results	Revision 0 08/03/2011
11. NUREG-0619	BWR Feedwater Nozzle Inservice Inspection Summary Report	03/31/2003
12. CEP-RVI-002	Core Shroud Support and Access Hole Cover, "Reactor Vessel Internals Management Program Plan"	Revision 0
13. CR-GGN-2004-01703	Leak of the Inner Seal of the Reactor Head Flange	Revision 0 04/07/2007
14. SEP-RVI-002	Grand Gulf Reactor Vessel Internals (RVI) Inservice Inspection Program Plan	Revision 0

During the audit of program elements 1–6, the staff found that program elements “scope of program,” “detection of aging effects,” “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.

During the audit of the “operating experience” program element, the staff determined that the operating experience provided by the applicant was insufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. To obtain the information necessary to determine if the applicant’s operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the subject discussed below.

GALL Report AMP XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” states that the program “has been shown to be generally effective in managing aging effects in Class 1, 2, or 3 components and their integral attachments in light-water cooled power plants.” GALL Report AMP XI.M1 also provides industry operating experience cases in its “operating experience” program element. The applicant’s LRA Section B.1.23, “Inservice Inspection,” indicates that the program is consistent with the GALL Report and is in compliance with the ASME Code. However, the LRA does not provide any detailed description or discussion of plant-specific operating experience to demonstrate the effectiveness of the program in managing aging effects (e.g., detection of aging effects such as indications of cracking or loss of material, monitoring and trending of aging effects such as results of flaw evaluation and subsequent inspections, and any corrective actions such as inspection sample expansion and repair or replacement activities). Therefore, the staff needs additional information to confirm that the “operating experience” program element of the applicant’s program adequately addresses and evaluates relevant plant-specific operating experience, consistent with the GALL Report AMP, in terms of program effectiveness.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “scope of program,” “detection of aging effects,” “preventive actions,” “parameters monitored or

inspected,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M1. The staff also identified certain aspects of LRA program element “operating experience” that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff identified that additional information on operating experience is required before a determination can be made about the sufficiency of the LRA AMP to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

#### **LRA AMP B.1.24, Inservice Inspection–IWF**

Summary of Information in the Application. The LRA states that AMP B.1.24, “Inservice Inspection–IWF,” is an existing program, with enhancements, that is consistent with the program elements in GALL Report AMP XI.S1, “Inservice Inspection–IWF.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walkdowns of the turbine building, mechanical auxiliary building, reactor enclosure, suppression pool, and standby service water basins. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “IWF,” “support,” “inservice inspection,” and “bolt.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD07	Aging Management Program Evaluation Report Civil/Structural–Inservice Inspection-IWF	Revision 0
2. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness	Revision 0, 09/13/2011
3. 07-S-09-20	Maintenance Section Procedure Bolt Torquing Safety Related	Revision 1, 01/28/1986
4. 07-S-14-297	General Maintenance Instruction Torquing Requirements for General Maintenance Tasks Safety Related	Revision 8, 07/17/2008
5. EN-DC-141	Design Inputs	Revision 8, 12/14/2010
6. CEP-ISI-102	Program Section For ASME Section XI, Division 1 Inservice Inspection Program	Revision 2, 12/14/2009
7. PI-GGNS-ISI-3Q10	ISI Program Health Report	3Q 10/19/2010
8. CR-GGN-2011-04991	Corrective Action Report	07/22/2011

Document	Title/Description	Revision/Date
9. ISI-EV-11-001	Visual/Surface Evaluation of IWF Fastener	07/18/2011
10. CR-GGN-2010-06080	Corrective Action Report	08/13/2010
11. CR-GGN-2010-06042	Corrective Action Report	08/19/2010
12. CR-GGN-2011-05150	Corrective Action Report	07/27/2011
13. LO-NOE-2009-00082	Response to IN-09-004 Age-Related Constant Support Degradation	03/02/2009
14. CR-GGN-2007-03517	Corrective Action Report	12/14/2007
15 CR-GGN-2006-02782	Corrective Action Report	07/13/2006
16. OAR-1-00010	Inservice Inspection Summary Report	08/18/2010
17 OAR-1-00009	Inservice Inspection Summary Report	01/19/2009
18. GGNS-EP-08-LRD06	Aging Management Program Evaluation Report Non-Class 1 Mechanical Bolting Integrity	Revision 1

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 these program elements were evaluated and are described below.

During the audit, the staff verified that the “scope of program,” “parameters monitored or inspected,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. In addition, the staff found that for the “preventive actions,” “detection of aging effects,” and “monitoring and trending” program elements, insufficient information was available to determine if these elements were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

The “preventive actions” program element of the LRA AMP states that structural bolting is torqued in accordance with the site maintenance procedures and the lubricants that are recommended in the maintenance procedure include the use of molybdenum disulfide ( $\text{MoS}_2$ ). The LRA AMP further states that it is assumed that all high-strength structural bolting material (i.e., ASTM A325 and A490) have used this lubricant in the torquing process during construction and maintenance activities for the life of the plant so far; however, torquing procedures for high-strength bolts will be enhanced to prohibit use of this lubricant. The GALL Report AMP states that the selection of bolting material installation torque or tension and the use of lubricants and sealants should be done in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339 to prevent or mitigate degradation and failure of structural bolting.  $\text{MoS}_2$  has been shown to induce stress-corrosion cracking in high-strength steels, and though the applicant has indicated it will update its procedures to prohibit its use, there are aging concerns for degradation of the high-strength structural bolting where  $\text{MoS}_2$  was used. The LRA AMP does not address how and when the high-strength bolts previously torqued using  $\text{MoS}_2$  lubricant will be inspected for degradation.

The “detection of aging effects” program element of the LRA AMP states that the ISI-IWF program will be enhanced to include provisions to perform volumetric examinations comparable to that of ASME Section XI, Table IWB-2500-1, Examination Category B-G-1, for identified high-strength bolts. This is consistent with the recommendations in the GALL report AMP. However, the staff is not clear on how the volumetric inspections will be included in the IWF aging management program. The staff needs information on the methods that will be used to select bolts for volumetric examination, the sample size of bolts to be examined, and the frequency that the examinations will occur.

The “monitoring and trending” program element of the LRA AMP states that examinations that reveal indications that exceed the acceptance standards and require corrective measures are extended to include additional examinations in accordance with IWF-2430. During its audit, the staff reviewed documentation from IWF Inspection Interval 3 (July 2011) regarding degradation of a bolt that was found while performing a VT-3 examination of a pipe restraint in the standby service water system. The degradation was determined to exceed the acceptance criteria of the IWF program, but the staff did not find any documentation to indicate that the examination was or would be extended to include additional examinations in accordance with IWF-2430. Also, upon review of plant-specific operating experience, the staff noted several cases in which conditions were found during IWF examinations that appeared to be degraded. In each case, the licensee performed an engineering evaluation and determined that the as-found component was acceptable for continued service (i.e., did not violate the acceptance standards of IWF-3410), but the licensee still chose to enter the component into its Corrective Action Program and rework the component to as-new condition. The staff’s concern is that reworked supports that are part of the ISI IWF inspection sample may not be representative of the age-related degradation of similar components that are not part of the ISI inspection sample.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that the operating experience provided by the applicant and identified by the staff’s independent database search is insufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. To obtain the information necessary to determine if the applicant’s operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the subject discussed below.

Site-specific operating experience identified that there may be age-related degradation of underwater bolting of component supports in the SSW basins. The staff is concerned that although the degraded bolts were not found during IWF inspections, it is possible that bolts within the IWF program may have been identified during these inspections and potentially may be subject to degradation. In addition, the staff is not clear if there has been any effort to inspect any bolts in the SSW basin that are in the IWF inspection sample that may be subject to the same degradation.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “scope of program,” “parameters monitored or inspected,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.S3. The staff also identified certain aspects of LRA program elements “preventive actions,” “detection of aging effects,” and “monitoring and trending” that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also identified that additional information on operating experience is required before a determination can be made about the sufficiency of the LRA AMP to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

### **LRA AMP B.1.25 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems**

**Summary of Information in the Application.** The LRA states that AMP B.1.25, “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. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “crane,” “hoist,” “rust,” “corrosion,” “pitting,” “loss of material,” “degradation,” “coating,” “wear,” and “rail.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD-07	GGNS License Renewal Project Aging Management Program Evaluation Report Civil/Structural	Revision 0, 08/11/2011
2. 07-S-14-185	General Maintenance Instruction Periodic Inspection New Fuel Bridge Crane Safety Related	Revision 6, 03/22/2001
3. 07-S-14-226	General Maintenance Instruction Spent Fuel Cask Crane Periodic Inspection Safety Related	Revision 8, 07/30/2008
4. 07-S-14-256	General Maintenance Instruction Periodic Inspection and Maintenance P&H Overhead Bridge Crane Non-Safety Related	Revision 2, 02/12/1996
5. 07-S-14-272	General Maintenance Instruction Periodic Inspection and Maintenance Containment Polar Crane Safety Related	Revision 9, 02/25/2009
6. 07-S-5-300	Maintenance Procedure Control and Use of Cranes and Hoists Safety Related	Revision 113, 09/10/2010
7. EN-DC-150	Condition Monitoring of Maintenance Rule Structures	Revision 2, 12/20/2011

Document	Title/Description	Revision/Date
8. 07-S-05-305	Qualification/Certification of Overhead Crane Operators, Persons in Charge, Signalmen and Forklift Operators	Revision 8, 10/24/2006
9. EN-LI-102	Corrective Action Process	Revision 17, 12/08/2011
10. CR-GGN-2006-03962	Spent Fuel Cask Handling Crane Rail Clamp Down Bolt Abrasion	09/20/2006
11. CR-GGN-2008-00867	Turbine Building Crane Loose Bolts	02/19/2008
12. CR-GGN-2009-00545	Polar Crane Rail Clips–Broken Stud	02/04/2009
13. CR-GGN-2011-01583	Polar Crane Safety Rail Damage	03/09/2011

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 verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M23.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR

#### **LRA AMP B.1.26, Internal Surfaces in Miscellaneous Piping and Ducting Components**

**Summary of Information in the Application.** The LRA states that AMP B.1.26, “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. Issues identified but not resolved in this report will be addressed in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent database search of the applicant's operating experience database using the following keywords: "cracking," "damage," and "piping."

