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

May 9, 2017

Mr. Michael R. Chisum
Site Vice President
Entergy Operations, Inc.
Waterford 3
17265 River Road
Killona, LA 70057-3093

SUBJECT: AGING MANAGEMENT PROGRAMS AUDIT REPORT REGARDING WATERFORD STEAM ELECTRIC STATION, UNIT 3 LICENSE RENEWAL APPLICATION REVIEW (CAC NO. MF7492)

Dear Mr. Chisum:

By letter dated March 23, 2016, Entergy Operations, Inc. submitted an application pursuant to Title 10 of the *Code of Federal Regulations* Part 54, to renew the Operating License No. NPF-38 for Waterford Steam Electric Station, Unit 3 for review by the U.S. Nuclear Regulatory Commission (NRC or the staff). On July 29, 2016, the staff completed the onsite audit of aging management programs. The audit report is enclosed.

If you have any questions, please contact me by telephone at 301-415-6447 or by e-mail at Phyllis.Clark@nrc.gov.

Sincerely,

/RA/

Phyllis Clark, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-382

Enclosure:
Audit Report

cc: Listserv

SUBJECT: AGING MANAGEMENT PROGRAMS AUDIT REPORT REGARDING WATERFORD STEAM ELECTRIC STATION, UNIT 3 LICENSE RENEWAL APPLICATION REVIEW (CAC NO. MF7492)

DISTRIBUTION:
E-MAIL:
PUBLIC
RidsNrrDlr Resource
RidsNrrDlrRpb1 Resource
RidsNrrDlrRerb Resource
RidsNrrDlrRarb Resource
RidsNrrDlrRasb Resource
RidsNrrDlrRsrg Resource
RidsNrrPMWaterford Resource
RidsRgn4MailCenter@nrc.gov

PClark
SBloom
DMorey
BWittick
AJohnson
AGhosh, OGC
DMcIntyre, OPA
SBurnell, OPA
AMoreno, OCA
FRamirez, RIV
CSpeer, RIV
KKennedy, RIV
jjarrel@entergy.com
dfrey@entergy.com
lmilste@entergy.com
GYOUNG4@entergy.com
Dlach@entergy.com
ataylo1@entergy.com
aharris@entergy.com

ADAMS Accession Number: **ML17054C529** *Concurred via e-mail

OFFICE	LA:DLR	PM:RPB1:DLR	BC:RARB:DLR	BC:RASB:DLR
NAME	*YEdmonds	PClark	DMorey	BWittick (BRoger for)
DATE	3/13/17	3/13/2017	4/28/2017	5/4/2017

OFFICE	(A)BC:ESGB:DE	(A)BC:RPB1:DLR	PM:RPB1:DLR
NAME	AJohnson	RChazell	PClark
DATE	3/20/17	3/16/17	5/9/2017

OFFICIAL RECORD COPY

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION, DIVISION OF LICENSE RENEWAL

Docket No:	50-382
License No:	NPF-38
Licensee:	Entergy Operations, Inc.
Facility:	Waterford Steam Electric Station, Unit 3
Location:	Killona, LA
Dates:	July 11–July 15, 2016 July 25–July 29, 2016
Reviewers:	P. Clark, Project Manager, Division of License Renewal (DLR) D. Morey, Branch Chief, DLR B. Wittick, Branch Chief, DLR A. Buford, Structural Engineer, DLR S. Cuadrado de Jesús, General Engineer, DLR W. Holston, Sr. Mechanical Engineer, DLR A. Wong, Sr. Project Manager, DLR Z. Bart Fu, Mechanical Engineer, DLR S. Min, Materials Engineer, DLR M. Yoo, General Engineer, DLR C. Doutt, Sr. Electrical Engineer, DLR J. Gavula, Mechanical Engineer, DLR B. Lehman, Materials Engineer, DLR J. López, Structural Engineer, DLR A. Mink, Mechanical Engineer, DLR D. Brittner, Mechanical Engineer, DLR A. Prinaris, Structural Engineer, DLR W. Gardner, General Scientist, DLR M. Sadollah, Electrical Engineer, DLR G. Thomas, Sr. Structural Engineer, DLR H. Akhavannik, Electrical Engineer, DLR A. Huynh, Materials Engineer, Division of Engineering J. Medoff, Sr. Mechanical Engineer, DLR S. Obadina, Mechanical Engineer, DLR B. Allik, Materials Engineer, DLR

Enclosure

Approved By: Dennis Morey, Chief
Aging Management of Reactor Systems Branch
Division of License Renewal

Brian Wittick, Chief
Aging Management of Structures, Electrical, and Systems Branch
Division of License Renewal

Andrew Johnson, Acting Chief
Steam Generator Tube Integrity and Chemical Engineering Branch
Division of Engineering

Introduction

The U.S. Nuclear Regulatory Commission (NRC or the staff) conducted a 10-day audit onsite at the Waterford Steam Electric Station, Unit 3 (Waterford 3), nuclear power plant in Killona, Louisiana, from July 11, 2016, to July 29, 2016. Additional in-office document review was conducted before and after the onsite audit. The purpose of the audit was to examine Entergy Operations, Inc. (Entergy or the applicant), aging management programs (AMPs) and related documentation to verify the applicant's claims of consistency with the corresponding AMPs in NUREG-1801, "Generic Aging Lessons Learned (GALL) Report - Final Report," Revision 2, issued December 2010. As described in the GALL Report, the staff based its evaluation of the adequacy of each AMP on its review of the following 10 program elements in each AMP: (1) "scope of program"; (2) "preventive 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 Waterford license renewal application (LRA) and documented in the staff's safety evaluation report (SER).

NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," (SRP-LR), Revision 2, issued December 2010, provides staff guidance for reviewing an LRA. The SRP-LR 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 the audit, the staff audited AMP elements 1 through 6 and 10 ("scope of program," "preventive 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 through 9 ("corrective actions," "confirmation process," and "administrative controls") were audited during the scoping and screening methodology audit conducted June 13, 2016, to June 16, 2016, and are evaluated separately. The staff audited all AMPs that the applicant stated were consistent with the GALL Report AMPs.

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

In performing the audit, the staff examined the applicant's LRA, program basis documents, and related references; interviewed various applicant representatives; and conducted walkdowns of several plant areas. In total, 41 AMPs were reviewed and 36 breakout (discussion) sessions with applicant representatives were conducted. This report documents the staff's activities during the audit.

LRA AMP B.1.1, Bolt Integrity

Summary of Information in the Application. The LRA states that AMP B.1.1, "Bolting Integrity," is an existing program with enhancements and an exception that will be 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. During the audit, the staff reviewed the enhancements associated with this AMP. The exception and enhancements to the GALL Report AMP will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted a walkdown of the component cooling water (CCW) heat exchanger room B. The staff also conducted an independent search of the applicant's operating experience database using keywords: "bolt," "preload," "crack," "leak," "corrosion," "molybdenum," "MoS_2," and "disulfide."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00007	Aging Management Program Evaluation Results Non-Class 1 Mechanical	Revision 0
2. EN-MA-145	Maintenance Standard for Torque Applications	Revision 5
3. UNT-006-032	Coating and Corrosion Program	Revision 0
4. EN-DC-150	Condition Monitoring of Maintenance Rule Structures	Revision 7
5. CR-WF3-2015-00947	Condition Report	02/19/2015
6. N/A	Response to WF3 Action Item #16	07/08/2014
7. N/A	Response to WF3 Action Item #70	07/09/2014
8. EN-DC-150	Condition Monitoring of Maintenance Rule Structures	Revision 7
9. EN-DC-178	System Walkdowns	Revision 7
10. SEP-RR-WF3-001	ASME Section XI Repair/Replacement Program	Revision 0
11. EN-LI-102	Corrective Action Program	Revision 24
12. CEP-PT-001	ASME Section XI Pressure Testing Program	Revision 306
13. CEP-NDE-0901	VT-1 Visual Examination (ASME XI)	Revision 4
14. CEP-NDE-0902	VT-2 Visual Examination (ASME XI)	Revision 7
15. CEP-NDE-0903	VT-3 Visual Examination (ASME XI)	Revision 5
16. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0
17. CR-WF3-2015-01853	Condition Report	03/30/2015
18. WO-410215	RFRMVAAA105-A Flange Bolts Replacement (2015-1853)	04/07/2015
19. WO-368658	RFRMCHL0001-A Inspect/Leak Check Chiller Piping	06/24/2015
20. CR-WF3-2015-01852	Condition Report	03/30/2015

Document	Title	Revision/Date
21. WO-410214	RFRMCHL0001-A Flange Bolting Replacement (2015-1852)	04/07/2015
22. CR-WF3-2015-09705	Condition Report	12/30/2015
23. CR-WF3-2015-09704	Condition Report	12/30/2015

The staff conducted its audit of LRA program elements 1 through 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. The staff noted that aspects of the "detection of aging effects" program element, not associated with the exception, are not consistent with the corresponding program element in the GALL Report AMP. The staff's evaluation of aspects of the 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, sufficient information was not available to determine whether it was consistent with the corresponding program elements of the GALL Report AMP. In order to obtain the information necessary to verify whether this program element is consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing a request for additional information (RAI) for the subject discussed below.

- The LRA AMP states an enhancement to the "scope of program" program element. The enhancement states that the Bolting Integrity Program procedures will be revised to include submerged pressure-retaining bolting. The GALL Report AMP XI.M18 "detection of aging effects" program element recommends periodic inspections (at least once per refueling cycle) of closure bolting for signs of leakage to ensure the detection of age-related degradation due to loss of material and loss of preload. During its onsite review of the LRA and program basis documents, the staff noted that the applicant's program lacked information regarding how inspections of the submerged bolting will be performed to detect the applicable aging effects. The staff notes that a submerged environment limits the ability to perform inspections and detect leakage of submerged bolted connections; therefore, it is not clear how the submerged closure bolting will be inspected such that loss of material and loss of preload can be detected prior to loss of intended function consistent with the GALL Report AMP "detection of aging effects" program element.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known 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. 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 an RAI for the subject discussed below.

- The GALL Report AMP XI.M18 states that molybdenum disulfide (MoS_2) should not be used as a lubricant because of its potential contribution to stress corrosion cracking (SCC), especially for high-strength bolts. The GALL Report AMP XI.M18 states that preventive actions include the proper selection of bolting material and the use of lubricants and sealants consistent with the guidance in Electric Power Research Institute

(EPRI) NP-5769 and NUREG-1339 to prevent or mitigate degradation and failure of safety-related bolting. The GALL Report also states that the applicant is to evaluate applicable operating experience to support the conclusion that the effects of aging are adequately managed. The LRA states that the Bolting Integrity Program includes preventive actions to restrict the use of lubricants containing MoS_2. The LRA AMP also states that "applicable industry standards and guidance documents, including NUREG-1339, EPRI NP-5769, and EPRI TR-104213, were used to develop the program implementing procedures." During its onsite audit, the staff performed a database search of Waterford 3 operating experience and found no results for the keywords "molybdenum," "disulfide," and "MoS_2" associated with the installation of closure bolts. The staff also reviewed plant procedures and confirmed that the bolting procedures had been revised to prohibit the use of MoS_2; however, it is not clear whether MoS_2 lubricants were used at Waterford 3 before plant procedures were revised to prohibit their use. The staff needs additional information on whether MoS_2 lubricants were used at Waterford 3; and, if so, how the Bolting Integrity Program will manage the age-related degradation of closure bolts lubricated with MoS_2. The staff also noted that this is a common issue across B.1.1 "Bolting Integrity," and B.1.16 "Inservice Inspection – IWF" AMPs.

The staff also audited the description of the LRA AMP provided in the final safety analysis report (FSAR) 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.M18. The staff's evaluation of aspects of the "detection of aging effects" program element associated with exceptions will be addressed in the SER. The staff's evaluation of aspects of the program elements associated with enhancements will be addressed in the SER. The staff also identified certain aspects of the "detection of aging effects" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also found that additional information is required before a determination can be made regarding whether the applicant's operating experience supports the sufficiency of the LRA AMP. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.2, Boric Acid Corrosion

Summary of Information in the Application. The LRA states that AMP B.1.2, "Boric Acid Corrosion," is an existing program that is consistent with the program elements in GALL Report AMP XI.M10, "Boric Acid Corrosion." To verify this claim of consistency, the staff audited the LRA AMP.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "boric," "corr," "encrust," and "residue."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00002	Operating Experience Review Results – Aging Effects Requiring Management	Revision 0
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness, Section 3.1.2 Boric Acid Corrosion	Revision 0
3. WF3-EP-14-00007	AMP Evaluation Results – Non-Class 1 Mechanical, Section 4.2 Boric Acid Corrosion	Revision 1
4. EN-DC-319	Boric Acid Corrosion Control Program	Revision 10
5. SEP-BAC-WF3-001	Boric Acid Corrosion Control, Program Section	Revision 1
6. CEP-CAC-001	Boric Acid Corrosion Control, Program Plan	Revision 1
7. Program Health Report	BACCP – Boric Acid Corrosion Control Program	Q2-2015
8. Program Health Report	BACCP – Boric Acid Corrosion Control Program	Q4-2015
9. CR-WF3-2013-05809	The monthly performance indicator for externally identified Condition Reports (CR) was red for November 2013.	N/A
10. CR-WF3-2014-02771	Active leak on RC-301A. Repeat from CR-WF3-2013-00166	N/A
11. CR-WF3-2014-06493	White Boric Acid Not an Active Leak	N/A
12. CR-WF3-2015-00228	White Boric Acid Not an Active Leak	N/A
13. CR-WF3-2015-00280	Dry White Boric Acid on HPSI Pump Casing	N/A

During the audit of program elements 1 through 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's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience and the applicant had adequately evaluated and incorporated the operating experience into this program.

The staff also audited the description of the AMP provided in the FSAR supplement in LRA Section A.1.2. 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," "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.M10. The staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated and the applicant had adequately evaluated and incorporated the operating experience into this program. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.3, Buried and Underground Piping and Tanks Inspection

Summary of Information in the Application. The LRA states that AMP B.1.3, "Buried and Underground Piping and Tanks Inspection," is a new program that will be consistent with the program elements in GALL Report AMP XI.M41, "Buried and Underground Piping and Tanks," as modified by LR-ISG-2011-03, "Changes to the GALL Report Revision 2 Aging Management Program XI.M41, 'Buried and Underground Piping and Tanks.'" To verify this claim of consistency, the staff audited the LRA AMP. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this new program, and the staff's audit addressed only the program elements described in the applicant's basis document, cathodic protection survey results, coating and backfill specifications, qualifications of coating inspectors, inspection reports, and a review of plant-specific operating experience. 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 provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "buried," "coat," "concrete," "crack," "wrap," "wall loss," "vault," "underground," "through wall," "piping," "min wall," "microbiologic," "loss of material," "holiday," "flaw," "excavat," and "leak."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00007	Aging Management Program Evaluation Results Non-Class 1 Mechanical Systems	Revision 0
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0
3. WF3-ME-14-00009	Aging Management Review of the Component Cooling and Auxiliary Component Cooling Water Systems	Revision 1
4. NUC2013155.00	Concrete Evaluation Conducted in Excavations #1 and #2 Conducted on 12/05/2013	Revision 0, 01/16/2014
5. LM-0311	Qualification Card for Coating Inspectors Meeting Coating QC Inspector Level 3 (Fleet Curriculum)	06/29/2016
6. EN-QV-111	Training and Certification of Inspection/Verification and Examination Personnel	Revision 16
7. CP 3-2016 8287E Cathodic Protection Survey	Cathodic Protection System Survey Underground Piping and Grounding Waterford 3 Site CCC Job No. 8287E	March 2016
8. CR-WF3-2013-06121	Cathodic Protection Availability and Rectifier Modification	12/20/2013
9. Work Order 52657334 01	CP ECTR14243-TRANSF PERFORM FUNCTIONAL TEST/ME-004-431	02/03/2016
10. Work Order 52665515 01	CP ECTR14243-TRANSF PERFORM FUNCTIONAL TEST/ME-004-431	04/21/2016
11. Work Order 52682189 01	CP ECTR14243-TRANSF PERFORM FUNCTIONAL TEST/ME-004-431	07/20/2016

Document	Title	Revision/Date
12. WF3 Piping Specification 1564.100	Ebasco Specification Station Piping, Hangers and Supports	Revision 8, 06/21/1995

During the audit of program elements 1 through 7, the staff could not verify that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. The staff noted that the Buried and Underground Piping and Tanks Inspection program will be consistent with the program elements in GALL Report AMP XI.M41 as modified by LR-ISG-2011-03. However, on February 4, 2016, the staff issued the final version of LR-ISG-2015-01, "Changes to Buried and Underground Piping and Tank Recommendations," which replaces AMP XI.M41 issued in LR-ISG-2011-03. The staff will consider issuing an RAI to compare the Buried and Underground Piping and Tanks Inspection program to AMP XI.M41 issued in LR-ISG-2015-01.