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

Relevant Documents Reviewed		
Document	Title/Description	Revision/Date
1. GGNS-EP-08-LRD06	GGNS License Renewal Project, Aging Management Program Evaluation Report Non-Class 1 Mechanical	Revision 1
2. GGNS-EP-08-LRD10	GGNS License Renewal Project Operating Experience Review Results—Aging Management Program Effectiveness	Revision 0
3. CR-GGN-2011-07724	Internal Inspection of Motor-Operated Valve for Corrosion	10/31/2011
4. CR-GGN-1996-00272	Interior Surface Inspection of Spray Sparger Piping	10/29/1996

During the audit of program elements 1–6, the staff verified that the "preventive actions" and "monitoring and trending" program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. For the "scope of program," "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

The "scope of program" program element of the LRA AMP does not state the environments of the program, if metallic ducting components are included in this program, omits a heat-transfer function line for heat exchangers in Section 3.3.2-16, does not list all the aging effects to be managed in the program, and does not align Table 1 and Table 2 line items associated with LRA Table 3.2.1-43. The GALL Report AMP recommends that the full scope of the program for its materials, environments, and aging effects be described in the program's AMP and the associated aging effect requiring management (AERM) line items. The staff is not clear that these statements are consistent because a full description of the scope associated with this program is absent and the program is not defined and bounded.

The "parameters monitored or inspected" program element of the LRA AMP does not state the inspection parameters to be associated with metallic components and polymers. The GALL Report AMP recommends a detailed list of parameters to be used with metallic components or polymers. The staff is not clear that these statements are

consistent because it is unclear what the methods for inspection are concerning components within this program.

The “detection of aging effect” program element of the LRA AMP does not state if the program is opportunistic, if the program will be used during scheduled outages, and the amount of surface area that will be used for flexible polymeric manipulation or if some surfaces may be inaccessible. The GALL Report AMP recommends a 10 percent surface area for manipulation, and that the program be opportunistic and used during scheduled outages. The staff is not clear that these statements are consistent because an undefined manipulation area would not allow physical manipulation to be effective and the frequency of the program’s inspections is currently undefined.

The “acceptance criteria” program element of the LRA AMP does not state the acceptance criteria to be associated with various materials within the program. The GALL Report AMP recommends a detailed approach to ensure the level of acceptance for materials within the program. The staff is not clear that these statements are consistent because without an acceptance level, the determination of when aging effects is occurring is unclear.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing RAIs for the subject discussed below.

It is unclear which water systems are included in the scope of the program, whether the program’s purpose intends to retain a component’s intended function, and a provision is not included for a plant-specific program when visual inspections of internal surfaces are not possible.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “preventive actions” and “monitoring and trending” are consistent with the corresponding program elements in GALL Report AMP XI.M38. The staff also identified certain aspects of LRA program elements “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” and “acceptance criteria” that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff identified a need for additional information about the

adequacy of the program description in the AMP and the associated section of the UFSAR supplement.

### **LRA AMP B.1.27, Masonry Wall**

Summary of Information in the Application. The LRA states that AMP B.1.27, “Masonry Wall,” is an existing program, with enhancements, that is consistent with the program elements in GALL Report AMP XI.S5, “Masonry Walls.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walkdowns of the Auxiliary Building and Turbine Building. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “block,” “mortar,” “CMU,” and “masonry.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD07	Grand Gulf Nuclear Station–License Renewal LRA Appendix B.1.27: Masonry Wall Program	Revision 0
2. EN-DC-150	Condition Monitoring of Maintenance Rule Structures	Revision 2, 12/20/2011
3. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness	Revision 0, 09/13/2011
4. CR-GGN-2001-00555	CMU Wall Cracked in Anchor Bolt Area	04/05/2011
5. CR-GGN-1997-00841	Cracks in CMU Wall in Auxiliary Building and Control Building	07/25/1997
6. CR-GGN-2007-05824	Cracks in SSW Basin	01/24/2008
7. GGNS-C-399.0	Maintenance Rule Inspection of Structures, Tanks, and Transformers	Revision 9, 11/13/2009
8. ER-GGNS-97-0043	Grand Gulf Nuclear Station Engineering Report for Allowable Crack Widths for Concrete and CMU Walls	Revision 0, 11/17/1997
9. ER-GG-1997-0761-000	Resolution of GGCR1997-0841-00	Revision 0, 10/11/1997

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 verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. In

addition, the staff found that for the “detection of aging effects” program element, insufficient information was available to determine if it was consistent with the corresponding program element of the GALL Report AMP. To obtain the information necessary to verify if this program element is consistent with the corresponding program element of the GALL Report AMP, the staff will consider issuing an RAI for the subject discussed below.

The “detection of aging effects” program element of the LRA AMP states that an enhancement will be made to clarify that detection of aging effects requires masonry walls to be inspected every 5 years, unless technical justification is provided to extend the inspection to a period not to exceed 10 years. The GALL Report AMP recommends masonry walls be inspected every 5 years, with provisions for more frequent inspections in areas where significant loss of material or cracking is observed to ensure there is no loss of intended function between inspections. The staff is not clear that these statements are consistent because the GALL Report recommends an inspection frequency of 5 years with no provisions to extend the period beyond 5 years.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

Audit Results. Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.S5. The staff also identified certain aspects of LRA program element “detection of aging effects” that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

#### **LRA AMP B.1.28, Non-EQ Cable Connections**

Summary of Information in the Application. The LRA states that AMP B.1.28, “Non-EQ Cable Connections,” is a new program that is consistent with the program elements described in NUREG-1801, Section 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. Issues identified but not resolved in this report are addressed in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent database

search of the applicant's operating experience database using the following keywords: "cable connections," "loosening," and "corrosions."

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

Relevant Documents Reviewed		
Document	Title/Description	Revision/Date
1. GGNS-EP-08-LRD08	Aging Management Program Evaluation Results–Non-EQ Cable Connections	Revision 1
2. GGNS-EP-08-LRD02	Operating Experience Review Report–AERM	Revision 0
3. EN-FAP-LR-026	Fleet Administrative Procedure–License Renewal Bolted Cable Connection AMP	Revision 1
4. EPRI TR-104213	Bolted Joint Maintenance and Application Guide	12/1995

During the audit of program elements 1–6, the staff verified that the "scope of program," "preventive actions," "monitoring and trending," and "acceptance criteria" program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. For the "parameters monitored or inspected" and "detection of aging effects" program elements, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

The Grand Gulf LRA Section B.1.28 states that this AMP is consistent with the GALL Report AMP XI.E6. The "parameters monitored or inspected" program element of the basis document, GGNS-EP-08-LRD08, Rev. 1, states that the representative sample of electrical cable connections will be tested, and the factors considered for sample selection will be application (medium and low voltage), circuit loading (high voltage), and location (high temperature, high humidity, vibration, etc.). The GALL Report AMP recommends under the "parameters monitored or inspected" program element that the following factors be considered for sampling: voltage level (medium and low voltage), circuit loading (high load), connection type, and location (high temperature, high humidity, vibration, etc.). Most connections used in nuclear power plants include splices (butt or bolted), crimp-type ring lugs, connectors, and terminal blocks. The staff is not clear that these statements are consistent because the "parameters monitored or inspected" program element of the basis document, GGNS-EP-08-LRD08, Rev. 1, does not consider or address connection types in the sample selection criteria.

The "detection of aging effects" program element of the Grand Gulf basis document, GGNS-EP-08-LRD08, Rev. 1, states that inspection methods may include thermography, contact resistance testing, or other appropriate quantitative methods based on plant configuration and industry guidance. The "detection of aging effects" program element of the GALL Report AMP recommends that testing may include thermography, contact resistance testing, or other appropriate testing methods without removing the connection insulation, such as heat shrink tape, sleeving, insulation boots, etc. The staff is not clear that these statements are consistent because from the program description of the applicant's basis document, it appears that the applicant may

use other testing methods that may include removing the connection insulation. Removing connection insulation for testing is not recommended in the GALL Report AMP XI.E6.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the subjects discussed below.