During the audit, the staff made the following observations:

- The staff reviewed WF3-ME-14-00009 and noted that concrete pipe in contact with soil has embedded steel reinforcement. During a breakout session, the staff noted that reinforced concrete, or cementitious material, has cathodic protection listed as a preventive action in LR-ISG-2015-01 but not in LR-ISG-2011-03.

- The staff reviewed NUC2013155.00 and noted that during an inspection and assessment of the exterior of buried pipe encased in concrete, a feeler gage was used to determine the depth of a crack and that the crack did not penetrate to the surface of the pipe. This is consistent with the recommendations of LR-ISG-2015-01, which states that cracks in controlled low-strength material backfill that could admit groundwater to the surface of the component are not acceptable.

- The staff reviewed LM-0311 and noted that coating inspectors are qualified to Coating QC Inspector Level 3. During a breakout session, the staff asked how this qualification is consistent with the recommendations in LR-ISG-2015-01 regarding the qualifications of individuals evaluating the extent of coating degradation. In response, the applicant provided EN-QV-111, which provided training and certification of inspection/verification and examination personnel. The staff reviewed EN-QV-111 and noted that individuals performing coating inspections are qualified in accordance with ANSI/ASME N.45.2.6-1978 Level III. The staff noted during a breakout session that this standard is not consistent with the recommendations in LR-ISG-2015-01 for individuals evaluating the extent of coating degradation.

- The staff reviewed CP 3-2016 8287E Cathodic Protection Survey and noted that a 100 mV polarization acceptance criteria was used because of the dissimilar metals in the system. During a breakout session, the staff noted that the use of a 100 mV polarization with dissimilar (i.e., mixed-metal) environments is not consistent with the recommendations in LR-ISG-2015-01.

- During its review of plant-specific operating experience, the staff reviewed CR-WF3-2013-06121. The staff noted that during the 5-year period from January 2009 to January 2014, the system had been out of service for 43 of 60 months, which represents a system availability of 28 percent. The staff noted that this is not consistent

with the recommendations of LR-ISG-2015-01, which recommends an availability of 85 percent for an effective cathodic protection system. In addition, the staff noted that breaks in a buried cable that provided DC current from the rectifier to the anode bed were the apparent cause. Furthermore, the staff noted that a modification was completed in June 2014, to move the rectifier closer to the anode bed to reduce the frequency of breaks in the power supply cable.

- The staff reviewed CP ECTR14243-Trans. Performance Functional Test/ME-004-431, which performed a test of the rectifier input current and rectifier voltage output every 3 months during 2016. The staff noted that rectifier input current and rectifier voltage output met acceptance criteria for all three work orders.

- The staff reviewed WF3 Piping Specification 1564.100 and noted that all ferrous buried piping under reinforced concrete slabs and within 50 feet of reinforced concrete slabs or concrete circulating water lines was encased in a cement-sand mortar envelope (i.e., controlled low-strength material). In addition, the staff noted that ferrous piping 50 feet or more away from reinforced concrete slabs or concrete circulating water lines was coated with coal tar enamel.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR supplement. The staff found that sufficient information was not available to determine whether the description provided in the FSAR supplement was an adequate description of the LRA AMP. The staff will consider issuing an RAI requesting that the applicant compare the Buried and Underground Piping and Tanks Inspection FSAR supplement to the FSAR summary description issued in LR-ISG-2015-01.

Audit Results. Based on this audit, the staff noted that the Buried and Underground Piping and Tanks Inspection program has not been evaluated against the changes to AMP XI.M41 that were issued in LR-ISG-2015-01. Therefore, the staff has identified certain aspects of the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff identified a need for additional information regarding the adequacy of the program description in the FSAR supplement.

LRA AMP B.1.4, Coating Integrity

Summary of Information in the Application. The LRA states that AMP B.1.4, "Coating Integrity," is a new program with an exception that will be consistent with the program elements in GALL Report AMP XI.M42, "Internal Coatings/Linings for In-scope Piping, Piping Components, Heat Exchangers, and Tanks," as described in LR-ISG-2013-01, "Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks." To verify this claim of consistency, the staff audited the LRA

AMP. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this new program, and the staff's audit addressed only the program elements described in the applicant's basis document and plant-specific operating experience. Issues identified but not resolved in this report will be addressed in the SER. During the audit, the staff reviewed an exception associated with this AMP. The exception to the GALL Report AMP is evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "blister," "block," "clog," "coat," "delamin," "flak," "foul," "holiday," "lined," "lining," "peel," and "perforat."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00007	Aging Management Program Evaluation Results Non-Class 1 Mechanical, Coating Integrity	Revision 0
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness, Section 3.2.2, "Coating Integrity"	Revision 0
3. WF3-ME-14-00030	License Renewal Topical Report on Coating Integrity	Revision 0
4. 1564-3279	Turbine Cooling Water Surge Tank	Revision 0
5. CR-WF3-2009-06452	Diesel Fire Pump B – Potential Coating Debris Inside of Heater Causing Flow Blockage	11/09/2009

The staff conducted its audit of LRA program elements 1 through 7 based on the contents of the new program as modified by the proposed exception.

During the audit, the staff verified that the "preventive actions," "parameters monitored or inspected," "monitoring and trending," "acceptance criteria, and "corrective actions" program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. The staff also verified that aspects of the "detection of aging effects" program element not associated with the exception identified in the LRA are consistent with the corresponding program element in 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 "scope of program," program element, sufficient information was not available to determine whether it was consistent with the corresponding program element of the GALL Report AMP. In order to obtain the information necessary to verify whether 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 the LRA AMP states that coatings that are within the scope of the program are those that are applied to the internal surfaces of in-scope components where loss of coating or lining integrity could impact the component's and downstream component's current licensing basis (CLB) intended function(s). The GALL Report AMP recommends that coatings are within the scope of the AMP where loss of coating or lining integrity could prevent satisfactory

accomplishment of any of the component's or downstream component's CLB intended functions identified under 10 CFR 54.4(a)(1), (a)(2), or (a)(3). It is not clear to the staff that these statements are consistent because the term "and" implies that both the component's intended function and a downstream component's intended function must be impacted by loss of coating integrity for the coating to be within the scope of the program. AMP XI.M42 recommends that the criteria for inclusion are either of the impacts. This issue also impacts the LRA FSAR description of the Coating Integrity Program.

- During its review of plant-specific operating experience, the staff reviewed CR-WF3-2009-06452. This condition report documents that the internal surfaces of the fire pump diesel jacket water cooling heater might be coated. The LRA Table 2s do not cite this component.

In order to verify that the exception will make the AMP adequate to manage the applicable aging effects, the staff will consider issuing an RAI for the subject discussed below.

- The LRA AMP states an exception to the "detection of aging effects" program element. The exception states that the program will provide a one-time inspection of the internal coating for the 11-foot diameter carbon steel circulating water piping. The exception does not state that periodic inspections will be subsequently conducted if the one-time inspection results do not meet acceptance criteria.

During the audit, the staff made the following observations:

- The staff reviewed WF3-ME-14-00030 and confirmed that the applicant identified six tanks that are internally lined; however, the tanks have not been included within the scope of the Coating Integrity Program. The staff noted that all of the tanks are within the scope of license renewal because they have an intended function per 10 CFR 54.4(1)(2). The document states that downstream aging effects will not occur because either coating debris would be captured by resin or resin retention elements, or pass through to other nonsafety-related components or the river. The basis for not including these tanks is as follows: (a) with the exception of the supplemental chilled water expansion tank and turbine cooling water surge tank, there are no safety-related components within the vicinity of the tanks that could be impacted should the tank leak; and (b) there are no downstream effects on safety-related equipment.

- WF3-ME-14-00030 states that the essential chilled water expansion tanks are the only safety-related component located in the vicinity of the supplemental chilled water expansion tank. The supplemental chilled water expansion tank is at atmospheric pressure.

- WF3-ME-14-00030 states that the turbine cooling water surge tank is located in the CCW surge tank room with the safety-related CCW surge tank. The turbine cooling water surge tank is at atmospheric pressure. The staff reviewed drawing 1564-3279 and confirmed that the tank is approximately 7 feet tall.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience. The applicant stated that the Coating Integrity Program is a new program and plant operating experience will be obtained as it is implemented. The staff

noted that AMP XI.M42, the basis for the Coating Integrity Program, was based on industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR supplement. With the exception of the issue identified in the "scope of program" program element, above, the staff verified this description is consistent with the description provided in the SRP-LR, as modified by LR-ISG-2013-01.

Audit Results. Based on this audit, the staff verified that the "preventive actions," "parameters monitored or inspected," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.M42. The staff also verified that for the "detection of aging effects" program element, the aspects of the LRA AMP program element not associated with the exception are consistent with the corresponding program element in GALL Report AMP XI.M42. The staff's evaluation of aspects of the program elements associated with exceptions will be addressed in the SER. The staff also identified certain aspects of the "scope of program" and "detection of aging effects" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff identified a need for additional information regarding the adequacy of the program description in the FSAR supplement.

LRA AMP B.1.5, Compressed Air Monitoring

Summary of Information in the Application. The LRA states that AMP B.1.5, "Compressed Air Monitoring," is an existing program with enhancements that will be 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. During the audit, the staff reviewed the enhancements associated with this AMP. The enhancements will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns of the Reactor auxiliary building, the Cooling Tower Area, and the Turbine Generator Building. The staff also conducted an independent search of the applicant's operating experience database using keywords: "instrument air," "compressed air," "GL 88-14," "INPO SOER 88-01," "air samples," "dew point," "particulates," "corrosion products," "contaminants," and "leaks."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3 Response to GL 88-14	Waterford 3 SES Docket No. 50-382 License No. NPF-38 Generic Letter [GL] 88-14	02/21/1989
2. WF3-ME-14-00013	Aging Management Review of the Air System	Revision 0, 04/10/2015

Document	Title	Revision/Date
3. WF3-EP-14-00007	Aging Management Program Evaluation Results Non-Class 1 Mechanical Compressed Air Monitoring	Revision 0, 01/0/2016
4. TRM	Waterford 3 Technical Requirements Manual (TRM)	Amendment 91
5. Entergy Operations Inc., Waterford SES Unit No. 3	Compressed Air Systems Design Basis Document	November 1995
6. CE-002-032	Maintaining Instrument Air System	Revision 305, 11/03/2014
7. MM-006-034	Station and Instrument Air Compressor Maintenance	Revision 305, 04/11/2012
8. CE-001-004	Periodic Analysis and Scheduling Program	Revision 315, 02/05/2015
9. Work Order – IA MCMP0001 A	Replace Inlet and Discharge Air Filters	Completed 08/25/2014
10. Work Order – IA MTWR0001 C&D	Replace Desiccant Absorber	Completed 09/15/2015
11. Work Order – IA MCMP0001 A	Remove and Clean Separator Y-Strainer	Completed 02/26/2015
12. Work Order – IA MCMP0001 A	Lube Compressor Bearings, Purge Coupling	Completed 02/05/2015
13. CR-WF3-2014-01061	A small leak was discovered on the Emergency Diesel Generator (EDG) A starting air system tube fitting near the Air Dryer AZ Repressuring Valve.	05/11/2014
14. CR-WF3-2014-02354	Packing gland leakage was found at Instrument Air Valve to Nitrogen ACC-4 Header; leakage is outside the pressure testing boundary and acceptable per CEP-NDE-0902.	04/29/2014
15. CR-WF3-2014-00021	Recommendation 4 in INPO SOER 88-01 Instrument Air System Failures (dated June 3, 1988) was revised to require the use of most current instrument air quality standards.	01/03/2014
16. CR-WF3-2013-02375	A small air leak was discovered between fittings on the airline downstream of IA-5277 (IA Isolation to FW-173B Isol to VLV FW-173B).	05/13/2013
17. CR-WF3-2013-02290	Control Room received IA Dryer B Trouble Alarm multiple times during the day due to Hi Dew Point. One of the IA Dryer Skid B prefilter drain traps was found half full of water.	05/07/2013
18. CR-WF3-2012-01091	SOER 88-01 Evaluation Guideline states to measure any particulates absolute > 40 µm. This should be included in procedure CE-002-032 Maintaining Instrument Air System (Revision 302, dated 3/1/2011) so it is clear how the vendor measures and categorizes particulate sizes.	03/02/2012
19. CR-WF3-2011-026276	An instrument air leak on the pneumatic air filter was discovered inside the shroud of FW MVAAA184-A.	09/06/2011
20. CR-WF3-2010-04899	No actions or programs specific to the instrument air or station air compressors area to prevent corrosive or hazardous gases from entering into the air systems, as stated in the special consideration section of SOER 88-01 Evaluation that requires the instrument air be free of corrosive and hazardous gases.	08/11/2010

Document	Title	Revision/Date
21. CR-WF3-2006-00666	A small air leak was discovered upstream of the manual isolation for the air regulator but downstream of IA-5701 (maintenance air for the "A" EDG) next to the regulator.	03/06/2006
22. ISTEP	Integrated System Trending and Evaluation Program	07/13/2016

The staff conducted its audit of LRA program elements 1 through 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, the staff made the following observations:

- For the "preventive actions" program element, the staff noted that the GALL Report recommends that moisture and other corrosive contaminants in the system's air are maintained below specified limits to ensure that the system and components maintain their intended functions. In addition, the staff noted that the applicant followed procedure CE-002-032 (Revision 305, 11-03-2014, section 10.1) to analyze air samples for particulates, dew point, and hydrocarbon using acceptance criteria from (ANSI)/ISA-7.0.01-1996, "Quality Standard for Instrument Air," a guidance document referenced in the GALL Report.

- For the "detection of aging effects" program element, the staff noted that the GALL Report recommends that the typical compressed air systems are equipped with in-line dew point instrumentation that either checks continuously using an automatic alarm system or is checked at least daily to ensure that moisture content is within specifications. The staff noted that the applicant documented an incidence in which the Control Room had received high dew point alarms for the Instrument Air (IA) Dryer B (CR-WF3-2013-02290). Water was found in the IA Dryer Skid B prefilter drain traps. Additionally, the GALL Report recommends periodic visual inspections of critical component internal surfaces (compressor, dryers, aftercoolers, and filters) to ensure no loss of material due to corrosion. The staff also noted that the applicant routinely maintained the air systems. For example, the instrument air inlet and outlet filters are replaced annually (e.g., Work Order – IA MCMP0001 A, 08-25-2014). The instrument air compressors are maintained, inspected, and/or replaced based on performance under procedure MM-006-034 (Revision 305, 04-11-2012).

- For the "monitoring and trending" program element, the staff noted that the GALL Report recommends air quality analysis results should be reviewed to determine if alert levels or limits have been reached or exceeded. The staff noted that the applicant relied on computerized tools (e.g., Integrated System Trending and Evaluation Program) to monitor and trend plant systems' (e.g., instrument air system) performance.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "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.M24. The staff's evaluation of aspects of the program elements associated with enhancements will be addressed in the SER.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.6, Containment Inservice Inspection – IWE

Summary of Information in the Application. The LRA states that AMP B.1.6, "Containment Inservice Inspection - IWE," is an existing program with an enhancement that will be 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. During the audit, the staff reviewed an enhancement associated with this AMP. The enhancement to the LRA AMP is evaluated in the SER. The LRA states that the Waterford 3 containment is a free-standing steel containment vessel (SCV) consisting of a vertical upright cylinder with a hemispherical dome and an ellipsoidal bottom encased in concrete and founded on the common concrete foundation with the Shield Building.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, since the plant was in power operation and a walkdown to observe the condition of the steel containment was not possible, the staff reviewed limited available photographs of the Waterford 3 SCV. The staff also conducted an independent search of the applicant's operating experience database using keywords: "bellows," "bolt," "corros," "coat," "degrad," "loss of material," "containment," and "moisture barrier."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00008	Aging Management Program Evaluation Report (AMPER) Civil/Structural: B.1.6 Containment Inservice Inspection – IWE Program Book	Revision 1
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0, 11/30/2015
3. WF3-EP-14-00002	Operating Experience Review Results – Aging Effects Requiring Management (AERM)	Revision 0, 9/13/2015
3. SEP-CISI-104	Program Section for ASME Section XI, Division 1, WF3 Containment Inservice Inspection Program	Revision 1, 10/22/2012

Document	Title	Revision/Date
4. CEP-CII-003	General Visual Examinations of Class MC Components	Revision 304, 10/04/2012
5. CEP-NDE-0903	VT-3 Examination (ASME Section XI)	Revision 5, 07/29/2009
6. CEP-NDE-0112	Certification of Visual Examination Personnel	Revision 9, 11/19/2013
7. EN-MA-145	Nuclear Management Manual: Maintenance Standard for Torque Applications	Revision 3, 04/25/2014
8. EN-LI-102	Nuclear Management Manual: Corrective Action Program	Revision 24, 09/05/2014
9. EN-DC-141	Nuclear Management Manual: Design Inputs	Revision 15, 09/05/2014
10. WF3-CS-14-00001	Aging Management Review of the Reactor Building	Revision 1, 06/30/2014
11. W3F1-92-0473	Memo to File: NRC Information Notice 92-20, "Inadequate Local Leak Rate Testing"	12/22/1992
12. CEP-RR-001	ASME Section XI, Repair/Replacement Program (fleet-wide)	Revision 311, 01/11/2016
13. SEP-RR-WF3-001	Waterford 3 ASME Section XI, Repair/Replacement Program	Revision 0, 03/07/2012
14. CR-WF3-2000-01275	Condition Report to evaluate VT-3 examination findings of containment vessel interior moisture barrier failure at 22 locations	10/20/2000
15. CR-WF3-2000-01279	Condition Report to evaluate VT-3 examination findings of containment vessel exterior moisture barrier failure at 20 locations	10/20/2000
16. CR-WF3-2000-01375	Condition Report to evaluate visual examination findings of containment vessel performed as part of corrective actions [for CR-WF3-2000-01275] revealed corrosion [below annulus moisture barrier] of a greater extent than anticipated	10/28/2000
17. CR-WF3-2002-00508	Condition Report to evaluate moisture barrier seal damage in two places inside containment	03/26/2002
18. CR-WF3-2003-03082	Condition Report on VT-3 examination findings of flaking, peeling, blistering, and discoloration of coatings on containment vessel interior	10/24/2003
19. CR-WF3-2003-03142	Condition Report on VT-3 examination findings of flaking, peeling, blistering, and discoloration of coatings on containment vessel interior	10/27/2003
20. CR-WF3-2003-03425	Condition Report to track and trend the findings of the inspection of containment vessel surfaces during Refuel 12	11/05/2003
21. CR-WF3-2008-01858	Condition Report to evaluate VT-3 inspection findings of containment inner moisture barrier damage at six locations	05/01/2008
22. CR-WF3-2012-05353	Condition Report to determine extent of condition of SGT NCR 1082 on conditions related to the annulus moisture barrier	10/19/2012
23. CR-WF3-2012-07654	Condition Report to determine extent of condition and repair SGT NCR 1175 on conditions related to the annulus moisture barrier	12/22/2012
24. ISI-VT-12-071 through -99	Visual Examination of IWE Surfaces (General) [RF-18-IWE to Procedure CEP-CII-003 Revision 304]	05/08/2014

Document	Title	Revision/Date
25. ISI-VT-14-027 thru -064	Visual Examination of Pressure Retaining Bolting (VT-3) [RF-19-IWE to Procedure CEP-NDE-0903 Revision 005]	04/19/2014
26. ISI-VT-15-040 through -054	Visual Examination of IWE Surfaces (General) [RF-20-IWE to Procedure CEP-CII-003 Revision 305]	11/13/2015
27. ISI-VT-09-030	Visual Examination of IWE Surfaces (General) [RF-16-IWE to Procedure CEP-NDE-0903 Revision 005]	10/31/2009
28. CR-WF3-2014-03076	Condition Report to document issuance of NRC IN 2014-07 and to determine the WF3 impact of it	05/27/2014
29. LOU-156 G-175, Sheet 1 of 3	Drawing Reactor Containment Building Piping Penetrations	Revision 18, 08/06/1997
30. LOU-156 G-175, Sheet 1 of 3	Drawing Reactor Containment Building Piping Penetrations	Revision 19, 12/20/1995
31. LOU-156 G-175, Sheet 1 of 3	Drawing Reactor Containment Building Piping Penetrations	Revision 15, 02/08/1996
32. NDE-2000-298	Thickness Readings Adjacent to Corrosion Pits Above Moisture Barrier in the Annulus (5 places)	11/02/2000
33. NDE-2000-434	Area #15 – Thickness Readings Taken on Annulus Side Liner Plate in Knuckle Region	11/04/2000
34. NDE-2000-484	Inner Moisture Barrier Reinspection of 22 Areas Identified in CR-2000-1275	11/07/2000

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

During the audit, the staff verified that the "scope of program," "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 "preventive actions" and "detection of aging effects" program elements, sufficient information was not available to determine whether they were consistent with the corresponding program elements of the GALL Report AMP. In order to obtain the information necessary to verify whether 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 GALL Report AMP XI.S1 states, in part: "The program is also augmented to require that the selection of bolting material installation torque or tension and the use of lubricants and sealants are 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." The corresponding Section 3.2.B.2b of the LRA Aging Management Program Management Evaluation Report (AMPER) document states, in part: "The program is a condition monitoring program and does not include guidance for the selection of bolting material, installation torque or tension, and use of lubricants and sealants. The program is supplemented by existing plant procedures to ensure that the selection of bolting material installation torque or tension, and the use of lubricants and sealants is appropriate for the intended purpose. These procedures use the guidance contained in NUREG-1339 and in EPRI NP-5769, NP-5067, and TR-104213 to ensure proper specification of bolting material, lubricant, and installation torque." It was not

clear to the staff if the above statements are consistent because (1) it appears to be an enhancement to the LRA's existing code-based condition monitoring [only] program, and (2) there is an apparent lack of a procedural link between the AMP implementing procedures (e.g., SEP-CISI-104, SEP-RR-WF3-001) and the "existing supplemental procedures" being credited. The staff also noted that this is a common issue across LRA AMPs B.1.6, "Containment Inservice Inspection – IWE," and B.1.16, "Inservice Inspection – IWF."

- The "preventive actions" program element of GALL Report AMP XI.S1 states, in part: "If the structural bolting consists of ASTM A325, ASTM F1852, and/or ASTM A490 bolts, the preventive actions for storage, lubricants, and stress corrosion cracking potential discussed in Section 2 of RCSC (Research Council for Structural Connections) publication 'Specification for Structural Joints Using ASTM A325 or A490 Bolts,' need to be considered." The related enhancement to the LRA AMP "preventive actions" program element intended to achieve consistency states: "Revise plant procedures to include the preventive actions for storage of ASTM A325, ASTM F1852 and A490 bolting from Section 2 of Research Council for Structural Connections (RCSC) publication, 'Specification for Structural Joints Using ASTM A325 or A490 Bolts.'" The staff also noted that the applicant excluded the use of preventive actions for lubricants and stress corrosion cracking potential by stating that a review of Section 2 of the RCSC publication concluded that the publication only addresses storage and does not address the preventive actions for lubricants and stress corrosion cracking potential for these bolts. It was not clear to the staff if the above statements are consistent, and if the above enhancement is adequate to make the LRA AMP consistent, because (1) the enhancement description does not include the RCSC Section 2 preventive actions for *"lubricants" and "stress corrosion cracking potential,"* and (2) the related justification provided in the AMPER document appears to interpret the standard in a manner that is inconsistent with the consideration in the GALL Report AMP. The staff also noted that this is a common issue across LRA AMPs B.1.6, "Containment Inservice Inspection – IWE"; B.1.16, "Inservice Inspection – IWF"; and B.1.38, "Structures Monitoring."

- The "detection of aging effects" program element of the GALL Report AMP X1.S1 recommends that the program be augmented to require surface examination, in addition to visual examination, to detect cracking in stainless steel penetration sleeves, bellows, dissimilar metal welds, and steel components that are subject to cyclic loading but have no CLB fatigue analysis. The GALL Report AMP also states that where feasible, appropriate Appendix J tests may be performed in lieu of surface examination. The corresponding program element in the LRA AMPER document states: "Stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading but have no CLB fatigue analysis are monitored for cracking. Additionally, AMP X1.S4 Containment Leak Rate Program (10 CFR Part 50, Appendix J) tests may be performed in lieu of surface examination." Noting that visual examination may not detect fine cracks that could occur as a result of cyclic loading, and that the LRA AMP did not identify any enhancement to supplement the existing program and implementing procedures with the enhanced examination method capable of detecting cracking, it was not clear to the staff that these statements are consistent because the LRA AMP and implementing procedures do not clearly reflect whether surface examinations will be conducted, in addition to visual examination, to detect cracking, or if Appendix J testing will be performed instead; nor does it identify the specific components to which each detection method will be applied. If Appendix J testing will be performed,

the LRA does not specify the type of testing or explain why the testing is appropriate for timely detection of cracking.

During the audit, the staff made the following observations:

- The staff reviewed Nondestructive Evaluation (NDE) Reports of ultrasonic thickness (UT) and pit measurements of the SCV plate, in the knuckle region with observed corrosion indications, taken above and below the annulus moisture barrier in Area #15 that were evaluated as part of condition reports CR-WF3-2000-01279 and CR-WF3-2000-01375. The staff noted that the thickness readings in the examined areas varied from 2.261 inches to 2.367 inches, all of which were above the design thickness of 2.1875 inches in the knuckle region. The staff also noted that the pit depths varied from 0.031 inch to 0.109 inch, all of which were significantly smaller than 10 percent of the design metal plate thickness. Therefore, following UT measurements and determination that the corrosion mechanism was not active, the surface areas with corrosion noted in 2000 in the annulus moisture barrier area were accepted by examination.

- The staff reviewed CR-WF3-2014-03076, which dispositioned NRC Information Notice (IN) 2014-07 and confirmed that Waterford 3's containment metal shell is not designed with leak-chase channel systems related to the operating experience described in the IN.

- The staff reviewed Section 3.2.A.b of the AMPER document and noted that the technical evaluation of NRC IN 92-20 for applicability concluded that a valid Type B local leakage rate test (LLRT) of the Waterford 3 containment penetration bellows could be performed in accordance with the requirements of 10 CFR Part 50 Appendix J; therefore, the IN recommendation for augmented inspection of the bellows does not apply to the Waterford 3 program. The staff also reviewed memo W3F1-92-0473, which documented the review of IN 92-20, and confirmed that for the multi-ply bellows used on containment piping penetrations, a mesh wire cloth between the plies ensures a gap for adequate performance of a LLRT.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is generally bounded by known industry operating experience (e.g., no previously unknown or recurring aging effects were identified by the applicant or staff). However, the staff identified plant-specific operating experience in which corrosion was identified. The staff's evaluation of the identified plant-specific operating experience will be addressed in the SER. In order to obtain the information necessary to determine whether the applicant's plant-specific operating experience supports the sufficiency of the LRA AMP, the staff will consider issuing RAIs for the subjects discussed below.

- The staff reviewed condition report CR-WF3-2000-01375, dated October 28, 2000, which documented corrective actions to address plant-specific operating experience of corrosion, with flaking noted on the SCV to a depth of at least 18 inches below the surface of the outer moisture barrier in the annulus region. This condition appeared to exist around the entire knuckle region of the containment vessel within the annulus and it is not addressed in LRA AMP B.1.6. CR-WF3-2000-01375 noted that this corrosion apparently was from initial construction (from exposure to the weather), was determined to be non-active unless reactivated by moisture, and ultrasonic wall thickness measurements showed that the containment vessel wall thickness exceeded the design

thickness of 2.1875 inches. Chemical analysis of scale samples indicated the presence of chlorides and sulfides. The presence of these chemicals also indicates the potential for an active corrosion mechanism to be initiated if any moisture were introduced. Therefore, there exists the potential that the existing apparently non-active corrosion, with presence of traces of chlorides and sulfides, of the SCV in the knuckle area below the annulus moisture barrier may be reactivated by moisture and may potentially impact containment vessel intended function before or during the period of extended operation. The staff also noted that, during refueling outage 18, a construction opening for steam generator replacement was made in the Shield Building by hydrodemolition, which could have resulted in intrusion of water into the annulus moisture barrier areas. The staff requires additional information to determine the need to verify, prior to entering the period of extended operation that the observed corrosion continues to remain non-active and whether the applicant's plant-specific operating experience supports the sufficiency of the LRA AMP.

The staff also audited the description of the LRA AMP provided in the FSAR supplement. The staff found that sufficient information was not available to determine whether the description provided in the FSAR supplement was an adequate description of the LRA AMP. In order to obtain the information necessary to verify the sufficiency of the FSAR supplement program description, the staff will consider issuing an RAI for the subject discussed below.

- The information in the FSAR supplement description in LRA Section A.1.6 and the AMPER does not appear to provide an adequate summary description of the AMP because (1) it does not sufficiently summarize what the LRA AMP covers in terms of components, materials, environments, aging effects, and key condition monitoring actions; rather, a significant part of the supplement primarily repeats the structural configuration description of the SCV that is already in FSAR Section 3.8.2, and (2) the description does not provide information consistent with that for program XI.S1 in SRP-LR Table 3.0-1.

Audit Results. Based on this audit, the staff verified that the "scope of program," "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.S1. The staff's evaluation of aspects of the program element associated with enhancements will be addressed in the SER. The staff also identified certain aspects of the "preventive actions," and "detection of aging effects" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience at the plant is generally bounded by the operating experience for which the GALL Report program was evaluated; however, the staff also found that additional information is required before a determination can be made regarding whether the applicant's operating experience supports the sufficiency of the LRA AMP. In addition, the staff identified a need for additional information regarding the adequacy of the program description in the FSAR supplement.