NUREG-1800 Rev. 2, Table 3.0.1, “UFSAR Supplement for Aging Management of Applicable Systems,” GALL Report AMP XI.E6, recommends that the program consists of a representative sample of electrical connections within the scope of license renewal, which is tested at least once before the period of extended operation to confirm there are no aging effects requiring management during that period. Testing may include thermography, contact resistance testing, or other appropriate testing methods without removing the connection insulation, such as heat shrink tape, sleeving, insulating boots, etc. Section A.1.28 of the applicant’s LRA states that the Non-EQ Cable Connection Program is a one-time inspection program that provides reasonable assurance that the intended function of the metallic parts of electrical cable connections are maintained with the current licensing basis through the period of extended operation. This LRA section further states that cable connections included are those connections susceptible to age-related degradation resulting in increased resistance of connection because of thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation that are not subject to the environmental qualification requirements of 10 CFR 50.49. This program provides for one-time quantitative inspections that will be completed before the period of extended operation on a sample of connections. In Section B.1.28 of the LRA, the applicant states that the program is consistent with the program elements described in NUREG-1801, Section XI.E6, “Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.” However, the applicant’s UFSAR supplement description does not describe the type of one-time quantitative inspection that it will perform.

Audit Results. Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in the GALL Report AMP XI.E6. The staff also identified certain aspects of LRA program elements “parameters monitored or inspected” and “detection of aging effects” that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff identified a need for additional information about the adequacy of the program description in the UFSAR supplement.

#### **LRA AMP B.1.29, Non-EQ Inaccessible Power Cables (400 V to 35 KV)**

Summary of Information in the Application. The LRA states that AMP B.1.29, “Non-EQ Inaccessible Power Cables (400 V to 35 KV),” is an existing program, with enhancements, that is consistent with the program elements in GALL Report AMP XI.E3, “Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walkdowns of inscope manholes for the 4.16 kV SSW pumps and load center cable (MH20, MH21, and MH01). The staff reviewed existing inscope program inspection and test results and also conducted an independent search of the applicant's operating experience database using the following keywords: “manhole,” “duct,” “water,” “cable,” “underground,” and “vault.”

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

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. LRA Appendix B, B.1.29	Inaccessible Power Cables (400 V to 35 kV)	Revision N/A, 10/28/2011
2. GGNS-EP—08-LRD10	Operating Experience Review Results—Aging Management Program Effectiveness	Revision 0, 09/13/2011
3. GGNS-EP-08-LRD08	Aging Management Program Results—Electrical	Revision 1, 10/11/2011
4. GGNS-EE-08-AME01	Aging Management Review—Electrical	Revision 0, 09/22/2011
5. CR-GGN-2009-01028	Condition Report—Water in safety related manholes #20 and #21	Revision N/A, 02/25/2009
6. CR-GGN-2009-00965	Condition Report—Water in safety related manholes #20 and #21 (Various Dates)—With Corrective Actions	Revision N/A, 03/02/2009
7. CR-GGN-2010-04875	Condition Report—Inspection of Manhole for Water-Pump Water From MH 21	Revision N/A, 06/07/2010
8. CR-GGN-2011-01609	Condition Report—Inspection of MH 20 and MH21	Revision N/A, 03/10/2011
9. 9645-E-029.0	Technical Specification for 9000 Volt Power Cable for Mississippi Power and Light company Grand Gulf Nuclear Station Units 1 and 2	Revision 8, 06/02/1976

Document	Title/Description	Revision/Date
10. 9645-E-029.1	Technical Specification for 35,000-Volt Power Cable for Mississippi Power and Light Company Grand Gulf Nuclear Station Units 1 and 2	Revision 10, 06/09/1976
11. EN-DC-346	Cable Reliability Program	Revision 1, 02/15/2011
12. GNRO-2011/00093	Attachment 1 to GNRO-2011/00093–List of Regulatory Commitments	Revision N/A, 10/28/2011
13. GGNS-EP-08-LRD02	Operating Experience Report–AERM	Revision 0, 09/16/2011
14. CR-GGN-2010-00529 and CR-GGN-2010-00539	Condition Report–Water Found in Manholes MH20, MH21, and MHS15	Revision N/A, 01/26/2010

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 verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.E3.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

#### **LRA AMP B.1.30, Non-EQ Instrumentation Circuits Test Review**

**Summary of Information in the Application.** The LRA states that AMP B.1.30, “Non-EQ Instrumentation Circuits Test Review,” is a new program that is consistent with the program elements in GALL Report AMP XI.E2, “Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in



Instrumentation Circuits.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walkdowns of the containment building. The staff also conducted an independent database search of the applicant’s operating experience database using the following keywords: “cable,” “cracking,” “spiking,” and “instrumentation calibration.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD08	LRA APPENDIX B.1.30 NON-EQ Instrumentation Circuits Test Review	Revision 1
2. GGNS-EP-08-LRD02	Operating Experience Review Report	Revision 0, 09/16/2011
3. Surveillance Procedure 06-1C-1C51-SA-0001	Average Power Range Monitor Calibration	Revision 101, 01/05/2011
4. Surveillance Procedure 06-1E-1C51-O-0001	Local Power Range Monitor Calibration	Revision 111, 09/01/2009
5. Surveillance Procedure 06-OP-1C51-V-0003	APRM Functional Test Safety Related	Revision 114, 07/02/2008
6. Surveillance Procedure 06-OP-1C51-V-0002	IRM Functional Test Safety Related	Revision 106, 02/22/2008
7. Adm procedure 01-S-02-3	LPRM Detector Removal / Installation	Revision 116

During the audit of program elements 1–6, the staff verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging. The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.E2.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

### **LRA AMP B.1.31, Non-EQ Insulated Cables and Connections**

**Summary of Information in the Application.** The LRA states that AMP B.1.31, “Non-EQ Insulated Cables and Connections,” is a new program that is consistent with the program elements in GALL Report AMP XI.E1, “Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walkdowns of cables from ESF transformer Nos. 11, 12, and 21; the containment building; and switchyard. The staff also conducted an independent database search of the applicant's operating experience database using the following keywords: “cable,” “copper,” and “cracking.”

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

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD08	LRA Appendix B.1.31 Non-EQ Insulated Cables And Connections	Revision 1, NA
2. GGNS-EP-08-LRD02	Operating Experience Review Report	Revision 0, 09/16/2011
3. EN-DC-115	Cable reroute procedure	Revision 9 NA

During the audit of program elements 1–6, the staff verified that the “preventive actions,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

For the “scope of program” and “parameters monitored or inspected” program elements insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

During the staff's walkdown of cables from ESF transformer Nos. 11, 12, and 21, the staff observed cables in uncovered open trays that may be subject to ultraviolet radiation and moisture, which are not in the scope of LRA AMP B.1.31. The GALL Report AMP recommends that the AMP applies to accessible electrical cables and connections within the scope of license renewal that are located in adverse localized environments caused by temperature, radiation, or moisture. The staff asked the applicant to explain how these components will be age-managed during the period of extended operation.

The "parameters monitored or inspected" program element of the LRA AMP did not identify either a methodology for determining the most limiting condition or the most limiting condition for the insulation material of electrical cables or connections. The GALL Report AMP for the "parameters monitored or inspected" program element recommends "[a]n adverse localized environment is a plant-specific condition; therefore the applicant should clearly define how this condition is determined. The applicant should determine and inspect the adverse condition localized environment for each of the most limiting temperature, radiation, or moisture conditions for the accessible cables and connections that are within the scope of license renewal." The staff asked the applicant to identify the methodology for determining an adverse localized environment and what limiting conditions for temperature, radiation, or moisture of insulation material of electrical cables or connections will Grand Gulf Nuclear Station apply in the identification of an adverse localized environment.

During the audit of the "operating experience" program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements "preventive actions," "detection of aging effects," "monitoring and trending," and "acceptance criteria" are consistent with the corresponding program elements in GALL Report AMP XI.E1. The staff also identified certain aspects of LRA program elements "scope of program," and "parameters monitored or inspected" that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

### **LRA AMP B.1.32, Oil Analysis**

Summary of Information in the Application. The LRA states that AMP B.1.32, “Oil Analysis,” is an existing program, with enhancements, that is consistent with the program elements in GALL Report AMP XI.M39, “Lubricating Oil Analysis.” To verify this claim of consistency, the staff audited the LRA AMP. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent search of the applicant's operating experience database using the following keywords: “microbiologically induced corrosion,” “MIC,” and “oil.”