LRA AMP B.1.7, Containment Leak Rate

Summary of Information in the Application. The LRA states that AMP B.1.7, "Containment Leak Rate," 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 provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "penetration," "LLRT," "Appendix J," and "air lock."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00008	Aging Management Program Evaluation Results-Civil/Structural. Part: Containment Leak Rate Program	Revision 1, 12/03/2015
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0, 11/30/2015
3. EN-DC-334	Primary Containment Leakage Rate Testing (Appendix J)	Revision 3, 11/21/2013
4. EN-LI-102	Corrective Action Program	Revision 24, 09/05/2014
5. WF3-QA	Quality Assurance Program Manual	Revision 29, 12/01/2014
6. CEP-APJ-001	(Fleet) Primary Containment Leakage Rate Testing (10 CFR Part 50 Appendix J) Program Plan	Revision 2, 09/25/2013
7. SEP-APJ-005	(Plant Specific) Waterford 3: Primary Containment Leakage Rate Testing (Appendix J) Program	Revision 5, 05/30/2011
8. SEP-CISI-104	Program Section for ASME Section XI, Division 1 WF3 Containment Inservice Inspection Program (including drawings IWE – 11, "Reactor Containment Vessel Inspection Layout Inside Surface," and IWE – 12, "Reactor Containment Vessel Inspection Layout Outside Surface")	Revision 1, 10/22/2012
9. WF3-CS-14-00001	WF3 License Renewal Project: Aging Management Review of the Reactor Building	Revision 1, 12/03/2015
10. CEP-CII-003	Visual Examination of Class MC Components	Revision 305, 09/16/2015
11. CEP-NDE-0112	Certification of Visual Examination Personnel	Revision 9, 11/19/2013
12. CEP-NDE-0100	Administration and Controls of NDE	Revision 9, 07/29/2015
13. WF31-2015-0047	Request To Permanently Extend the ILRT to 15 years (10 CFR 50.90). Entergy Letter to NRC with Attachments 1, 2, and 3.	06/18/2015
14. CR-WF3-2000-1275 (MAI 421737)	Rework Moisture Barriers for Containment and Annulus (one of affected interior locations is immediately below penetration #21)	11/06/2000
15. DWG-LOU-1564-G-175, Sheet 2/3	Piping Penetrations – Reactor Containment Building	Revision 3, 12/12/1995
16. ECR 0000018568	Penetration 102 – Appendix J Leakage Limits	05/04/2011

Document	Title	Revision/Date
17. CR 2011-02988	Penetration 102 – Exceeded LLRT Operational Limit	05/04/2011
18. DWG-LOU-1564 B-316, Sheet 2A	Electrical Penetrations – Penetration Locations, Louisiana Power and Light Co., Waterford S.E.S. Unit No. 3	Revision 0
20. WO-52465	WF3 2005 ILRT Summary	05/21/2005
21. CR-WF3-2012-07775	Hydrogen Analyzer Systems A&B – Missing LLRT	12/27/2012
22. CR-WF3-2014-02275	Penetration 132 – Identified cause of electrical LLRT failure, locknuts inside containment needed tightening	04/27/2014
23. CR-WF3-2014-01821	Main Steam Line #1 – LLRT failure	04/17/2014

During the audit of program elements 1 through 6, 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 B.1.7, "Containment Leak Rate" are consistent with the corresponding program elements of the GALL Report AMP XI.S4, "10 CFR Part 50, Appendix J." For the "scope of program" program element, sufficient information was not available to determine whether it was consistent with the corresponding program element of the GALL Report AMP. In order to obtain the information necessary to verify whether the "scope of program" 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.

- During the onsite review of Waterford 3 implementing procedure for the 10 CFR Part 50 Appendix J leakage rate testing, SEP-APJ-005, "Primary Containment Leakage Rate Testing (Appendix J) Program," contained in the AMP Basis Document, the staff noted a certain number of containment pressure-retaining components (e.g., valves, penetrations) are not subjected to LLRT as required by the 10 CFR Part 50 Appendix J rule and the "scope of program" program element of GALL Report AMP XI.S4. The "scope of program" program element of AMP XI.S4 states, "[t]he scope of the containment LRT program includes all containment boundary pressure-retaining components." It is not clear how the applicant's Containment Leak Rate program is consistent with that of the GALL Report AMP XI.S4, for which consistency is claimed. To resolve and clarify this inconsistency with the GALL Report AMP XI.S4 and the requirements of 10 CFR 54.21(a), the staff is considering issuing the noted RAI.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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 "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 of the GALL Report AMP XI.S4. The staff also identified certain aspects of the "scope of program" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.8, Diesel Fuel Monitoring

Summary of Information in the Application. The LRA states that AMP B.1.8, "Diesel Fuel Monitoring," is an existing program with enhancements that will be 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. During the audit, the staff reviewed the enhancements associated with this AMP. The enhancements will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns of the fuel oil storage 7-day tanks, fuel oil feed tanks, fire water diesel tank, and the fuel oil auxiliary tank. The staff also conducted an independent search of the applicant's operating experience database using keywords: "fuel oil," "sample," "tank(s)," and "diesel."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. G164-Sheet 3	Auxiliary Flow Diagram (Drawing)	07/10/1978
2. C-9300193	Water Treatment Building and Fire Pump House (Drawing)	05/03/1991
3. G164 Sheet 1	Emergency Generator Diesel Oil System (Drawing)	12/10/1991
4. 15642527 R2	Diesel Oil Tank Bottom and Anchor Ring Layout (Drawing)	09/30/1996
5. 15642528 R1	Diesel Oil Tank Roof Details (Drawing)	January 1979
6. 15642525 R4	Diesel Oil Storage Tank General Plan (Drawing)	06/01/2016
7. Unlabeled	Trending Data on EDG Fuel Oil Storage Tank (FOST)	07/12/2016
8. CE-002-030	Safety-Related Procedures (Maintaining Diesel Fuel Oil)	Revision 026
9. CE-001-004	Periodic Analysis Scheduling Program	Revision 315
10. Work Order 23148	Drain and Clean Fuel Oil Storage Tank B	02/28/2005
11. Work Order 00401851	Clean Diesel Fuel Oil Storage Tank B	06/02/2016
12. Work Order 500010005	Clean Diesel Fuel Oil Storage Tank A	03/08/2005
13. Work Order 00400699	Clean Diesel Fuel Oil Storage Tank B	06/08/2016
14. Work Order 00246844	Clean Diesel Fuel Oil Day Tank A	09/27/2010
15. Work Order 00293713	Clean Diesel Fuel Oil Day Tank B	02/25/2013

Document	Title	Revision/Date
16. Work Order 00362389	Auxiliary Boiler Fuel Oil Inspection	02/27/2014
17. CR-WF3-2015-05090	Sample Results Show High Lubricity	08/04/2015
18. CR-WF3-2013-05945	EDFOST Elevated Particulate Results	12/10/2013
19. CR-WF3-2011-07629	FOST A/B Particulate Trending Upwards	11/15/2011
20. CR-WF3-2011-05236	EDFOST B Particulate 9.96mg/liter	07/24/2011
21. CR-WF3-2009-05410	API Gravity Sample from Fuel Truck	10/14/2009
22. CR-WF3-2006-01410	Gravity Results Received High	05/09/2006
23. CR-WF3-2006-01446	Gravity Results Are Above .865	05/11/2006
24. CR-WF3-2006-01248	Corrosion Identified to EDG Oil Storage Tank Valve	04/26/2006
25. CR-WF3-2006-01241	Gravity for Diesel Fuel Oil Was Greater than .865	04/25/2006
26. CR-WF3-2007-02366	Gravity from Fuel Truck Sample	06/27/2007
27. CR-WF3-2010-05048	Fuel Oil Particulate Results High at (Leake) Oil	08/18/2010
28. WF3-EP-14-00007	Aging Management Program Evaluation Results Non-Class 1 Mechanical	Revision 0
29. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0

The staff conducted its audit of LRA program elements 1 through 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, the staff made the following observation:

- Section 4.4 of WF3-EP-14-00007 Non-Class 1 AMP Evaluation Report did not list one of two diesel fire pump tanks that was identified during the walkdown of the diesel tanks. This gap was brought to the applicant’s attention and it was verified that tank DFOMTNK0001-B was in scope for license renewal. The applicant created condition report CR-WF3-2016-04497 to add this tank to the program basis document, which will ensure that the tank is subject to the recommendations of GALL Report AMP XI.M30, “Fuel Oil Chemistry.”

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "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.M30.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.9, Environmental Qualification (EQ) of Electric Components

Summary of Information in the Application. The LRA states that AMP B.1.9, "Environmental Qualification (EQ) of Electric Components Program," 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.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns of the electrical penetration area and the auxiliary building. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "cable," "jacket ," "arcing," "thermal," "connection," "contamination," "discoloration," "swelling," "insulation," and "moisture."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00009	Aging Management Program Evaluation Results – Electrical	Revision 1, 2/1/2016
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0, 11/30/2015
3. EN-DC-164	Environmental Qualification (EQ) Program	Revision 4, 11/21/2013
4. WF3-EP-14-00004	TLAA and Exemption Evaluation Results	Revision 0, 2/5/2016
5. 7320-10003	Instrumentation and Control Electrical Penetration for Waterford Unit 3	9/1/1988
6. Excel Spreadsheet – No document identifier	Cornerstone Rollup – Equipment Qualification 1Q10	04/14/2010

Document	Title	Revision/Date
7. Q1-2011	Equipment Qualification Program Health Report (1/1/2011–3/31/2011)	03/31/2011
8. Q1-2012	Equipment Qualification Program Health Report (1/1/2012–3/31/2012)	03/31/2012
9. Q1-2013	Equipment Qualification Program Health Report (1/1/2013–3/31/2013)	03/31/2013
10. Excel Spreadsheet – No document identifier	Cornerstone Rollup – Equipment Qualification 2Q10	07/14/2010
11. Q2-2011	Equipment Qualification Program Health Report (4/1/2011–6/30/2011)	06/01/2011
12. Q2-2012	Equipment Qualification Program Health Report (4/1/2012–6/30/2012)	06/30/2012
13. Q2-2013	Equipment Qualification Program Health Report (4/1/2013–6/30/2013)	06/30/2013
14. Q3-2010	Equipment Qualification Program Health Report (7/1/2010–9/30/2010)	09/30/2010
15. Excel Spreadsheet – No document identifier	Cornerstone Rollup – Equipment Qualification 3Q10	10/13/2010
16. Q3-2011	Equipment Qualification Program Health Report (7/1/2011–9/30/2011)	09/20/2011
17. Q3-2012	Equipment Qualification Program Health Report (7/1/2012–9/30/2012)	09/30/2012
18. Q4-2010	Equipment Qualification Program Health Report (10/1/2010–12/31/2010)	12/31/2010
19. Q4-2011	Equipment Qualification Program Health Report (10/1/2011–12/31/2011)	12/31/2011
20. Q4-2012	Equipment Qualification Program Health Report (10/1/2012–12/31/2012)	12/31/2012
21. EN-LI-104	EQ Focused Self-Assessment LO-WLO-2011-0015 Attachment 9.10	Revision 8

During the audit of program elements 1 through 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’s independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience (e.g., no previously unknown or recurring aging effects were identified by the applicant or staff).

The staff also audited the description of the LRA AMP provided in the FSAR 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,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program element of the LRA AMP 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 at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the

staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.10, External Surfaces Monitoring

Summary of Information in the Application. The LRA states that AMP B1.10, "External Surfaces Monitoring," is an existing program with enhancements that will be consistent with the program elements in GALL Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," as modified by LR-ISG-2011-03, "Changes to the Generic Aging Lessons Learned (GALL) Report Revision 2, Aging Management Program XI.M41, 'Buried and Underground Piping and Tanks,'" and LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation." 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. During the audit, the staff reviewed the enhancements associated with this AMP. The enhancements will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns of the Dry Cooling Tower, aluminum flame arrestors, vent lines to fuel oil storage day tanks A and B, the Essential Chilled Water System room, as well as portions of the MSIV B and MSIV A rooms. The staff also conducted an independent search of the applicant's operating experience database using keywords: "corrosion," "leak," "leakage," "under insulation," "external," "surface," "tank," and "pinhole."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. EN-DC-178	System Walkdowns	Revision 7, 11/21/2013
2. UNT-006-032	Coating and Corrosion Program	Revision 000, 03/31/2016
3. WF3-EP-14-00003	WF3 License Renewal Project: Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0
4. WF3-EP-14-00007	WF3 License Renewal Project: Aging Management Program Evaluation Results: Non-Class 1 Mechanical	Revision 0
5. EN-TQ-104	Engineering Support Personnel Training Program	Revision 20 03/25/2016
6. WF3-ME-14-00029	WF3 License Renewal Project: License Renewal Topical Report on Mechanical Components Susceptible to Corrosion Under Insulation	Revision 0 12/03/2015
7. PE-004-021	CCW Heat Exchanger Performance Test	Revision 003 02/27/2014
8. PE-004-033	Wet Cooling Tower A(B) Thermal Performance Test	Revision 305 02/27/2014
9. PE-004-024	ACCW & CCW System Flow Balance	Revision 304 02/27/2014

The staff conducted its audit of LRA program elements 1 through 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 the "acceptance criteria" program elements, sufficient information was not available to determine whether they are consistent with the corresponding program elements of the GALL Report AMP. In order to obtain the information necessary to verify whether 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 LRA AMP includes an enhancement to the "detection of aging effects" program element. The enhancement states that the accessible portion of in-scope piping components with tightly adhering insulation will be inspected. The GALL Report AMP recommends that the entire population of in-scope piping components with tightly adhering insulation be inspected. It is not clear to the staff that these statements are consistent because the applicant's use of the word "accessible" suggests that some in-scope piping components with tightly adhering insulation will not be inspected.

- The LRA AMP includes an enhancement to the "acceptance criteria" program element. The enhancement states that flexible polymeric materials should have no unanticipated dimensional change. The GALL Report AMP states that flexible polymeric materials should have no dimensional change. It is not clear to the staff that these statements are consistent because the applicant's use of the word "unanticipated" suggests that some in-scope flexible polymeric components may experience anticipated dimensional changes.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is not bounded by known industry operating experience. 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 subjects discussed below.

- Operating experience has revealed external corrosion to be a significant issue at Waterford 3. Licensee Event Report 2014-004-03 states that through-wall corrosion was identified on the EDG Feed Tank vent lines where the vent lines pass through the roof. An NRC inspector identified the corrosion, and it was not known how long the through-wall corrosion had existed. Waterford 3 has implemented a fleet procedure to resolve the adverse condition. Given the EDG vent line corrosion event, the staff is concerned that for components exposed to outdoor air, either: (a) not everything was examined during walkdowns; or (b) the interval between inspections is too long. Based on discussions during the AMP audit and review of corrective actions associated with the corrosion event, it appeared that the former and not the latter was the case. This is reinforced by the staff's observation of the condition of components exposed to outdoor air during the AMP audit. It is unclear how the fleet procedure, recent operating experience, and activities to resolve the issue are incorporated into the LRA AMP(s).

- The applicant is using visual inspection per the External Surfaces Monitoring AMP to inspect Dry Cooling Tower Aluminum Heat Exchanger Fins for cracking and loss of

material in order to assure that the intended function of heat transfer is maintained. It is unclear to the staff how the visual inspections will satisfactorily detect loss of intended function.

The staff also audited the description of the LRA AMP provided in the FSAR 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," and "monitoring and trending" program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.M36. The staff also identified certain aspects of the "detection of aging effects" and "acceptance criteria" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also found that additional information is required before a determination can be made regarding whether the applicant's operating experience supports the sufficiency of the LRA AMP. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.11, Fatigue Monitoring

Summary of Information in the Application. The LRA states that AMP B.1.11, "Fatigue Monitoring Program," is an existing program with enhancements 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. During the audit, the staff reviewed the enhancements associated with this AMP. The enhancements will be evaluated in the SER.