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

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD06	Oil Analysis	Revision 1
2. GGNS-EP-08-LRD10	OP Review Results–AMP Effectiveness	Revision 0
3. 01-S-07-27	Administrative Procedures GGNS Lube Oil Sample Program Safety Related	Revision 13, 05/20/2005
4. 01-S-07-27	Administrative Procedures Lube Oil Safety Related	Revision 008, 05/07/2008
5. 08-S-04-368	Chemistry Instruction Water and Sediment In Oil Safety Related	Revision 1, 09/22/1982
6. EN-DC-310	Predictive Maintenance Program	Revision 4
7. EN-LI-102	Corrective Action Process	Revision 17
8. CR-GGN-2010-00048	Standby Diesel Start Air Compressor	01/05/2010
9. CR-GGN-2008-05508	Drywell Purge Compressor	10/05/2008

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 verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" are consistent with the corresponding program elements in GALL Report AMP XI.M39. The staff's evaluation of aspects of the program elements associated with enhancements that are not necessary for consistency will be addressed in the SER.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

### **LRA AMP B.1.33, One-Time Inspection**

**Summary of Information in the Application.** The LRA states that AMP B.1.33, "One-Time Inspection," is a new program that is consistent with the program elements in GALL Report AMP XI.M32, "One-Time Inspection." To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent database search of the applicant's operating experience database using the following keywords: "cracking," "degradation," and "loss of material."

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

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision / Date</b>
1. GGNS-EP-08-LRD06	GGNS License Renewal Project Aging Management Program Evaluation Report Non-Class 1 Mechanical, One-Time Inspection	Revision 1
2. GGNS-EP-08-LRD10	GGNS License Renewal Project Operating Experience Review Results—Aging Management Program Effectiveness, Section 3.2.8 One-Time Inspection	Revision 0
3. EN-FAP-LR-024	Entergy, Nuclear Management Manual, Fleet Administrative Procedure, Information Use, One-Time Inspection	Revision 0
4. CR-GGN-2005-04433	Condenser Bay Ventilation—Disassembly (Visually Detected Cracking of Fan Housing Cross Member)	10/13/2005
5. CR-GGN-2007-01614	Turbine Steam Tunnel Snubber Visual Inspections	03/28/2007

During the audit of program elements 1–6, the staff verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. For the “detection of aging effects” program element insufficient information was available to determine if it was consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if this program element is consistent with the corresponding program element of the GALL Report AMP, the staff will consider issuing an RAI for the subject discussed below.

The “detection of aging effects” program element of the LRA AMP does not state what inspection methods are aligned with the aging effects of loss of material, cracking, and fouling. The GALL Report AMP identifies the inspection method that will be associated with each aging effect, aging mechanism, and parameter monitored. The staff is not clear that these statements are consistent because the LRA omits the aligning inspection methods with its associated aging effects, aging mechanisms, and parameters monitored that are included in the applicant’s program.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR to match the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing an RAI for the subject discussed below.

LRA Section A.1.33 does not state the conditions when structures and components are to be excluded in the AMP scope. The SRP-LR Table 3.0-1 states that the One-Time Inspection Program cannot be used for structures or components with known age-related degradation, or when the environment in the period of extended operation is not expected to be equivalent to that in the previous 40 years.

**Audit Results.** Based on this audit, the staff verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.M32. The staff also identified certain aspects of the “detection of aging effects” program element of the LRA AMP that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

### **LRA AMP B.1.34, One-Time Inspection–Small Bore Piping**

Summary of Information in the Application. The LRA states that AMP B.1.34, “One-Time Inspection–Small Bore Piping,” is a new program that is consistent with the program elements in GALL Report AMP XI.M35, “One-Time Inspection of ASME Code Class 1 Small-Bore Piping.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent database search of the applicant’s operating experience database using the following keywords: “cracking,” “corrosion,” “cyclic,” “degradation,” “detection,” “damage,” “flaw,” “fatigue,” “indication,” “inspection,” “piping,” “rupture,” “steel,” “stress,” “thermal,” “through-wall,” “weld,” and “leak.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD05	Aging Management Program Evaluation Report Class 1 Mechanical	Revision 1
2. GGNS-EP-08-LRD02	Operating Experience Review Report–AERM	Revision 0
3. Electric Power Research Institute Technical Report 1013389	BWRVIP-155: BWR Vessel and Internal Project Evaluation of Thermal Fatigue Susceptibility in BWR Stagnant Branch Lines	06/2006
4. GNRO-2008/00071	Inservice Inspection (ISI) Program Third 10-Year Interval, Revision 0, Grand Gulf Nuclear Station, Unit 1, Docket No. 50-416, License No. NPF-29	10/29/2008
5. GNRO-2004/00039	Inservice Inspection Summary Report, Grand Gulf Nuclear Station, Unit 1, Docket No. 50-416, License No. NPF-29	06/18/2004
6. GNRO-2006-00002	Inservice Inspection Summary Report, Grand Gulf Nuclear Station, Unit 1, Docket No. 50-416, License No. NPF-29	01/13/2006
7. GNRO-2006/00044	Corrections to Inservice Inspection Summary Report, Grand Gulf Nuclear Station, Unit 1, Docket No. 50-416, License No. NPF-29	08/10/2006
8. GNRO-2007/00046	Inservice Inspection Summary Report, Grand Gulf Nuclear Station, Unit 1, Docket No. 50-416, License No. NPF-29	07/10/2007
9. GNRO-2009/00004	Inservice Inspection Summary Report, Grand Gulf Nuclear Station, Unit 1, Docket No. 50-416, License No. NPF-29	01/19/2009
10. GNRO-2010/00061	Inservice Inspection Summary Report, Grand Gulf Nuclear Station, Unit 1, Docket No. 50-416, License No. NPF-29	08/23/2010
11. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness	Revision 0
12. EN-FAP-LR-024	One-Time Inspection	Revision 0

Document	Title/Description	Revision/Date
13. GGNS-ME-08-AMM03	Aging Management Review of the Reactor Coolant System Pressure Boundary	Revision 0
14. CR-GGN-2006-2117	Condition Report	05/23/2006
15. CR-GGN-2001-00472	Condition Report	03/22/2001
16. CR-GGN-1991-00174	Condition Report	11/29/1991
17. CR-GGN-1983-00314	Condition Report	04/12/1983
18. CR-GGN-2010-01333	Condition Report	03/01/2010
19. CR-GGN-2007-02990	Condition Report	06/05/2007
20. CR-GGN-2007-05846	Condition Report	12/20/2007
21. CR-GGN-2008-05139	Condition Report	09/29/2008

During the audit of program elements 1–6, the staff verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. For the “detection of aging effects” program element, insufficient information was available to determine if it was consistent with the corresponding program element in the GALL Report AMP. To obtain the information necessary to verify if this program element is consistent with the corresponding program element of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

LRA Section B.1.34 states that the applicant’s One-Time Inspection–Small-Bore Piping Program is consistent with GALL Report AMP XI.M35 and includes a statistically significant sampling approach. GALL Report AMP XI.M35 states under the “detection of aging effects” program element that the inspection sample size should be at least 3 percent of the weld population or a maximum of 10 welds of each weld type if the unit (a) has never experienced a failure of its ASME Code Class 1 small-bore piping, and (b) has more than 30 years of operating history at the time the application is submitted. Otherwise, the inspection sample size should be at least 10 percent of the weld population or a maximum of 25 welds of each weld type. The NRC issued the operating license for GGNS on November 1, 1984, and the applicant submitted the LRA on October 28, 2011; therefore, GGNS had less than 27 years of operating history at the time the application was submitted. Based on the operating history of GGNS, the sample size for the one-time inspection should be at least 10 percent of the weld population or a maximum of 25 welds of each weld type to be consistent with GALL Report AMP XI.M35. However, LRA Section B.1.34 does not provide the total population of welds of each weld type or the total number of these welds that will be included in the volumetric inspections.

GALL Report AMP XI.M35 states under the “detection of aging effects” program element that the one-time inspection program does not apply to plants that have experienced cracking in ASME Code Class 1 small-bore piping because of stress corrosion, cyclical (including thermal, mechanical, and vibration fatigue) loading, or thermal stratification



and thermal turbulence. LRA Section B.1.34 states that GGNS has not experienced this type of cracking. The staff could not determine how or to what extent the applicant reviewed operating experience information to demonstrate that GGNS has not experienced cracking in its ASME Code Class 1 small-bore piping.

GALL Report AMP XI.M35 states under the “detection of aging effects” program element that the inspections should be based on susceptibility, inspectability, dose considerations, operating experience, and the limiting locations of the total population of ASME Code Class 1 small-bore piping. The GALL Report also states that opportunistic destructive examinations of socket welds may be performed and a sampling basis should be used if more than one weld is removed from service. LRA Section B.1.34 states that the applicant’s One-Time Inspection–Small-Bore Piping Program is consistent with GALL Report AMP XI.M35 and that sample selection is based on susceptibility to stress corrosion, cyclic loading (including thermal, mechanical, and vibration fatigue), or thermal stratification and thermal turbulence. The applicant’s One-Time Inspection–Small-Bore Piping Program does not include a methodology for selecting sample locations. The applicant’s program also credits opportunistic destructive examinations; however, the program does not discuss a sampling basis for these examinations when more than one socket weld is removed from service.

During the audit of the “operating experience” program element, the staff determined that 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 the effects of aging. To obtain the information necessary to determine if the applicant’s operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing an RAI for the subject discussed below.

LRA Section B.1.34 states that the applicant’s One-Time Inspection–Small-Bore Piping Program is consistent with GALL Report AMP XI.M35 and provides a one-time volumetric inspection of a sample of ASME Code Class 1 small-bore piping locations susceptible to cracking. GALL Report AMP XI.M35 states under the “operating experience” program element that volumetric inspection techniques should have a demonstrated capability and proven industry record to detect cracking in piping weld and base metal material. The applicant’s One-Time Inspection–Small-Bore Piping Program includes volumetric examinations of full penetration welds using “demonstrated techniques.” It is not clear what constitutes a “demonstrated technique” for volumetric examinations of full penetration welds or if such techniques are capable of detecting cracking.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing RAIs for the subjects discussed below.

The UFSAR supplement does not specifically state the inspection sample size.

The One-Time Inspection–Small-Bore Piping Program includes opportunistic destructive tests as a method for detecting aging effects, and each destructive examination will be credited as equivalent to two volumetric examinations; however, the UFSAR supplement does not state that the program detects aging through destructive examinations.

Audit Results. Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M35. The staff also identified certain aspects of LRA program element “detection of aging effects” that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also identified that additional information on operating experience is required before a determination can be made about the sufficiency of the LRA AMP to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

#### **LRA AMP B.1.36 Protective Coatings Monitoring and Maintenance**

Summary of Information in the Application. The LRA states that AMP B.1.36, “Protective Coatings Monitoring and Maintenance,” is an existing program, with enhancements, 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. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “coating” and “cracking.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GIN200000715	Service Level 1 Coating Condition Assessment	07/12/2000
2. GIN200200681	Service Level 1 Coating Condition Assessment Continuation	09/22/2002
3. GIN200500535	Service Level 1 Coating Condition Assessment Continuation	10/1/2005
4. GIN200700118	Service Level 1 Coating Condition Assessment Continuation	03/30/2007
5. GIN200800285	Service Level 1 Coating Condition Assessment Continuation	10/02/2008
6. GIN201000129	Service level 1 Coating Condition Assessment Continuation	05/10/2010

Document	Title/Description	Revision/Date
7. 07-S-07-211	General Maintenance Instruction Service Level 1 Coatings Condition Assessment Safety Related	Revision 2, 09/17/2010
8. CR-GGN-2004-03521	Unavailable	09/27/2004

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 verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.S8.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

#### **LRA AMP B.1.37, Reactor Head Closure Studs Program**

**Summary of Information in the Application.** The LRA states that AMP B.1.37, “Reactor Head Closure Studs Program” is an existing program, with an exception, that is consistent with the program elements in GALL Report AMP XI.M3, “Reactor Head Closure Stud Bolting.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER. This audit report does not consider the sufficiency of the exception, which will be evaluated in the SER. A brief summary of the exception is provided below.

The applicant’s exception is related to the “preventive actions” element of the LRA program; specifically, the applicant’s use of closure bolting with an actual measured yield strength greater than 150 ksi. In the GALL Report AMP, this element recommends the use of bolting materials with a measured yield strength less than 150 ksi, in addition to the other recommendations for

preventive actions. The staff noted that the “corrective actions” program element of the GALL Report AMP XI.M3 also has a similar recommendation for replacement bolting. However, during the audit, the staff noted that the onsite program documentation does not clearly indicate if the applicant’s “corrective actions” program element is consistent with the GALL Report in using replacement bolting materials that have a measured yield strength of less than 150 ksi. The staff will consider issuing an RAI, to clarify if the applicant’s program has an additional exception to the “corrective actions” program element.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “bolt,” “bolting,” “closure stud,” “stress corrosion cracking,” “wear,” and “cracking.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08LRD05	Aging Management Program Evaluation Report Class I Mechanical–Reactor Head Closure Studs	Revision 1 10/25/2011
2. 07-S-14-114	Plant Operations Manual–Reactor Pressure Vessel Reassembly	Revision 22 07/09/2010
3. CEP-ISI-102	ASME Section XI, Division 1 Inservice Inspection Program	Revision 1 12/14/2009
4. CEP-RR-001	ASME Section XI Repair/Replacement Program	Revision 304 12/09/2010
5. EN-LI-102	Entergy Corrective Action Process	Revision 17 12/08/2011
6. GGNS-EP-08-LRD10	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0 09/13/2011
7. CR-GGN-1986-0082	Condition Report, “2 Top Head Closure Studs Received Undersized”	10/01/1986
8. CR-GGN-2004-01563	Condition Report , “Abnormal High Pressure Reading on EN31N092 (Reactor Vessel Flange Detection Instrumentation)”	03/27/2004
9. CR-GGN-2004-01703	Condition Report, “Abnormal High Pressure Reading on EN31N092 (Reactor Vessel Flange Leak Detection Instrumentation)”	04/07/2007

The staff conducted its audit of LRA program elements 1–6, based on the contents of the existing program. Aspects of the “preventive actions” program element of the LRA AMP associated with the exception were not evaluated during this audit. Aspects of this program element not associated with the exception were evaluated and are described below.

During the audit the staff verified that the “scope of program,” “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. The staff also verified that aspects of the “preventive actions” program element not associated with the exception are consistent with the corresponding program element of the GALL Report AMP. The staff’s evaluation of aspects of this program element associated with the exception will be addressed in the SER.

In addition, the staff found that for the “detection of aging effects” program element, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

The program description of LRA Section B.1.37 states that ASME Section XI examination and inspection requirements specified in Table IWB 2500-1 are used. The LRA AMP also states that surface examination of reactor pressure vessel studs, nuts, and washers from 2001 through 2010 identified no relevant indications. In contrast, the applicant’s Appendix A of its Inservice Inspection (ISI) Program, dated June 26, 2000, indicated that VT-1 visual examinations were planned to be performed on closure nuts and washers. The staff seeks clarification on what examinations are performed on the applicant’s closure bolting program to ensure the effectiveness of the program. In addition, the staff needs a summary review of the inspection results of the closure bolting components that were obtained using other examination methods specified in the ASME Code Section XI, but not discussed in the LRA, to ensure the adequacy of the program.

The staff also determined that the operating experience provided by the applicant and identified by the staff’s independent database search was insufficient to allow the staff to verify that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. To obtain the information necessary to determine if the applicant’s operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the subject discussed below.

During the audit of the applicant’s database, the staff noted that in 1986, the applicant discovered that two closure studs were undersized. The condition report did not provide further information. During the audit, the staff requested additional information on the referenced undersized studs, such as which portions of the studs were undersized, and if and how the condition was corrected, but it was not able to verify this information. The staff’s concern is related to whether the undersized studs, if left in service, would be subjected to higher service stresses. If so, they would have a higher susceptibility to the following aging effects: SCC and loss of material because of wear or galling. The staff needs clarification on how the undersized studs were dispositioned, such that their intended function is maintained, and that their aging effects are managed adequately during the period of extended operation.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit the staff verified that LRA program elements “scope of program,” “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. The staff also verified that aspects of LRA program elements “preventive actions” not associated with the exception are consistent with the corresponding program element of the GALL Report AMP XI.M3. The staff also identified certain aspects of LRA program element “detection of aging effects” that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also identified that additional information on operating experience is required before a determination can be made about the sufficiency of the LRA AMP to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

### **LRA AMP B.1.38, Reactor Vessel Surveillance**

Summary of Information in the Application. The LRA states that AMP B.1.38, "Reactor Vessel Surveillance," is an existing program, with an enhancement, 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. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes the enhancement necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of the enhancement that is not necessary for consistency; this will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent database search of the applicant's operating experience database using the following keywords: "weld," "plate," "vessel," and "surveillance."

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

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. LRA B.1.38	Reactor Vessel Surveillance	06/22/2011
2. NUREG-1801 XI.M31	Reactor Vessel Surveillance	Revision 2, 12/2010
3. BWRVIP-116	BWRVIP-116: BWR Vessel and Internals Project, Integrated Surveillance Program (ISP) Implementation for License Renewal	07/2003
4. BWRVIP-86	BWRVIP-86, Revision 1: BWR Vessel and Internals Project, Updated BWR Integrated Surveillance Program (ISP) Implementation Plan	Revision 1, 09/2008
5. SE for BWRVIP-86, Rev. 1	Final Safety Evaluation for BWRVIP-86, Revision 1: BWR Vessel and Internals Project, Updated BWR Integrated Surveillance Program (ISP) Implementation Plan	10/20/2011
6. Attachment to GNRO-96/00035	Surveillance Specimen Program Evaluation for Grand Gulf Nuclear Station	05/02/1996
7. GNRO-94-00073	Response to Generic Letter 92-01 Containing Revised Information Concerning Reactor Vessel Structural Integrity	05/05/1994

The staff conducted its audit of LRA program elements 1–6, based on the contents of the new/existing program as modified by the proposed enhancement. During the audit, the staff verified that the "preventive actions," "parameters monitored or inspected," and "acceptance criteria" program elements of the LRA AMP are consistent with the corresponding elements of

the GALL Report AMP. In addition, the staff found that for the “scope of program,” “detection of aging effects,” and “monitoring and trending” program elements, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

In relation to the “scope of program” program element, LRA Table 4.2-2 identifies “Shell Plate 1” as a new material to be considered for the applicant’s upper-shelf energy evaluation. During the audit, the staff also noted that Shell Plate 1 has the highest adjusted reference temperature among all the plates of the applicant’s reactor vessel. The staff is not clear how the applicant’s program will monitor and use actual test data related to the new limiting material (i.e., Shell Plate 1) to achieve the program objective specified in the GALL Report. In addition, the information provided in the LRA does not permit the staff to verify independently the neutron irradiation embrittlement of all relevant beltline and extended beltline materials for the period of extended operation.