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

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00006	Fatigue Monitoring Program – Program Book	Revision 0
2. PE-002-003	Safety Related Procedure – Fatigue Monitoring Program	Revision 3, 12/14/05
3. CR-WF3-2015-00044	Condition Report – Fatigue Monitoring Program	1/6/2015
4. WF3-ME-15-00002	Plant Transient Analysis for Waterford – Plant Startup Through 4/15/14–1400394.32 – (License Renewal)	Revision 0, 6/2/2015
5. 1400394.301	Waterford 3 Plant Fatigue Transient Review	Revision 0, 4/9/2015

Document	Title	Revision/Date
6. WF3-EP-14-00005	Engineer Report: TLAA – Mechanical Fatigue	Revision 0, 2/2/2016
7. NRC-RIS-2011-14-A2-WF3-0001	NRC-RIS-2011-14 – Metal Fatigue Analysis Performed by Computer Software	4/11/12

The staff conducted its audit of LRA program elements 1 through 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," "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" and "parameters monitored or inspected" program elements, sufficient information was not available to determine whether they were consistent with the corresponding program elements of the GALL Report AMP. In order to obtain the information necessary to verify whether 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 "parameters monitored or inspected" program element of the LRA AMP states that the number of occurrences of plant design transients that cause significant fatigue usage will be monitored, which is consistent with the recommendations in the GALL Report. However, the staff noted that the cycle limit of the "Loss of Charging" transient is less than the cycle limit listed in FSAR Table 3.9-3. The staff is concerned that the applicant may not be monitoring the most limiting cycle limit of the transient.

- The "parameters monitored or inspected" program element of the LRA AMP states that the number of occurrences of plant design transients that cause significant fatigue usage will be monitored, which is consistent with the recommendations in the GALL Report. However, the LRA does not include which transients are used as inputs to the fatigue analyses associated with the Leak-Before-Break analyses and Postulation of High-Energy Line Break analyses.

In order to verify that the enhancements will make the AMP adequate to manage the applicable aging effects, staff will consider issuing an RAI for the subject discussed below.

- The LRA AMP states an enhancement to the "scope of program" program element. The enhancement states that it will develop a set of fatigue usage calculations that consider the effects of the reactor water environment for additional plant-specific locations. However, the LRA does not include any information on the methodology the applicant will use to identify and evaluate plant-specific locations that may be more limiting for environmentally assisted fatigue than those listed in NUREG/CR-6260.

During the audit, the staff made the following observation:

- The staff reviewed operating experience action: NRC-RIS [Regulatory Issue Summary] -2011-14 and noted that the applicant reviewed RIS 2011-14 and determined that the staff's concerns in the RIS are not applicable at Waterford. The staff noted that the applicant determined that its procedures do not allow the use of the user-defined options or manual editing features.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is not bounded by known industry operating experience. 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 discussed below.

- The staff issued RIS 2008-30 to address a specific methodology to demonstrate cyclic load capabilities. However, the LRA did not provide enough information to justify how it has addressed the staff's concerns in RIS 2008-30.

The staff also audited the description of the LRA AMP provided in the FSAR 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 "preventive actions," "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 X.M1. The staff's evaluation of aspects of the program elements associated with enhancements will be addressed in the SER. The staff also identified certain aspects of the "scope of program" and "parameters monitored or inspected" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff found that additional information is required before a determination can be made regarding whether the applicant's operating experience supports the sufficiency of the LRA AMP. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.12, Fire Protection

Summary of Information in the Application. The LRA states that AMP B.1.12, "Fire Protection," is an existing program with enhancements that will be 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. During the audit, the staff reviewed the enhancements associated with this AMP. The enhancements will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns of the Cable Spreading Room in the reactor auxiliary building, and the Wing Area of the Reactor Building. The staff also conducted an independent search of the applicant's operating experience database using keywords: "3M fire wrapping," "fire wraps," "fire doors," "fire barriers," "floors," "ceilings," "fire barrier," "intumescent coating," "penetration seals," "openings," "holes," "cracks," "cable trays," "cerablanket," "Hemyc," "Thermo-lag," and "pyrocrete."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00007	Aging Management Program Evaluation Results Non-Class 1 Mechanical Fire Protection	01/20/2016

Document	Title	Revision/Date
2. ME-003-006	Fire Barrier Penetration Seals	Revision 306 3/30/2015
3. ME-003-007	Fire Wrap Barriers	Revision 015 9/17/2012
4. ME-003-009	Fire Rated Walls, Floors, and Ceilings	Revision 305 4/18/2016
5. PS-015-111	Fire Door Surveillance	Revision 01 2/16/2012
6. UNT-005-013	Fire Protection Program	Revision 13 4/1/2015
7. CR-WF3-2015-01464	A void (approximately 6 inches x 6 inches x 6 inches) was discovered in a 3-hour fire barrier while performing a core bore cutting on the -30 elevation outside of charging pump room A.	03/12/2015
8. CR-WF3-2015-00405	Holes found in the EDG Feed Tank Vent Lines 7EG1-29 and 7EG1-30 should have been evaluated as part of the Fire Protection Program.	01/21/2015
9. CR-WF3-2015-00102	Fire door (door 246) to Emergency Feedwater Pump-A Room on -35 RAB was found not self-latching.	01/08/2015
10. CR-WF3-2014-00936	Fire door (door 35) handle at +21 Q-deck to RCA was broken.	03/02/2014
11. CR-WF3-2014-00260	The bottom bolt of Fire Door (#D179) to the RAB +35 Electrical Penetration Area A latching mechanism cover was missing. The top bolt was loose.	01/18/2014
12. CR-WF3-2013-00261	Calculation EC-F111-001 (Fire Barrier Design Basis Review) was not completed for a barrier segment (segment 150A) in the Turbine Generator Building.	01/15/2013
13. CR-WF3-2011-01696	Documentation of approved UL-listed fire dampers installed at 66 penetrations demonstrating that their fire ratings were commensurate with the fire barrier ratings could not be located.	03/28/2011
14. CR-WF3-2010-04471	Contrary to Section 14-2.6 of NFPA 80 “Fire Doors and Windows” (1997), which states that combustible material shall be kept well away from openings, a 200-gallon used lube oil tank was found within 3 feet of fire door D61. D61 is an entry point into electrical switchgear room containing electrical offsite power switchgear equipment.	07/22/2010
15. CR-WF3-2009-01062	Seal lists in ME-003-006 Revision 303 are not updated for inaccessible seals identified in the 2005, 2007, and 2008 inspections.	03/05/2009
16. CR-WF3-2008-01465	Fire wrap (3M Interam E-54A) for conduit 30604D-SA in Fire Area RAB 17 Component Cooling Water Heat Exchanger B Room was not installed per design (ER-W3-1999-0172-000) as documented in the Engineering Request Change Notice.	04/24/2008
17. CR-WF3-2008-00654	The fire rating of Cable Vault/Relay Room RAB7 was in question because of the presence of a 4-inch conduit (Conduit 35210-NB) partially installed in the room.	02/20/2008
18. CR-WF3-2007-00381	Fire wrap was not installed in accordance with “Fire Wrap Installation and Rework Procedure – PMC-003-001.”	01/31/2007
19. CR-WF3-2004-01220	Cracks were found in Pyrocrete Barrier above Door 217 in Room #225, Fire Zone 22.	04/22/2004

Document	Title	Revision/Date
20. Technical Requirements Manual	Waterford 3 Technical Requirements Manual (TRM)	Amendment 91

The staff conducted its audit of LRA program elements 1 through 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, the staff made the following observations:

- For the "parameters monitored or inspected," the staff noted that the GALL Report recommends that the fire protection program manage the effects of aging (e.g., loss of material, cracking) for fire barrier materials (e.g., fire wrapping.) The staff noted that the applicant's "Fire Wrap Barriers" (ME-003-007, Revision 015, dated September 17, 2012, step 9) procedure directs plant personnel to inspect fire wrap barriers of different configurations (e.g., single tray, double tray) and materials (e.g., Hemyc, 3M fire wrap) for degradation at least once every 18 months.

- For the "parameters monitored or inspected," the staff noted that the GALL Report recommends that visual inspection of not less than 10 percent of each type of penetration seal be performed for any sign of degradation. If any sign of degradation is detected within the first sample, the scope of the inspection is then expanded to include additional seals (under "detection of aging effects"). The staff noted that the applicant's "Fire Barrier Penetration Seals" (ME-003-006, Revision 306, dated March 30, 2015) procedure directs plant personnel to inspect at least 10 percent of each type of penetration seal every 18 months (every refueling outage, page 3, step 1.2) for change in appearance and abnormal degradation. Consistent with the Waterford 3 TRM (4.4.11.c, amendment 91), step 1.2.1 of the same procedure instructs plant personnel to inspect an additional 10 percent of each type of sealed penetration if abnormal degradation of penetration seals in the first sample of 10 percent is detected. The locations of penetration seals to be inspected are specified in the attachments to the procedure.

- Under the same program elements of "parameters monitored or inspected" and "detection of aging effects," the GALL Report recommends that fire-rated doors are (1) inspected for any degradation of door surfaces, and (2) functionally tested to ensure intended function. The staff noted that the applicant's "Fire Door Surveillance" (PS-015-111, Revision 301, dated 3-16-2012) procedure directs plant personnel to perform various inspections and testing of fire doors (steps 5.2, 5.3 and 5.4).

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "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.M26. The staff's evaluation of aspects of the program elements associated with enhancements will be addressed in the SER.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B1.13, Fire Water System

Summary of Information in the Application. The LRA states that AMP B.1.13, "Fire Water System," is an existing program with enhancements and exceptions that will be consistent with the program elements in GALL Report AMP XI.M27, "Fire Water System," as modified by LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation." 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. During the audit, the staff reviewed the exceptions and enhancements associated with this AMP. The exceptions to the GALL Report AMP and the enhancements will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns of the fire water storage tanks (FWSTs), reactor auxiliary building (RAB), 21-foot elevation preaction control station, and the electric and diesel-driven fire pumps. The staff also conducted an independent search of the applicant's operating experience database using keywords: "biofoul," "biological," "blister," "block," "clog," "coat," "delamin," "flak," "foul," "holiday," "lined," "lining," "MIC," "microbiologic," "min wall," "peel," and "perforat," "pit," "recur," "sprinkler," and "through wall."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00007	Aging Management Program Evaluation Results Non-Class 1 Mechanical Fire Water System	Revision 0
2. MM-003-021	Sprinkler System Inspection (Safety Area)	Revision 10
3. MM-004-422	Sprinkler System Inspection (Nonsafety Areas)	Revision 8
4. MM-004-424	Building Fire Hose Station Inspection and Hose Replacement	Revision 304
5. OP-903-055	Fire Main Flush and Hydrant Inspection	Revision 11
6. OP-903-057	Fire Protection System Flow Test	Revision 018
7. N/A	Technical Requirements Manual	Amendment 72, Amendment 91
8. WF3-ME-14-00028	License Renewal Topical Report on Recurring Internal Corrosion	Revision 0

Document	Title	Revision/Date
9. Work Order (WO) 436421-02	Fire Water Storage Tank “B” – [area of corrosion on southwest corner of the tank]	06/15/2016
10. WO 436421-01	Fire Water Storage Tank “A” – [area of corrosion on northwest corner of the tank	03/24/2016
11. WO-WF3-52283342	Perform Flow Test of Fire Protection System per OP-903-057 – Results	03/30/2013
12. WO-WF3-51545900	Perform Flow Test of Fire Protection System per OP-903-057 – Results	07/20/2009
13. WO-WF3-52462938	Inspect Safety Related Sprinkler Systems MM-03-021 – Results	05/28/2014 10/22/2015
14. WO-WF3-52509629	Non-Safety Fire Protection Sprinkler Inspection – Results	01/16/2015 01/14/2016
15. OP-903-059	Sprinkler System Functional Test	Revision 12
16. OP-903-058	Fire Hose Station Valve Cycling Check	Revision 14
17. WO-51668265	Hose Station Flow Test	02/22/2016
18. WO 52297378	Perform Functional Test of RAB/RCA FP sprinkler systems per OP-903-059 – results	02/15/2011
19. OP-904-014	Turbine Building/Outside Sprinkler System Manual Test	Revision 302
20. WO 52375029	Verify Flow Through Deluge Nozzles – Results	
21. PMQR 1527-01	Work Instruction for Verifying Flow Through Deluge Nozzles [Start-up Transformer A] – Results	04/13/13
22. PMRQ 6727-02	Work Instruction for Verifying Flow Through Deluge Nozzles [Start-up Transformer B] – Results	10/22/2013
23. PMQR 1528-01	Work Instruction for Verifying Flow Through Deluge Nozzles [Main Transformer A] – Results	05/21/2014
24. PMQR 6672-01	Work Instruction for Verifying Flow Through Deluge Nozzles [Main Transformer B] – Results	05/02/2014
25. WO 00257162	HVRMFLT0008 – Spray Nozzle Air Flow Test RAB Exhaust Filter Train Inlet for E-22 Fan Units – Results	03/29/2012
26. WO 52463131	SBVMFLT0001 A – Air Flow Test Through Spray Nozzles [SBV Filter Train A Primary HEPA Filter] – Results	07/01/2014
27. WO 52489432	FP MTNK0001 B [fire water storage tank B] – Inspect Tank Internals IAW NFPA-25 [“Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,”] – Results	07/10/2014
28. WO 00232209	FP MTNK0001 A [fire water storage tank A] – Inspect Tank Internals IAW NFPA-25 – Results	11/05/2010
29. WO 00232586	FP MTNK0001 B [fire water storage tank B] – Inspect Tank Internals IAW NFPA-25 – Results	11/18/2010
30. WO 52487901	FP MTNK0001 A [fire water storage tank A] – Inspect Tank Internals IAW NFPA-25 – Results	08/25/2015
31. CR-WF3-2015-05569	FWST A Internal Corrosion	08/25/2015
32. CR-WF3-2007-00648	The fifth North/South sprinkler header from the West side of the 7B Warehouse has at least two water leaks.	02/22/2007

Document	Title	Revision/Date
33. CR-WF3-2008-01464	Emerge minor maintenance work order 147762 onto schedule to replace a section of Fire Protection sprinkler pipe in 7B Warehouse that has a pinhole leak.	04/15/2008
34. CR-WF3-2009-06241	Unit Auxiliary Transformer A Failed Main Drain Test	11/04/2009
35. CR-WF3-2009-06452	Diesel Fire Pump B – Debris Inside of Heater Causing Flow Blockage	11/09/2009
36. CR-WF3-2011-06149	Minor Through-wall Leak from FWST A Drain Pipe – From External Corrosion	08/31/2011
37. CR-WF3-2014-00830	Leak (30 drops per minute(dpm)) in Sprinkler Header Piping in Turbine Building	02/21/2014
38. CR-WF3-2012-04049	Leak in Sprinkler Piping in Warehouse	08/17/2012
39. CR-WF3-2012-03939	Leak (1 gallon per minute) in 4-inch Fire Sprinkler Header in Reactor Auxiliary Building	08/13/2012
40. CR-WF3-2012-01487	Leak (20 dpm) in the Fire Protection Line in the Turbine Building	03/26/2012
41. CR-WF3-2010-00484	Roll-up Condition Report To Address Clogged Nozzles During Testing of Startup Transformer B Deluge System	01/23/2010
42. CR-WF3-2010-00478	Two Clogged Nozzles During Testing of Startup Transformer B Deluge System	01/22/2010
43. CR-WF3-2008-04117	Underground Flow Tests Degraded Slightly from Previous Tests	08/27/2008
44. CR-WF3-2007-00648	Leaks (10 dpm) in Warehouse Fire Water Header	02/22/2007
45. CR-WF3-2015-08573	Leak (12 dpm) in Startup Transformer A Header Piping	11/19/2015
46. CR-WF3-2013-01846	Clogged Nozzle in Startup Transformer A Deluge System	04/13/2013
47. N/A	System Description, Fire Protection System, Table 5, “Areas Protected by Automatic Suppression Systems”	Revision 8
48. 58174323	Sprinkler System [piping installation details] Fire Protection – M3A, M4, M11A, M12B, M13	Revision 15

The staff conducted its audit of LRA program elements 1 through 7 based on the contents of the existing program as modified by the proposed exceptions and 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,” “acceptance criteria,” and “corrective actions” program elements associated with enhancements, sufficient information was not available to determine whether they were consistent with the corresponding program elements of the GALL Report AMP. In order to verify that the enhancements will make the AMP adequate to manage the applicable aging effects, the staff will consider issuing RAIs for the subjects discussed below.