In relation to the “detection of aging effects” program element, the staff is concerned that the projection of neutron fluence for the period of extended operation, in consideration of a potential approval of the planned extended power uprate, may exceed the neutron fluence of the surveillance materials in the Integrated Surveillance Program (ISP). In comparison, the GALL Report AMP states that the plant-specific or ISP shall have at least one capsule with a projected neutron fluence exceeding the 60-year peak reactor vessel wall neutron fluence before the end of the period of extended operation.

The LRA AMP addresses an enhancement to the “monitoring and trending” program element. The LRA indicates that the enhancement will ensure that any additional requirements specified in the final NRC safety evaluation for BWRVIP-86, Revision 1, will be addressed before the period of extended operation. The LRA does not specifically identify the “additional requirements” of the NRC safety evaluation of BWRVIP-86, Revision 1, which are applied to the applicant’s program.

During the audit of the “operating experience” program element, the staff determined that 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 the effects of aging. To obtain the information necessary to determine if the applicant’s operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing an RAI for the subject discussed below.

The “operating experience” program element of the LRA AMP does not provide sufficient information to demonstrate the adequacy of the applicant’s dosimetry monitoring activities that are part of the Reactor Vessel Surveillance Program. For example, the LRA does not clearly address why the 54 effective full-power year (EFPY) fluence in the LRA, which considers extended power uprate (EPU), is less than the 54-EFPY fluence that is projected using the linear extrapolation of the data in the applicant’s letter, dated May 5, 1994, with no consideration of EPU.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing an RAI for the subject discussed below.

LRA Section A.1.38 (UFSAR supplement) does not address all of the important program attributes described in SRP-LR Table 3.0-1, which provides an exemplary summary of the UFSAR supplement for this type of program. The staff is concerned that the applicant's UFSAR supplement omits some important program attributes of the GALL Report AMP.

**Audit Results.** Based on this audit, the staff verified that LRA program elements "preventive actions," "parameters monitored or inspected," and "acceptance criteria" are consistent with the corresponding program elements in GALL Report AMP XI.M31. The staff's evaluation of aspects of any program element associated with the enhancement that is not necessary for consistency will be addressed in the SER. The staff also identified certain aspects of LRA program elements "scope of program," "detection of aging effects," and "monitoring and trending" that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also identified that additional information on operating experience is required before a determination can be made about the sufficiency of the LRA AMP to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

#### **LRA AMP B.1.39, Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants**

**Summary of Information in the Application.** The LRA states that AMP B.1.39, "Inspection of Water-Control Structures Associated with Nuclear Power Plants," is an existing program, with enhancements, that is consistent with the program elements in GALL Report AMP XI.S7, "RG 1.127 Inspection of Water-Control Structures Associated with Nuclear Power Plants." To verify this claim of consistency, the staff audited the LRA AMP. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walkdowns of the "A" Standby Service Water Basin. The staff also conducted an independent search of the applicant's operating experience database using the following keywords: "concrete," "corrosion," "damage," "degradation," "erosion," "excavation," "leaching," "loss of material," "rust," "spalling," and "underground."

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



### Relevant Documents Reviewed

Document	Title/Description	Revision/Date
1. GGNS-EP-08-LRD07	Aging Management Program Evaluation Report Civil/Structural	Revision 0, 08/11/2011
2. EN-FAP-LR-006	Structural Screening and Aging Management Reviews	Revision 2
3. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness	Revision 0, 09/13/2011
4. GGNS-EP-08-LRD02	Operating Experience Review Report AERM	Revision 0, 09/16/2011
5. GGNS-CS-08-AMC01	Aging Management Review of Containment Building	Revision 0, 04/20/2011
6. GGNS-CS-08-AMC02	Aging Management Review of Water Control Structures	Revision 0, 04/20/2011
7. GGNS-CS-08-AMC03	Aging Management Review of Turbine Building, Process Facilities, and Yard Structures	Revision 0, 04/20/2011
8. GGNS-CS-08-AMC04	Aging Management Review of Bulk Commodities	Revision 0, 04/20/2011
9. GGNS-EP-08-LRD01	System and Structure Scoping Results	Revision 0, 07/08/2011
10. EN-FAP-LR-007	Evaluation of Aging Management Programs	Revision 1, 09/30/2010
11. EN-FAP-LR-012	Operating Experience Review for License Renewal	Revision 1, 09/30/2010
12. EN-DC-150	Condition Monitoring of Maintenance Rule Structures	Revision 2, 12/20/2011
13. EN-DC-141	Design Inputs	Revision 8, 12/14/2010
14. GGNS-C-399.0	Grand Gulf Nuclear Station Program Plan for Maintenance Rule Inspections of Structures, Tanks, and Transformers Inspections	Revision 9, 01/07/2010
15. GGNS-C-395.0	Program Plan for Foundation Settlement Monitoring	Revision 4, 04/26/1999

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 verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.S7.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

#### **LRA AMP B.1.40, Selective Leaching**

**Summary of Information in the Application.** The LRA states that AMP B.1.40, “Selective Leaching,” is a new program that is consistent with the program elements in GALL Report AMP XI.M33, “Selective Leaching.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “cast,” “corrosion,” “dealloy,” “degradation,” “dezinc,” “leach,” “loss of material,” “perforation,” “pitting,” “through-wall,” and “wastage.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LR006	Aging Management Program Evaluation Report Non-Class 1 Mechanical	Revision 1, 10/26/2011
2. EN-FAP-LR-025	Fleet Administrative Procedure Selective Leaching Inspection	Revision 0 11/30/2010
3. GGNS-ME-08-AMM20	Aging Management Review of Nonsafety-related Systems and Components Affecting Safety-related Systems	Revision 1 09/16/2011

During the audit of program elements 1–6 and the “corrective actions” program element, the staff verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. For the “detection of aging effects” and “corrective actions” program elements, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

The “detection of aging effects” program element of the LRA AMP states that the program will include visual and hardness measurements during its one-time inspections. The GALL Report AMP recommends visual and hardness measurements or other

mechanical examination techniques. However, EN-FAP-LR-025, "Selective Leaching Inspection," states that hardness testing or verification is conducted where possible. The applicant's procedure and AMP XI.M33 do not appear to be consistent because the implementing procedure does not require hardness measurements in all cases because of the possible modifier.

The "corrective actions" program element of the LRA AMP states that corrective actions of unacceptable inspection findings will be carried out in accordance with the Corrective Action Program, and that corrective actions will be consistent with NUREG-1801. The GALL Report AMP "corrective actions" program element states that unacceptable inspection findings result in the performance of additional inspections. However, procedure EN-FAP-LR-025, "Selective Leaching Inspection," states that the cause evaluation and corrective actions for indications of selective leaching should include consideration of scope expansion. The applicant's procedure and AMP XI.M33 do not appear to be consistent because the implementing procedure states that scope expansion should be considered whereas the GALL Report recommends that unacceptable findings will result in further inspections.

In the LRA, the applicant stated that "plant operating experience for this program will be gained as it is implemented during the period of extended operation, and will be factored into the program via the confirmation and corrective action elements of the GGNS 10 CFR 50 Appendix B quality assurance program." The staff conducted an independent review of the applicant's corrective action database and confirmed that there were no plant-specific operating experience results identifying selective leaching as an aging effect.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-LR.

**Audit Results.** Based on this audit, the staff verified that the "scope of program," "preventive actions," "parameters monitored or inspected," "monitoring and trending," and "acceptance criteria" program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.M33. The staff also identified certain aspects of the "detection of aging effects" and "corrective actions" program elements of the LRA AMP that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also independently verified that there is no plant-specific operating experience to indicate that the LRA AMP, when implemented by the applicant, will not be sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

#### **LRA AMP B.1.41, Service Water Integrity**

**Summary of Information in the Application.** The LRA states that AMP B.1.41, "Service Water Integrity," 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. Issues identified but not resolved in this report will be addressed in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted a walkdown of the standby service water basin. The staff also conducted an independent database search of the applicant's operating experience database using the following keywords: "corrosion," "degradation," "pitting," "coating," and "microbiological."