- The LRA AMP states enhancements to the "detection of aging effects" program element, Enhancement Nos. 2, 7, 14, 16, 19, and 20. The staff's concerns are as follows:

    - Enhancement No. 2 states that a wet pipe sprinkler system will be inspected every 5 years by opening a flushing connection at the end of one main and by removing a sprinkler toward the end of one branch line. The staff's concern is that the enhancement does not state that the wet pipe systems in each building will be inspected every 5 years. NFPA 25 Sections 14.2.2 and A.14.2.2 require that each building's wet pipe system be inspected. During the audit, the staff verified that there is only one wet pipe sprinkler system in each building protected by a wet pipe system.
    - Enhancement No. 7 states that strainers will be removed every 5 years to clean and inspect for damage and corroded parts. The staff's concern is that AMP XI.M27, as modified by LR-ISG-2012-02, recommends that strainers be inspected on a refueling outage interval and after each system actuation.
    - Enhancement No. 16 states that vacuum box testing will be performed on the bottom of the FWST to identify leaks and that in the event the bottom of the fire water tank is uneven, the station will perform a suitable NDE technique rather than vacuum box testing to identify leaks. The staff's concern is that it cannot evaluate the suitability of an unspecified technique to detect leaks in tank bottoms.
    - Enhancement No. 19 states that augmented flow tests or flushing and wall thickness measurements will be conducted for fire water piping experiencing recurring internal corrosion. The staff's concerns are that the enhancement did not address whether wall thickness measurements will be conducted in addition to flow tests and flushes or in addition to only flushes; and it did not state: (a) the minimum number of inspections that will occur in each 5-year interval; (b) the criteria to be used to determine that additional inspections are warranted (e.g., extent of degradation at individual corrosion sites, rate of degradation change, trend of through-wall leaks); (c) how inspections of components that are not easily accessed will be conducted; (d) how leaks in buried or underground piping will be detected; and (e) how many additional inspections will be conducted within an inspection interval when through-wall leakage is detected or inspection results reveal that pipe wall thickness is below minimum wall. In addition, Enhancement No. 19, which states that activities will be completed every 5 years, is not consistent with LRA Section 3.3.2.2.8 which states, "will conduct augmented flow tests or flushing, and wall thickness measurements for fire water piping experiencing recurring internal corrosion prior to the period of extended operation and at least once every refueling cycle during the period of extended operation."
    - Enhancement No. 20 states the alternative actions that will be taken prior to returning a FWST to service without repair or replacement of degraded coatings. The staff concerns are that: (a) the alternative could be used even though the size and frequency of blisters could be increasing; and (b) the enhancement allows a coating inspector rather than a coating specialist to evaluate the conditions for use of the alternative.

- The LRA AMP states an enhancement, Enhancement No. 22, to the "acceptance criteria" program element. The enhancement states that adhesion results can be

quantified by conducting visual inspections, wet sponge testing, or dry film testing. The staff's concern is that these methods are not capable of quantifying adhesion results.

- The LRA AMP states an enhancement, Enhancement No. 25, to the "corrective actions" program element. The enhancement states that obstruction evaluations will be conducted if there is evidence of "excessive" discharge of material during routine flow tests. AMP XI.M27, as modified by LR-ISG-2012-02 recommends the use of the criteria in NFPA 25 Section 14.3, "Obstruction Investigation and Prevention," which uses the term "obstructive" rather than "excessive." The staff's concern is that the term "excessive" is not defined.

In order to verify that the exceptions, Exception Nos. 5 and 6, will make the AMP adequate to manage the applicable aging effects, the staff will consider issuing RAIs for the subjects discussed below. The LRA AMP states exceptions to the "detection of aging effects" program element. The staff's concerns are as follows:

- Exception No. 5 states that cross-hatch testing, as described in ASTM D 3359, "Standard Test Methods for Measuring Adhesion by Tape Test" (recommended by AMP XI.M27, as modified by LR-ISG-0212-02 by citing NFPA 25 Section 9.2.7.1), is not conducted when signs of pitting, corrosion, or failure of the coating is detected. The basis for the exception in part includes crediting spot wet sponge tests and dry film testing as a means to detect coating adhesion deficiencies. The staff has concluded that these methods do not effectively detect coating adhesion deficiencies, but rather holidays and coating thickness, respectively.

- Exception No. 6 and Enhancement No. 3 address trip testing preaction valves with the control valves cracked open in lieu of testing with control valves in the full open position and internal inspections of dry sprinkler piping downstream of preaction systems, respectively. The staff's concern with Exception No. 6 is that a cracked open control valve might not provide adequate flow to detect potential flow blockage. The staff's concern with Enhancement No. 3 is that it does not state: (a) the frequency of inspections; (b) how access to the piping will be obtained (e.g., removal of a sprinkler and opening a flushing connection); and (c) the location of the removed sprinkler (i.e., most remote). The exception and enhancement address inspections or tests that are used to detect potential flow blockage of dry sprinkler piping downstream of preaction systems.

During the audit, the staff made the following observations:

- The staff reviewed TRM Table 3.7-2, "Spray and/or Sprinkler Systems," and confirmed that there are 21 credited spray or sprinkler systems.

- The staff reviewed TRM Table 3.7-4, "Fire Hose Stations," and confirmed that there are 76 credited fire hose stations.

- The staff reviewed the License Renewal Topical Report on Recurring Internal Corrosion. Attachment 1, "Recurring Internal Corrosion Subject to Aging Management Review," identified five CRs associated with leaks in the fire protection system. The CRs included: CR-WF3-2004-02297 (July 28, 2004); CR-WF3-2008-02468 (May 20, 2008); CR-WF3-2008-04793 (October 15, 2008); CR-WF3-2008-01390 (April 9, 2008); and CR-WF3-2012-00758 (February 12, 2012).

- The staff reviewed procedure OP-903-058 and confirmed that the acceptance criteria for the fire hose station flow confirmation (conducted every 3 years) is, “no flow blockage exists when each fire hose station valve is partially opened.” Specifically, the test states, “[n]o flow blockage is indicated by visible water flowing out of the hose station.” There are 76 hose stations in this portion of the test. The hose stations are located in the reactor auxiliary building, fuel handling building, Dry Cooling Tower, turbine building, reactor building, and support buildings. In addition, the test includes remote hose stations, defined as, “the farthest fire hoses from the Fire Pumps.” The acceptance criteria for the remote hose stations (conducted every 5 years) is, “[f]or each hose station being tested in Attachment 10.3 [remote hose stations], if Hose Station residual pressure is <65 PSI or flow rate is <100 GPM, then data must be submitted to the Fire Protection Engineer for evaluation of acceptance.” There are two remote hose stations, one in the fuel handling building and one in the turbine building.

- The staff reviewed procedure OP-903-059 and work orders WO 52297378 and confirmed that there are 37 main drain tests conducted, including 9 in the turbine building, 1 in the fuel handling building, 2 in the reactor building, 16 in the reactor auxiliary building, 7 in the yard areas, and 2 in the diesel engine fuel oil storage tank area. The staff noted that although the title of WO 52297378 refers to the “RAB/RCA FP sprinkler systems,” the work order documents testing of all the above cited main drain locations.

- The staff reviewed procedures OP-903-059 and OP-904-014 and confirmed that the applicant tests the piping downstream of the deluge valves by confirming that the water pressure is approximately 125 psig prior to opening the deluge valve, pressure drops to approximately 0 psig when opened, and returns to approximately 125 psig when the deluge valve is closed. The staff also noted that PMQR 1527-01, within work order WO 52375029, directs personnel to “[o]bserve flow at each Fire Protection Spray nozzle…and document and spray pattern abnormalities.” The staff reviewed other deluge valve testing work orders and confirmed that each included a similar PMQR (i.e., 6727-02, 1528-01, 6672-02) specific to the transformer’s deluge system being tested.

- The staff reviewed work orders WO 00257162 and WO 52463131 and confirmed that the procedure uses air to test deluge piping for filter units. The procedure requires the individual to check sprinkler nozzles for obstructions.

- The staff reviewed procedure OP-903-055 and confirmed that the acceptance criteria for the test is “[c]lear water is being discharged from the designated fire hydrant, and flushing has been in progress for at least 2 minutes.”

- The staff reviewed work orders WO 52489432, WO 00232209, WO 00232586, and WO 52487901 and confirmed that, with the exception of the August 25, 2015, inspection of fire water storage tank A, no corrosion or coating degradation was noted on the internals of the FWSTs. During the August 25, 2015, inspection of FWST A, minor corrosion was noted on the inside surface of the northeast manway, and some corrosion was noted on the drain line. The staff noted that CR-WF3-2015-05569 was initiated by the applicant to document the corrosion. The staff reviewed the photographs provided with the condition report and noted that corrosion inside the tank appears to be minor and that the corrosion on the inside surfaces of the drain piping are typical with that observed in carbon steel piping exposed to raw water.

- The staff reviewed CR-WF3-2010-00484 and noted that there have been six clogged nozzles spanning, two in 2005, one in 2006, one in 2008, and two in 2010.

- The staff reviewed the fire water system piping and instrument diagrams, system description, and installation drawing with the applicant and confirmed that in each building protected by a wet pipe system, there is only one wet pipe sprinkler system in contrast to dry piping preaction systems where there are multiple systems in each building.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR supplement. In order to obtain the information necessary to verify the sufficiency of the FSAR supplement program description, the staff will consider issuing RAIs for the subjects discussed below.

- The staff noted that certain aspects of the recommended FSAR supplement content were not included. Specifically, the following are missing from the FSAR supplement: (a) the program manages the aging effects through the use of flow testing and visual inspections performed in accordance with the 2011 Edition of NFPA 25; and (b) the water-based fire protection system is normally maintained at required operating pressure and is monitored such that loss of system pressure is immediately detected and corrective actions initiated.

Audit Results. Based on this audit, the staff verified that "scope of program," "preventive actions," "parameters monitored or inspected," and "monitoring and trending" program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.M27 as modified by LR-ISG-2012-02. The staff's evaluation of aspects of the "detection of aging effects" program element associated with exceptions will be addressed in the SER. The staff also identified certain aspects of the "detection of aging effects," "acceptance criteria," and "corrective actions" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff identified a need for additional information regarding the adequacy of the program description in the FSAR supplement.

LRA AMP B.1.14, Flow-Accelerated Corrosion

Summary of Information in the Application. The LRA states that AMP B.1.14, "Flow-Accelerated Corrosion," is an existing program with enhancements that will be consistent with the program elements in GALL Report AMP XI.M17, "Flow-Accelerated Corrosion," as modified by LR-ISG-2012-01, "Wall Thinning Due to Erosion Mechanisms." To verify this claim of consistency, the staff audited the LRA AMP. During the audit, the staff reviewed enhancements associated with this AMP and will document their evaluation in the SER.

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

the applicant's operating experience database using keywords: "cavit," "erosion," "FAC," "flow accel," and "wall thin."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00002	Operating Experience Review Results Aging Effects Requiring Management	Revision 0
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness, Section 3.1.12 Flow-Accelerated Corrosion	Revision 0
3. WF3-EP-14-00007	AMP Evaluation Results – Non-Class 1 Mechanical, Section 4.8 Flow-Accelerated Corrosion	Revision 1
4. EN-DC-315	Flow-Accelerated Corrosion	Revision 12
5. W3P89-3081	NRC GL 89-08, "Erosion/Corrosion Induced Pipe Wall Thinning"	7/21/1989
6. W3P89-1592	Supplemental Information in Response to NRC GL 89-08, "Erosion and Corrosion Induced Pipe Wall Thinning"	11/17/1989
7. CR-WF3-1997-01205	Due to Flow-Accelerated Corrosion, unexpected gross thinning. Replaced with stainless steel	N/A
8. CR-WF3-2007-03899	WF3 Flow-Accelerated Corrosion program – several components that are susceptible to flow-accelerated corrosion, but not included in the CHECWORKS software model do not have available documentation of previous inspections.	N/A
9. CR-WF3-2008-02852	WF3 Flow-Accelerated Corrosion Program software models (CHECWORKS) contain errors in the feedwater heaters by the fact that the nozzles are the original A106B (carbon steel) material.	N/A
10. CR-WF3-2009-00183	A review of the Flow-Accelerated Corrosion CHECWORKS predictive model (as a result of recent increase in Blowdown System flow) indicates that there are two areas where the model has not reflected actual plant conditions.	
11. CR-WF3-2009-00614	Cavitation in ACCW spool piece in valve body ACC-126A.	N/A
12. CR-WF3-2009-01980	Extent of condition for CR-WF32-2009-00183 identified three additional discrepancies.	N/A
13. CR-WF3-2009-07244	EPRI identified a "bug" in CHECWORKS software that is used to predict flow-accelerated corrosion downstream of a piping section that has been replaced, under certain specific conditions.	N/A
14. CR-WF3-2011-02509	MSR A shell wear (due to erosion and/or flow-accelerated corrosion) wall thickness less than minimum allowed of 1.2.3.2 per TD-W120.1825. Similar wear noted in past (CR-WF3-2006-4202).	N/A
15. CR-WF3-2011-03022	BD-109A replaced due to body leak (CR-WF3-2010-1873). BD-109A internal shows severe wastages on body and pipe joint.	N/A

Document	Title	Revision/Date
16. CR-WF3-2012-01648	BD-109A (S/G 1 Blowdown flow control valve) stated similar conditions expected for BD-109B and recommended inspection during RF17.	N/A
17. CR-WF3-2012-05734	Flow-accelerated corrosion scope expansion inspection identified additional wall thinning.	N/A

The staff conducted its audit of LRA program elements 1 through 7 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," "acceptance criteria," and "corrective actions" program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP, as modified by LR-ISG-2012-01.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience and the applicant had adequately evaluated and incorporated the operating experience into this program.