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

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. EN-DC-184	NRC Generic Letter 89-13 Service Water Program	Revision 1, 04/16/2010
2. EN-DC-316	Heat Exchanger Program	Revision 2, 09/15/2010
3. EN-DC-340	Microbiologically Influenced Corrosion Monitoring Program	Revision 0, 07/29/2009
4. NA	Strategic Plan for Open Loops	Revision 2, 09/15/2004
5. EN-EP-S-039-G	Testing Standard for Safety-Related Heat Exchangers Cooled by Standby Service Water	Revision 2, 06/11/2010
6. 07-S-07-211	Service Level I Coatings Condition Assessment	Revision 2, 09/17/2010
7. 08-S-03-10	Chemistry Sampling Program	Revision 48, 01/20/2011
8. 08-S-3-14	Chemical Additions to Plant Systems	Revision 24, 01/28/2009
9. 08-S-04-120	Chemistry Evolution at SSW	Revision 12, 06/10/2009
10. GGNS-EP-08-LRD06	Aging Management Program Evaluation Report Non-Class I Mechanical, Section 4.11 "Service Water Integrity"	Revision 1, 10/26/2011
11. GGNS-EP-08-LRD10	Operating Experience Review Results—Aging Management Program Effectiveness, Section 3.1.25 "Service Water Integrity Program"	Revision 0, 09/13/2011

During the audit of program elements 1–6, the staff verified that the "preventive actions," "detection of aging effects," and "acceptance criteria" program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. For the "scope of program," "parameters monitored or inspected," and "monitoring and trending" program elements insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

Procedure 07-S-07-211, Service Level I Coatings Condition Assessment, Section 6.0, "Frequency of Inspection," states that the time between inspections of the standby service water basin will not exceed 36 months. However, condition reports CR-GGN-2010-05825 and CR-GGN-2010-03814 described instances in which

underwater coating inspections identified loss of material ranging from 0.134 inches to 0.200 inches. The staff is not clear that the frequency specified in the coatings inspection procedure is adequate based on the amount of material loss in piping that can occur between inspections because of coating degradation.

UFSAR Section 9.2.1.2 states that long-term corrosion for the service water piping is compensated for by appropriate corrosion allowances. The Open Loop Strategic Plan states that Procedure 08-S-03-10 governs the sampling parameters for the standby service water system. It also notes that corrosion coupon testing and trending are done quarterly with a target value of less than 5 mils per year for mild steel. Since corrosion coupon testing and trending were not discussed in the LRA, it is unclear to the staff how long-term corrosion of the piping is being managed or if corrosion coupon testing and trending should be credited in this program.

CR-GGN-2010-01344 discusses loss of material because of minor erosion or corrosion at the flanged connection to a discharge check valve and proposes the inclusion of this section of standby service water piping in an "appropriate piping program (i.e., MS-46, "Moderate Energy Piping"). Although the program-basis document indicated that loss of material in standby service water piping was also being managed by a Microbiologically-Influenced Corrosion Monitoring Program, it was not clear to the staff if components in the standby service water system also were being managed for loss of material by a moderate energy piping program, which has not been described.

In response to GL 89-13, "Service Water System Problems Affecting Safety-Related Equipment," dated July 18, 1989 (AECM-90/0007), GGNS stated that, as a result of microbiological activity in the standby service water system, it had implemented a Small Bore and Deadleg Pipe Inspection Program directed at piping with stagnant or low-flow conditions. Since LRA Section A.1.41 states that the Service Water Integrity Program manages loss of material as described in the GGNS response to GL 89-13, it was not clear to the staff if all aspects of the previously cited Small Bore and Deadleg Pipe Inspection Program are incorporated into the Service Water Integrity Program.

During the audit of the "operating experience" program element, 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also found that 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. To obtain the information necessary to verify if the applicant's operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the subject discussed below.

CR-GGN-2003-00919 described an issue with the SSW basin siphon line, stating that numerous nodules and areas of corrosion were visible on the internal surfaces of this piping. Furthermore, these internal surfaces are inaccessible for applying protective coatings, and this piping does not benefit from the water treatment program for the standby service water system. Based on UFSAR Section 9.2.1.3, the interconnecting line between the two SSW basins is required to ensure the availability of a 30-day water supply. Depending on the water level, the line either equalizes or siphons water from

one basin to the other. Since the siphon function may be affected by pin-hole leaks in the upper portion of the interconnecting line, the staff is not clear if the inspections of this line are sufficient to ensure that the effects of aging will be adequately managed such that the intended function of the siphon line will be maintained.

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.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “preventive actions,” “detection of aging effects,” and “acceptance criteria” are consistent with the corresponding program elements in the GALL Report AMP. The staff also identified certain aspects of LRA program elements “scope of program,” “parameters monitored or inspected,” “monitoring and trending,” and “operating experience” that will require additional information or evaluation before consistency can be determined.

Based on this audit the staff also identified that additional information on operating experience is required before an indication about the sufficiency of the LRA AMP, as implemented by the applicant, to detect and manage aging can be reached. In addition, the staff verified that the description provided in the UFSAR supplement is an adequate description of the program.

#### **LRA AMP B.1.42, Structures Monitoring Program**

**Summary of Information in the Application.** The LRA states that AMP B.1.42, “Structures Monitoring Program,” is an existing program, with enhancements, that is consistent with the program elements in GALL Report AMP XI.S6, “Structures Monitoring.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

**Audit Activities.** During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. In addition, the staff conducted walk downs of the Auxiliary Building, “A” Standby Service Water Basin, and Containment Suppression Pool. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “concrete,” “corrosion,” “damage,” “degradation,” “erosion,” “excavation,” “leaching,” “loss of material,” “rust,” “spalling,” and “underground.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

<b>Relevant Documents Reviewed</b>		
<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD07	Aging Management Program Evaluation Report Civil/Structural	Revision 0, 08/11/2011
2. EN-FAP-LR-006	Structural Screening and Aging Management Reviews	Revision 2
3. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness	Revision 0, 09/13/2011

Document	Title/Description	Revision/Date
4. GGNS-EP-08-LRD02	Operating Experience Review Report AERM	Revision 0, 09/16/2011
5. GGNS-CS-08-AMC01	Aging Management Review of Containment Building	Revision 0, 04/20/2011
6. GGNS-CS-08-AMC02	Aging Management Review of Water Control Structures	Revision 0, 04/20/2011
7. GGNS-CS-08-AMC03	Aging Management Review of Turbine Building, Process Facilities, and Yard Structures	Revision 0, 04/20/2011
8. GGNS-CS-08-AMC04	Aging Management Review of Bulk Commodities	Revision 0, 04/20/2011
9. GGNS-EP-08-LRD01	System and Structure Scoping Results	Revision 0, 07/08/2011
10. EN-FAP-LR-007	Evaluation of Aging Management Programs	Revision 1, 09/30/2010
11. EN-FAP-LR-012	Operating Experience Review for License Renewal	Revision 1, 09/30/2010
12. EN-DC-150	Condition Monitoring of Maintenance Rule Structures	Revision 2, 12/20/2011
13. EN-DC-141	Design Inputs	Revision 8, 12/14/2010
14. GGNS-C-399.0	Grand Gulf Nuclear Station Program Plan for Maintenance Rule Inspections of Structures, Tanks, and Transformers Inspections	Revision 9, 01/07/2010
15. GGNS-C-395.0	Program Plan for Foundation Settlement Monitoring	Revision 4, 04/26/1999

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 verified that the “scope of program,” “preventive actions,” “parameters monitored or inspected” and “monitoring and trending” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. In addition, the staff found that for the “detection of aging effects,” and “acceptance criteria” program elements, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

The “detection of aging” program element of the LRA AMP states that an inspection frequency of 5 years is used for high-risk-significant structures and 10 years for low-risk-significant structures, with provisions for more frequent inspections to ensure that observed conditions that can potentially affect the intended functions are evaluated or corrected in accordance with the corrective action process. The LRA AMP also states that inspections of inaccessible areas in environments will be performed, in which observed conditions in accessible areas exposed to the same environment indicate significant degradation is occurring. The GALL Report AMP recommends, in general, that all structures are to be monitored at a frequency not to exceed 5 years. However, some structures of lower safety significance and that are subjected to benign environmental conditions may be monitored at an interval exceeding 5 years, but they

should be identified and listed together with their operating experience. The GALL Report AMP also recommends that for plants with nonaggressive ground water or soil, the acceptability of inaccessible areas should be evaluated when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. The staff is not clear if the inspection frequency criteria and the criteria for inspection of inaccessible areas identified in the LRA AMP and the criteria identified in the GALL Report AMP are aligned.

The "acceptance criteria" program element of the LRA AMP states that the program will be enhanced to prescribe acceptance criteria considering information provided in industry codes, standards, and guidelines, including NEI 93-03, ACI 201.1R-92, ANSI/ASCE 11-99, and ACI 349.3R-96. However, the LRA AMP references EN-DC-150, "Condition Monitoring of Maintenance Rule Structures," for acceptance criteria, which uses a yes-no check list to identify Tier One criteria rather than quantitative information identified in industry codes, standards, and guidelines. The GALL Report AMP recommends that the qualified engineering personnel evaluate inspection results based on acceptance criteria derived from design-bases codes and standards that include ACI 349.3R, ACI 318, ANSI/ASCE 11, or other relevant AISC specifications, as applicable, and consider industry and plant operating experience. The staff is not clear that the acceptance criteria in the LRA AMP meet the Tier One, Tier Two, and Tier Three criteria in the GALL Report AMP, or that a technical justification has been provided to justify deviations from the GALL Report AMP criteria.

During the audit of the "operating experience" program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging. To obtain the information necessary to determine if the applicant's operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the subjects discussed below.