The staff also audited the description of the LRA AMP provided in the FSAR supplement in LRA Section A.1.14. 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," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.M17, as modified by LR-ISG-2012-01. The staff's evaluation of aspects of the program elements associated with enhancements will be addressed in the SER. The staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated and the applicant had adequately evaluated and incorporated the operating experience into this program. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.15, Inservice Inspection

Summary of Information in the Application. The LRA states that AMP B.1.15, "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.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "cracking," "leak," "wear," "loss of material," "failure," "degradation," "flaw," "repair," and "weld."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00006	Program Basis Document, Aging Management Program Evaluation Results – Class 1 Mechanical	Revision 1, 05/01/2013
2. CR-WF3-2011-01748	Missed Examination of ASME Code Items	05/10/2011
3.CR-WF3-2005-01449	Boric Acid Discovered in the Annulus of Pressurizer Heater Sleeves C4 and D2	07/01/2005
4. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0, 11/30/2015
5. CR-WF3-2012-05113	Reactor Vessel Flange Leakoff Line	10/13/2012
6. NRC Integrated Inspection Report 05000382/ 2012005	NRC Integrated Inspection Report – Failure to perform ASME Code Section XI Required Examination	Revision 0
7. CR-WF3-2007-03385	Reactor Vessel Head Flange O-Ring Leak	10/31/2007
8. CR-WF3-2007-03129	Reactor Vessel Head Flange O-Ring Leak	09/04/2007
9. WF3-EP-14-00006	Program Basis Document, Aging Management Program Evaluation Results – Class 1 Mechanical, “Inservice Inspection”	Revision 1, 05/01/2013
10. LER-382-2000-011	RCS Pressure Boundary Leak due to PWSCC and Leaking MNSA Clamps	11/16/2000
11. LER-382-1999-002	Leaking Reactor Coolant System Pressure Boundary Nozzles	11/16/2000
12. LER-382-2003-003	RCS Pressure Boundary Leak due to PWSCC	12/18/2003
13.CR-WF3-2000-00199	Boric Acid Discovered in the Annulus of Pressurizer Heater Sleeves C4 and D2.	03/06/2000

The staff conducted its audit of LRA program elements 1 through 6 based on the contents of the existing program.

During the audit, the staff verified that the “preventive actions,” “parameters monitored or inspected,” “monitoring and trending,” “detection of aging effects,” “acceptance criteria,” and “corrective actions” 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, sufficient information was not available to determine whether it was consistent with the corresponding program elements of the GALL Report AMP. In order to verify that the program elements will make the AMP adequate to manage the applicable aging effects, the staff will consider issuing RAIs for the subjects discussed below.

- The LRA AMP states consistency to the “scope of program” program element. In the operating experience section, it indicates that it had missed a Code-required examination in 2010. The staff’s concerns are as follows:

  The staff performed a plant-operating experience review and noted that, in addition to missing an item in 2010, the applicant had also missed another Code

required testing in 2012. The staff has concerns that applicant may not be clear on its program scope and may miss Code required examinations during the period of extended operation.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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 "preventive actions," "parameters monitored or inspected," "monitoring and trending," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.M1. The staff's evaluation of aspects of the "scope of program" program element will be addressed in the SER. The staff also identified certain aspects of the "scope of program," program element of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in SRP-LR.

LRA AMP B.1.16 Inservice Inspection – IWF

Summary of Information in the Application. The LRA states that AMP B.1.16, "Inservice Inspection – IWF," is an existing program with enhancements that will be consistent with the program elements in GALL Report AMP XI.S3, "ASME Section XI, Subsection IWF." To verify this claim of consistency, the staff audited the LRA AMP. Issues identified but not resolved in this report will be addressed in the SER. During the audit, the staff reviewed the enhancements associated with this AMP. The enhancements will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted a walkdown of the Essential Chilled Water system. The staff also conducted an independent search of the applicant's operating experience database using keywords: "IWF," "support," "pipe hanger," and "corrosion."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-CS-14-00002	Aging Management Review of the Nuclear Plant Island Structure	Revision 1
2. WF3-ME-14-00009	Aging Management Review of the Component Cooling and Auxiliary Component Cooling Water Systems	Revision 1
3. WF3-CS-14-00004	Aging Management Review of Bulk Commodities	Revision 1

Document	Title	Revision/Date
4. WF3-EP-14-00008	Aging Management Program Evaluation Report Civil/Structural	Revision 1
5. CR-WF3-2014-01840	Condition Report	04/18/2014
6. ISI-VT-14-072	Visual Examination of Pipe Hanger, Support, or Restraint	04/24/2014
7. ISI-VT-15-019 WF3-2015-07635	Visual Examination of Pipe Hanger, Support or Restraint, Related CR	11/19/2015
8. CR-WF3-2014-02135	Condition Report	04/24/2014
9. CR-WF3-2012-07616	Condition Report	12/21/2012
10. LO-WLO-2015-00054 CA-00004	RF20 WF3 Inservice Inspection Pre-NRC Inspection Snapshot Assessment	08/13/2005
11. W/O 00109393	Work Order Associated with Condition Report	08/29/2007
12. ISI-VT-08-021 RF-15-3-ISI	ISI-VT-08-021 RF-15-3-ISI Inservice Inspection Report	05/01/2008
13. ISI-VT-12-051 CR-WF3-2012-05774 EC 40842	Evaluation of Spring Hanger	10/29/2012
14. CEP-NDE-0903	VT-3 Examination – Entergy Nuclear Engineering Programs	Revision 5
15. EN-DC-141	Design Inputs	Revision 15
16. EN-LI-102	Corrective Action Program	Revision 24
17. EN-MA-145	Maintenance Standard for Torque Applications	Revision 3
18. SEP-ISI-104	Program Section for ASME Section XI, Division 1 Inservice Inspection Program	Revision 2
19. EN-MA-145	Maintenance Standard for Torque Applications	Revision 5
20. UNT-006-032	Coating and Corrosion Program	Revision 0
21. EN-DC-178	System Walkdowns	Revision 7
22. SEP-RR-WF3-001	ASME Section XI Repair/Replacement Program	Revision 0
23. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0
24. CEP-NDE-0901	VT-1 Visual Examination (ASME XI)	Revision 4
25. CEP-NDE-0902	VT-2 Visual Examination (ASME XI)	Revision 7
26. CEP-NDE-0903	VT-3 Visual Examination (ASME XI)	Revision 5

The staff conducted its audit of LRA program elements 1 through 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,” “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,” “parameters monitored or inspected,” and “detection of aging effects” program elements, sufficient information was not available to determine whether they were consistent with the corresponding program elements of the GALL Report AMP. In order to obtain the information necessary to verify whether 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," "parameters monitored or inspected," and "detection of aging effects" program elements of the LRA AMP state that high-strength structural bolting is not considered susceptible to SCC because plant procedures prohibit the use of MoS_2 as a thread lubricant for bolting. The GALL Report AMP XI.S3 recommends that for high-strength structural bolts in sizes greater than 1-inch nominal diameter with measured yield strength greater than or equal to 150 ksi (1,034 MPa), in addition to the VT-3 examinations, volumetric examination be performed to detect cracking. Alternatively, the GALL Report states that such examination can be waived with adequate plant-specific justification. It is not clear whether plant-specific justification in the LRA to waive the volumetric examination is limited just to the absence of the use of MoS_2 lubricants. It is not also clear that the LRA statement is consistent with the GALL Report AMP XI.S3, because the GALL Report does not limit MoS_2 thread lubricant as the only contributor to the aging mechanism for SCC in the above-mentioned high-strength bolts.

- The LRA states that the "preventive actions" program element will be consistent with the GALL Report. The GALL Report AMP XI.S3 recommends that the program specify the use of bolting material that has an actual measured yield strength less than 150 ksi. However, the "preventive actions" program element of LRA AMP B.1.16 and its basis documents do not appear to include preventive actions to limit the selection of bolting material to those that have an actual measured yield strength of less than 150 ksi, which is recommended by the GALL Report to preclude SCC of high-strength bolts. Therefore, the staff was unable to verify consistency of the "preventive actions" program element of LRA AMP B.1.16 with that of the GALL Report AMP XI.S3.

- The "preventive actions" program element of GALL Report AMP XI.S3 states, in part: "[s]election of bolting material and the use of lubricants and sealants [are] 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 safety-related bolting." GALL Report AMP XI.S3 also states that "[s]tructural bolting replacement and maintenance activities include appropriate preload and proper tightening (torque or tension)…" The "preventive actions" program of the LRA AMP basis document states, in part:

    - The program is a condition monitoring program and does not include guidance for the selection of bolting material, installation torque or tension, and use of lubricants and sealants. The program is supplemented by existing plant procedures to ensure that the selection of bolting material installation torque or tension, and the use of lubricants and sealants is appropriate for the intended purpose. These implementing procedures use the guidance contained in NUREG-1339 and in EPRI NP-5769, NP-5067, and TR-104213 to ensure proper specification of bolting material, lubricant, and installation torque.

      It is not clear if the above statements are consistent with the GALL Report AMP XI.S3 because although aspects of the above statement appear to be an enhancement to the existing code-based condition monitoring (only) program, there is an apparent lack of a procedural link between the AMP implementing procedures and the "existing plant procedures" being credited to supplement the

AMP. The staff also noted that this is a common issue across B.1.16 "Inservice Inspection – IWF" AMPs and B.1.6 "Containment Inservice Inspection – IWE."

- The "preventive actions" program element of GALL Report AMP XI.S3 states, in part:

    - If the structural bolting consists of ASTM A325, ASTM F1852, and/or ASTM A490 bolts, the preventive actions for storage, lubricants, and stress corrosion cracking potential discussed in Section 2 of RCSC (Research Council for Structural Connections) publication "Specification for Structural Joints Using ASTM A325 or A490 Bolts," need to be considered.

  The related enhancement to the LRA AMP "preventive actions" program element, which is intended to achieve consistency with the GALL Report, states: "Revise plant procedures to include the preventive actions for storage of ASTM A325, ASTM F1852 and A490 bolting from Section 2 of Research Council for Structural Connections publication, 'Specification for Structural Joints Using ASTM A325 or A490 Bolts.'" This enhancement description does not include the RCSC Section 2 preventive actions for *"lubricants" and "stress corrosion cracking potential,"* and the related justification provided in the AMP basis document. Not including provisions consistent with the recommendations for lubricants and stress corrosion cracking potential appears to interpret the standard in a manner that is inconsistent with the intent of the GALL Report AMP. It is not clear whether the applicant's enhancement is adequate to make the LRA AMP consistent with the GALL Report AMP XI.S3. The staff also noted that this is a common issue across B.1.6, "Containment Inservice Inspection – IWE;" B.1.16, "Inservice Inspection – IWF;" and B.1.38, "Structures Monitoring" AMPs.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience (e.g., no previously unknown or recurring aging effects were identified by the applicant or staff). However, the staff identified plant-specific operating experience in which corrosion was identified. The staff's evaluation of the identified plant-specific operating experience will be addressed in the SER. 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 subjects discussed below.

- GALL Report AMP XI.S3 states that MoS_2 should not be used as a lubricant due to its potential contribution to SCC, especially for high-strength bolts. The GALL Report also states that the applicant should evaluate applicable operating experience to support the conclusion that the effects of aging are adequately managed. LRA Section B.1.16 and supporting procedures, consistent with the GALL Report AMP XI.S3, state that "[p]lant procedures prohibit the use of lubricants containing MoS_2…" and specify to follow the recommendations in NUREG-1339, EPRI NP-5769, NP-5067, and TR-104213 to ensure proper specification of lubricants for bolting. During its onsite audit, the staff confirmed that although the referenced bolting procedures were revised to prohibit the use of MoS2, it is not clear whether MoS2 lubricants have ever been used at Waterford 3. If so, additional information is necessary to resolve potential aging effects associated with the use of MoS2 in structural bolting. The staff also noted that this issue is common across B.1.1, "Bolting Integrity," and B.1.16, "Inservice Inspection – IWF" AMPs.

- ASME Section XI, Subsection IWF states that to the extent practical, the same supports selected for examination during the first inspection interval shall be examined during each successive inspection interval. During the audit, the staff reviewed operating experience and found the following:

    - For component supports and/or related hardware examined during IWF sampling inspections, degraded conditions were found that although acceptable-as-is, the components were re-worked/repaired to as-new condition. Since it was determined that the as-found condition did not affect the support's capability to perform its design function or exceed the threshold of ASME Section IWF-3400, "Acceptance Criteria," the applicant determined the actions associated with ASME Sections IWF-2420, "Successive Inspections," and IWF-2430, "Additional Examinations," criteria were not required and thus did not apply those Code provisions.
    - Component supports and/or related hardware were identified where degraded conditions were identified and re-worked/repaired as the result of walkdowns or other activities and not directly tied to an ISI-IWF inspection. However, the staff did not find evidence of an evaluation to determine whether the supports repaired were supports that were part of the sample periodically inspected by the ISI-IWF program. Conferencing with the applicant during the onsite audit indicated that such a process to identify whether repaired component supports are in the IWF inspection sample may not exist.

    Given that the program will manage aging of the entire ASME Code component support population through inspections of a representative population, any ISI-IWF sampled support that is re-worked to as-new condition would no longer be representative of other supports in the IWF component support population. Subsequent ISI-IWF inspections of the same sample may not represent the age-related degradation of the remaining population. The applicant's LRA and associated basis documents do not provide a discussion of how this issue is addressed in the AMP, or if the current processes consider expansion or change of the ASME-based IWF sample if a component support and/or related hardware within the IWF sample were re-worked. In addition, it is not clear whether a re-worked component support that is part of the ISI-IWF sample but not identified through the ASME ISI-IWF inspection, (but rather via a walkdown, other program, or some other means), would continue to be included in the ISI-IWF AMP program sample. As a result, it is not clear how the program will ensure that the component support inspection sample reflects the age-related degradation of the remaining population of IWF supports that are not inspected.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "monitoring and trending," and "acceptance criteria" program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.S3. The staff also identified certain aspects of the "preventive actions," "parameters monitored or inspected," and "detection of aging effects," program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also found that additional information is required before a determination can be made regarding whether the applicant's operating experience supports the sufficiency of the LRA AMP. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.17, 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.1.17, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems," is an existing program with enhancements that will be 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. Issues identified but not resolved in this report will be addressed in the SER. During the audit, the staff reviewed the enhancements associated with this AMP. The enhancements will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns of selected cranes, including the fuel handling building bridge crane, auxiliary monorail cranes, the turbine building gantry crane, and the steam generator feed water pumps (Kranco) crane. The staff also conducted an independent search of the applicant's operating experience database with focus on cranes, using the keywords: "corrosion," "bolt," and "wear."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-CS-14-00001	Aging Management Review of the Reactor Building	Revision 1, 12/03/2015
2. WF3-CS-14-00002	Aging Management Review of the Nuclear Island Structure	Revision 1, 12/03/2015
3. WF3-CS-14-00003	Aging Management Review of the Turbine Building and Other Structure	Revision 1, 12/03/2015
4. WF3-EP-14-00008	Aging Management Program Evaluation Results-Civil/Structural.	Revision 1, 12/03/2015
5. ME-004-401	Fuel Handling Building Crane PM	Revision 007, 10/20/2011
6. MM-004-201	Containment Building Polar Crane PM	Revision 303, 12/18/2008
7. MM-004-870	Kranco Overhead Cranes PM	Revision 301, 02/20/2008
8. MM-004-877	Containment Building Auxiliary Pedestal Crane PM	Revision 302, 09/20/2012
9. CR-WF3-2014-01628	Polar Crane, Rail Clamp Hold Down Bolt Broken	04/14/2014
10. CR-WF3-2009-02108	Rust, Dirt, Foreign Material on Trolley and Bridge, Fuel Handling Building	05/05/2009

Document	Title	Revision/Date
11. EN-LI-102	Corrective Action Program	Revision 24, 09/05/2014
12. WF3-QA	Entergy, Quality Assurance Program Manual	Revision 29, 12/01/2014
13. MM-007-002	Crane and Hoist Inspection and Testing	Revision 009, 04/18/2013
14. EBASCO Project ID LOU-1564.721	EBASCO Specification 503-70, Fuel Handling Building Bridge Crane, Seismic Category I	09/27/1983
15. CR-WF3-2007-03574	Missing Bolt, Polar Crane	10/10/2007
16. CR-WF3-2011-00215	Rust Forming on Trolley Rail Supports, Turbine Building Gantry Crane	01/13/2011
17. EBASCO Project ID LOU-1564.720	EBASCO Specification 503-70, Reactor Circular Bridge Crane, Seismic Class I	Revision 9, 03/13/1990
18. DWG-U-76742	(Turbine Building Crane) "Gantry Leg Details – Whiting Corporation"	Revision 2, 03/30/1977
19. DWG-U-70861	(Turbine Building Crane) "Gen'l Arrg't of one 4-Motor Gantry Bridge Front Elevation-Whiting Corporation"	Revision 4, 04/25/1977
20. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0, 11/30/2015
21. LO-WLO-2004-00033	Snapshot Assessment on Large Crane System Health	06/07/2004
22. EBASCO Project ID LOU-1564.722	EBASCO Specification 503-70, Turbine Building Gantry Crane, Seismic Category II	Revision 3, 11/15/1978
23. EBASCO Project ID LOU-1564.729A	EBASCO Specification 503-70, Miscellaneous Bridge Cranes, Seismic Category I and II	Revision 4, 04/01/1983
24. License Renewal Application	Waterford Steam Electric Station, Unit 3, Facility Operating License NPF-38	March 2016

The staff conducted its audit of LRA program elements 1 through 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's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR supplement. The staff found that sufficient information was not available to determine whether the description provided in the FSAR supplement was an adequate description of the LRA AMP. In order to obtain the information necessary to verify the sufficiency of the FSAR supplement program description, the staff will consider issuing an RAI for the subject discussed below:

- Table 3.0-1, "FSAR Supplement for Aging Management of Applicable Systems," of the SRP-LR outlines the FSAR description for an AMP to be consistent with GALL Report

AMP XI.M23 FSAR. The SRP-LR states, "[t]he number and magnitude of lifts made by the hoist or crane are also reviewed." The staff noted that the FSAR of LRA AMP B.1.17, LRA Section A.1.17, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program," does not address the number of lifts made for the scoped-in hoists or cranes. It is not clear how the applicant intends to meet the FSAR acceptance criteria for the GALL Report AMP XI.M23 as outlined in the SRP-LR.