During a walkdown of the Auxiliary Building, a crack was observed in the south stairwell exterior concrete wall that was noted to run from about 228 ft. elevation to about 166 ft. elevation with the crack about 0.01-inch wide and exhibiting some chipping (CR-GGNS-2002-01540). Plant personnel were uncertain if the crack was visible on the exterior wall and noted that binoculars were used to examine exterior concrete surfaces for areas not readily accessible. Section 3.5, "Evaluation Techniques," of ACI 349.3R-96 notes that visual examinations of structures should include all exposed surfaces of the structures and the surfaces should be directly viewed (maximum 600 mm focal length). The staff is not clear that sufficient visual resolution capability is being used during the LRA SMP visual inspections to detect and quantify forms of degradation that can potentially affect intended functions.

During a walkdown of the Auxiliary Building (e.g., elevation 93 ft., stair 1T02), water leakage was observed, apparently resulting from ground water infiltration from ineffective or degraded expansion or isolation joints between the Turbine Building and the Auxiliary Building. It was also noted on several surfaces in this area that rust colored stains were



present, apparently resulting from high humidity conditions causing rusting of metallic wall embeddings (e.g., piping attachments). Since a search of GGNS operating experience identified several nonconformance reports (e.g., MNCR 83-0653, MNCR 97-0151, GGCR1997-0172-00) noting that concerns had been expressed about water leaking into the plant through small cracks in the concrete and construction joints, the staff is not clear how the in-leakage of groundwater will be addressed under the Corrective Action Program.

During the LRA AMP breakout session, the staff requested information about historical data related to spent fuel pool leakage, and, if the leak-chase system is routinely inspected to verify that it is clear. The staff is not clear if the leakage is coming from the spent fuel pool, and, if leakage is present, that it is confined to the leak-chase system and not affecting intended functions.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR.

Audit Results. Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “parameters monitored or inspected,” and “monitoring and trending” are consistent with the corresponding program elements in GALL Report AMP XI.S6. The staff also identified certain aspects of LRA program elements “detection of aging effects” and “acceptance criteria” that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also identified that additional information on operating experience is required before a determination can be made about the sufficiency of the LRA AMP to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.

#### **LRA AMP B.1.43 Water Chemistry Control–BWR Program**

Summary of Information in the Application. The LRA states that AMP B.1.43, “Water Chemistry Control–BWR Program,” is an existing program 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. Issues identified but not resolved in this report will be addressed in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent database search of the applicant’s operating experience database using the following keywords: “stress corrosion cracking,” “stress,” “pitting,” and “cracking.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. Procedure 01-S-08-16	Chemical Treatment Program	Revision 21, 02/22/2005
2. Procedure 01-S-08-29	EPRI Water Chemistry Guidelines	Revision 09, 05/11/2009
3. Procedure 06-CH-1B21-O-002	Reactor Coolant Routine Chemistry	Revision 106, 10/04/2005
4. Procedure 08-S-03-10	Chemistry Sampling Program	Revision 48, 01/20/2011
5. NA	Primary/Secondary Strategic Chemistry Plan	Revision 6, 04/2009

During the audit of program elements 1–6, the staff verified that the “scope of program,” “preventive actions,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. For the “parameters monitored or inspected,” program element, insufficient information was available to determine if it was consistent with the corresponding program element of the GALL Report AMP. To obtain the information necessary to verify if this program element is consistent with the corresponding program element of the GALL Report AMP, the staff will consider issuing RAIs for the subject discussed below.

The LRA AMP states that it is consistent with the GALL Report AMP XI.M2, “Water Chemistry,” and that it uses the EPRI water chemistry guidelines. However, the applicable water chemistry guideline, BWRVIP-190, specifies a parameter for electrochemical corrosion potential, which is not reflected in the applicant’s procedures.

During the audit of the “operating experience” program element, the staff determined 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., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff found that insufficient information was available to determine if the description provided in the UFSAR supplement was an adequate description of the LRA AMP. To obtain the information necessary to verify the sufficiency of the UFSAR supplement program description, the staff will consider issuing an RAI for the subject discussed below.

The program description omits a specific reference to the EPRI BWRVIP-190, “Water Chemistry Guidelines–2008 Revision,” as provided in SRP-LR Table 3.0-1.

**Audit Results.** Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M2. The staff also identified certain aspects of LRA program element “parameters monitored or inspected,” that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff identified a need for additional information on the adequacy of the program description in the UFSAR supplement.

#### **LRA AMP B.1.44, Water Chemistry Control–Closed Treated Water Systems**

Summary of Information in the Application. The LRA states that AMP B.1.44, “Water Chemistry Control–Closed Treated Water Systems,” is an existing program, with enhancements, that is consistent with the program elements in GALL Report AMP XI.M21A, “Closed Treated Water Systems.” To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER. The scope of this audit report includes enhancements necessary to make the LRA AMP consistent with the corresponding GALL Report AMP. However, it does not consider the sufficiency of enhancements that are not necessary for consistency; these will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed onsite documentation that the applicant provided. The staff also conducted an independent search of the applicant’s operating experience database using the following keywords: “cavitation,” “corrosion,” “corrosive,” “cracking,” “erosion,” “loss of material,” “rust,” “microbiological,” and “degradation.”

The table below lists the documents that the staff reviewed and found to be relevant to the audit. The applicant provided these documents or they were identified in the staff’s search of the applicant’s operating experience database.

**Relevant Documents Reviewed**

<b>Document</b>	<b>Title/Description</b>	<b>Revision/Date</b>
1. GGNS-EP-08-LRD06	Aging Management Program Evaluation Report, Non-Class 1 Mechanical, Water Chemistry Control–Closed Treated Water Systems	Revision 1
2. GGNS-EP-08-LRD10	Operating Experience Review Results–Aging Management Program Effectiveness	Revision 0
3. 01-S-08-16	Plant Operations Manual, Administrative Procedure, Chemical Treatment Program, Safety Related	Revision 1, 02/22/2005
4. 08-S-03-10	Plant Operations Manual, Chemistry Procedure, Chemistry Sampling Program, Safety Related	Revision 048, 01/20/2011
5. 08-S-03-14	Plant Operations Manual, Chemistry Procedure, Chemical Additions to Plant Systems	Revision 024, 01/28/2009
6. EN-CY-101	Entergy Nuclear Management Manual, Chemistry Activities	Revision 2
7. GGNS-MS-46	Monitoring of Internal Erosion/Corrosion in Moderate Energy Piping	Revision 3, 06/27/2002
8. EN-DC-184	NRC Generic Letter 89-13 Service Water Program	Revision 1
9. CR-GGN-2001-02398	PCW microbial ATP level	04/07/2011
10. CR-GGN-2008-05988	TBCW high molybdate concentration	10/15/2008
11. CR-GGN-2010-07892	CCW Chloride Levels Above Admin Limit	11/09/2010

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 verified that the “scope of program,” “preventive actions,” “monitoring and trending,” and “acceptance criteria” program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. In addition, the staff found that for the “parameters monitored or inspected” and “detection of aging effects” program elements, insufficient information was available to determine if they were consistent with the corresponding program elements of the GALL Report AMP. To obtain the information necessary to verify if these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs for the subjects discussed below.

The GALL Report AMP XI.M21A “parameters monitored or inspected” program element recommends that the specific water chemistry parameters monitored and the acceptable range of values for these parameters be in accordance with industry standard guidance documents, such as those produced by EPRI. The applicant’s onsite documentation states that water chemistry is maintained in accordance with EPRI guidelines; however, the staff noted that the water chemistry control parameters were not always consistent with these guidelines. The staff is not clear if the applicant’s water chemistry control parameters are sufficient to effectively mitigate corrosion in the closed treated water systems.

An enhancement associated with the “detection of aging effects” program element of the LRA states that testing of the engine jacket water for the engine-driven fire water pump diesels will be performed at least once per refueling cycle. The GALL Report AMP recommends that the testing interval should not be greater than quarterly unless justified with additional analysis. The staff is not clear if the applicant’s proposed testing frequency is sufficient to ensure that the jacket water chemistry remains effective in mitigating corrosion.

In its review of the applicant’s documentation on the NRC’s Generic Letter 89-13, the staff noted that this program states that it is also applied to closed cooling loops because of the potential for in-leakage, inadequate chemistry controls, or aging that may have occurred before the current chemistry control program became effective. The staff also noted that GL 89-13 program activities were not included in the onsite documentation of the Water Chemistry Control–Closed Treated Water Systems Program. It is unclear to the staff which activities associated with the GL 89-13 Program are applied to the closed treated water systems.

During the audit of the “operating experience” program element, the staff determined that the operating experience that the applicant provided and the staff identified in an independent database search is bounded by industry operating experience (i.e., the applicant or the staff did not identify any previously unknown aging effects). The staff also determined that 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 the effects of aging.

The staff also audited the description of the LRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the SRP-LR

Audit Results. Based on this audit, the staff verified that LRA program elements “scope of program,” “preventive actions,” “monitoring and trending,” and “acceptance criteria” are consistent with the corresponding program elements in GALL Report AMP XI.M21A. The staff also identified certain aspects of LRA program elements “parameters monitored or inspected” and “detection of aging effects” that will require additional information or evaluation before consistency can be determined.

Based on this audit, the staff also verified that the operating experience is sufficient to indicate that the LRA AMP, as implemented by the applicant, is sufficient to detect and manage the effects of aging. In addition, the staff verified that the description provided in the UFSAR supplement is consistent with the description provided in the SRP-LR.