Audit Results. Based on this 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 program elements of the GALL Report AMP XI.M23. The staff's evaluation of aspects of the program elements associated with enhancements will be addressed in the SER.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff identified a need for additional information regarding the adequacy of the program description in the FSAR supplement.

LRA AMP B.1.18, Internal Surfaces in Miscellaneous Piping and Ducting Components

Summary of Information in the Application. The LRA states that AMP B.1.18, "Internal Surfaces in Miscellaneous Piping and Ducting Components," is a new program that will be consistent with the program elements in GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," as modified by LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation." To verify this claim of consistency, the staff audited the LRA AMP. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this new program, and the staff's audit addressed only the program elements described in the applicant's basis document and plant-specific operating experience. 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 provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "biofoul," "crack," "wall loss," "through wall," "piping," "foul," "leak," and "loss of material."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00007	Aging Management Program Evaluation Results Non-Class 1 Mechanical Systems	Revision 0
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0

During the audit of program elements 1 through 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, the staff made the following observation on a relevant AMR item:

- LRA Table 3.3.2-15-29, "Radiation Monitoring System, Nonsafety-Related Components Affecting Safety-Related Systems," states that aluminum filter housings exposed to waste water will be managed for loss of material using the Internal Surfaces In Miscellaneous Piping and Ducting Components program. The staff noted during a breakout session with the applicant that (1) cracking due to SCC is known to occur in high- and moderate-strength aluminum alloys; (2) halide concentrations should generally be considered high enough to facilitate cracking due to SCC of aluminum alloys in waste water unless demonstrated otherwise; and (3) depending on the specific aluminum alloy used for the filter housings, the aging effect of cracking due to SCC may be applicable. The staff will consider issuing an RAI to request the basis for why cracking due to SCC is not an applicable aging effect for aluminum filter housings exposed to waste water.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR supplement. The staff verified this description is consistent with the description provided in the SRP-LR, as modified by LR-ISG-2012-02.

Audit Results. Based on this 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 program elements in GALL Report AMP XI.M38, as modified by LR-ISG-2012-02.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR, as modified by LR-ISG-2012-02.

LRA AMP B.1.19, Masonry Wall

Summary of Information in the Application. The LRA states that AMP B.1.19, "Masonry Walls," is an existing program with enhancements that will be 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. During the audit, the staff reviewed the enhancements associated with this AMP. The enhancements will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns of the nuclear reactor auxiliary building, fuel handling building, and turbine building. The staff also conducted an independent search of the applicant's operating experience database using keywords: "masonry," "block," "crack," and "concrete."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00008	Aging Management Program Evaluation Report Civil/Structural	Revision 1
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0
3. EN-DC-150	Condition Monitoring of Maintenance Structures	Revision 6, 11/21/2013
4. W-CS-2003-001-00	Maintenance Rule Walkdown for Evaluation of Structures	Revision 0, 10/09/2003
5. WF3-CS-11-00001	Maintenance Rule Walkdown for Evaluation of Structures	Revision 0, 01/12/2011
6. WF3-CS-16-00006	Maintenance Rule Walkdown for Evaluation of Structures	Revision 0, 05/11/2016

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

During the audit, 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. The staff also verified that aspects of the "scope of program," "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements not associated with the enhancement identified in the LRA or by the staff during the audit are consistent with the corresponding program elements in the GALL Report AMP. The staff's evaluation of aspects of these program elements associated with the enhancements will be addressed in the SER.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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 "preventive actions" and "monitoring and trending" program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.S5. The staff also verified that for the "scope of program," "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements, the aspects of the LRA AMP program elements not associated with the enhancements are consistent with the corresponding program elements in GALL Report AMP XI.S5. The staff's evaluation of aspects of the program elements associated with enhancements will be addressed in the SER.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.20, Metal Enclosed Bus Inspection

Summary of Information in the Application. The LRA states that AMP B.1.20, "Metal Enclosed Bus Inspection," is a new program that will be consistent with the program elements in GALL Report AMP XI.E4, "Metal Enclosed Bus Program." To verify this claim of consistency, the staff audited the LRA AMP. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this new program, and the staff's audit addressed only the program elements described in the applicant's basis document as well as the relevant operating experience.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns of the 4 kV and 6.9 kV switchgear, 230 kV transmission switchyard, transformer yard, 230 kV switching station, fire pump house, water treatment building, auxiliary building, and electrical penetration area. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "MEB," "cable bus," "electrical bus," "enclosed bus," "connections," and "metal enclosed bus."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EE14-00001	Electrical Screening and Aging Management Review	Revision 1, 02/01/2016
2. WF3-EP-14-00002	Operating Experience Review Results – AERM	Revision 0, 09/13/2015
3. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0, 11/30/2015
4. WF3-EP-14-00009	Aging Management Program Evaluation Results – Electrical	Revision 1, 02/01/2016
5. CR-WF3-2014-01170	Condition Report (while performing quarterly thermography, hot spots were located on the insulator of generator output breaker cable connections)	Revision 0, 04/14/2014
6. CR-WF3-2008-02028	Condition Report (Isophase bus duct lead box housing contains a 9-inch long crack in the metal sidewall near the ceiling support)	Revision 0, 05/12/2008
7. EN-DC-349	Metal Enclosed Bus Inspection Procedure	Revision 3 11/21/2013
8. EN-DC-310	Predictive Maintenance Program (Thermography)	Revision 7, 06/11/2015
9. EN-FAP-LR-026	License Renewal Non-EQ Electrical Cable Connection AMP	Revision 4, 10/30/2014

During the audit of program elements 1 through 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. The staff noted that the

applicant has opted to include MEB enclosure assembly external surfaces inspection in this AMP instead of the structures monitoring program.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience. The review of a sample of work orders did not find any significant or unusual operating experience and no previously unknown or recurring aging effects were identified by the applicant or staff.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "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.E4.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.21, Neutron-Absorbing Material Monitoring

Summary of Information in the Application. The LRA states that AMP B.1.21, "Neutron-Absorbing Material Monitoring," is an existing program with enhancement that will be consistent with the program elements in GALL Report AMP XI.M40, "Monitoring of Neutron-Absorbing Materials Other than Boraflex." To verify this claim of consistency, the staff audited the LRA AMP. During the audit, the staff reviewed the enhancement associated with this AMP. The enhancement is evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "loss of attenuation," "degradation of neutron-absorbing capacity," "blisters," "pits," and "bulges."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. CR-WF3-2014-05222	Boral Coupon Scheduling Issue	11/09/2014
2. CR-WF3-2016-03932	Change to Periodicity for Testing to Meet XI.M40	06/15/2016
3. HPP-60994-9	Physical Properties Measurement Procedures Boral Surveillance Coupons for Waterford 3 Spent Fuel Racks, Holtec Project Procedure	Revision 1, 05/04/1998

Document	Title	Revision/Date
4. HPP-60994-9A	Boral Surveillance Program for Waterford Unit 3 Spent Fuel Racks	Revision 2
5. NE-001-106	SFSR Boral Surveillance Program	Revision 4
6. NET-191-01	Inspection and Testing of Boraflex and Boral Surveillance Coupons from Arkansas Nuclear One, Grand Gulf, and Waterford Stations	11/27/2001
7. NET-28040-01	Inspection and Testing of Boraflex and Boral Surveillance Coupons from Arkansas Nuclear One, Grand Gulf, and Waterford Stations	10/05/2010
8. SEP-191-02, NETCO	Procedures for Measuring and Recording Boral Surveillance Coupon Physical Attributes	10/14/1994

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

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's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "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.M40.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.22, Nickel Alloy Inspection

Summary of Information in the Application. The LRA states that AMP B.1.22, "Nickel Alloy Inspection," is an existing program that is consistent with the program elements in GALL Report AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only)." To verify this claim of consistency, the staff audited the LRA AMP.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "CRDM," "reactor vessel," "vessel head," "nozzle," "penetration," "weld," "stress corrosion," "thermal sleeve," and "PWSCC."

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

Relevant Documents Reviewed

Document and Number	Title	Revision/Date
1. LRA, Appendix B, Section B.1.22	Nickel Alloy Inspection	Revision 0, 3/23/2016
2. LRA, Appendix A, Section B.1.22	Nickel Alloy Inspection (FSAR Supplement)	Revision 0, 3/23/2016
3. WF3-EP-14-00003	WF3 License Renewal Project – Operating Experience Review Results – Aging Management Program Effectiveness (pages 70-75)	Revision 0
4. NOECP-107	Boric Acid Corrosion Control Program	Revision 003, 7/13/2009
5. SEP-A600-001	Entergy Nuclear South, Alloy 600 Management Program	Revision 0, 7/25/2006
6. SEP-ISI-104	Program Section for ASME Section XI, Division 1, Inservice Inspection Program	Revision 002, 3/12/2014
7. Program Plan	Waterford 3 Steam Electric Station, Inconel Alloy 600 Program Plan	Revision 1, 6/6/2001
8. WF3-ME-14-00003	WF3 License Renewal Project – Aging Management Review of the Reactor Coolant System and Pressurizer	Revision 1, 9/13/2015
9. WF3-EP-14-00006	Waterford 3 License Renewal Project – Aging Management Program Evaluation Results – Class 1 Mechanical, Section 4.1, Nickel Alloy Inspection Program	Revision 0
10. Program Owner Book	Waterford 3 Nuclear Plant, B.1.22 Nickel Alloy Inspection Program Book	Revision 0
11. CR-WF3-2008-02001	Condition Report – Alloy 600 Project – Loop 1 Shutdown Cooling Nozzle Leakage	5/5/2008
12. CR-WF3-2009-05822	Condition Report – NRC Concern with Boric Acid Leakage in the No. 2B Reactor Coolant Pump	10/27/2009
13. CR-WF3-2005-01449	Condition Report – Pressurizer Heater Sleeve Leakage	4/19/2005
14. CR-WF3-2004-00839	Condition Report – Issuance of NRC Non-Cited Violation for Failure To Implement Effective Corrective Actions in Recurring Reactor Coolant Pressure Boundary Leakage in Nickel Alloy 600 Reactor Coolant System Nozzles	3/18/2004
15. CR-WF3-2012-00927	Condition Report – Update of Current Licensing Basis to Implement ASME Code Case N-729-1 for Nickel Alloy Penetration Nozzles in the Upper Reactor Vessel Head in Replacement of Previous Requirements for These Components in NRC Order EA-03-009	2/22/2012
16. CR-WF3-2012-07261	Condition Report – Implementation of ASME Code Case N-770-1 for Dissimilar Metal Welds in the RCS Cold Leg – Including Submittal of NRC Relief Request for Limiting Ultrasonic Testing Coverage for These Components	12/6/2016
17. ASME Code Case N-729-1	Alternative Examination Requirements for PWR Reactor Vessel Upper Heads with Nozzles Having Pressure-Retaining Partial-Penetration Welds, Section XI, Division 1	3/28/2006

Document and Number	Title	Revision/Date
18. ASME Code Case N-722-1	Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated with Alloy 600/82/182 Materials, Section XI, Division 1	1/26/2009
19. ASME Code Case N-770-1	Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material with or without Application of Listed Mitigation Activities, Section XI, Division 1	12/25/2009

The staff conducted its audit of LRA program elements 1 through 6 based on the contents of the existing program.

During the audit, the staff verified that the "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 "scope of program," "parameters monitored or inspected," and "detection of aging effects" program elements, sufficient information was not available to determine whether they were consistent with the corresponding program elements of the GALL Report AMP. In order to obtain the information necessary to verify whether these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff conducted its review during the audit as follows:

- During the audit of the "scope of program," "parameters monitored or inspected," and "detection of aging effects" program elements, the staff noted that the scope of the program is limited only to nickel alloy components in the reactor coolant pressure boundary (RCPB) made of Alloy 600 base metal material or Alloy 600 type weld filler materials (i.e., Alloy 82, 182 and 82/182 weld materials). The staff also observed that the scope of the AMP does not include any components in the RCPB made from Alloy 690 base metal material or Alloy 690 type weld materials (i.e., Alloy 52, 152, and 52/152 weld materials including Alloy 600 components or Alloy 82/182 weld components mitigated with Alloy 690 half-nozzle repairs or Alloy 52/152 weld overlays). The staff further noted that this limits the scope of the program only to non-repaired or non-mitigated nickel alloy components in the reactor coolant system (RCS) cold legs. The program does not include the nickel alloy penetration nozzles in the replaced upper reactor vessel closure head (RVCH), or the nickel alloy components (including weld components) RCS hot leg loops, pressurizer or steam generators that were repaired with either half nozzle or weld overlay repair designs (which use Alloy 690 base metal or Alloy 52, 152, or 52/152 weld materials).

  In addition, the staff observed that, if the applicant's AMP is evaluated by itself, the Nickel Alloy Inspection AMP would identify exceptions to "scope of program," "parameters monitored or inspected," and "detection of aging effects" elements of GALL Report AMP XI.M11B because the program would not implement the following augmented inspections: (a) augmented inspections of the nickel alloy penetration nozzles in the replaced upper reactor vessel head (made of Alloy 690 type materials), as subjected to the requirements in 10 CFR 50.55a(g)(6)(ii)(D) and ASME Code Case N-729-1, and (b) augmented inspections of nickel alloy components in the RCS cold leg loops, steam generators, and pressurizer that have been repaired or mitigated with either weld-overlay or half nozzle repairs, as subject to the requirements in 10 CFR 50.55a(g)(6)(ii)(F) and ASME Code Case N-770-1.

However, the staff also observed that the applicant implements the appropriate inspections of these components in accordance with the program element criteria for LRA AMP XI.M1, "Inservice Inspection Program," which includes programmatic activities to implement the augmented inspection requirements in the following ASME Code Cases, as required by 10 CFR 50.55a: (a) ASME Code Case N-729-1 for inspections of the nickel alloy penetration nozzles in the upper RVCH, (b) ASME Code Case N-722-1 for performing bare metal visual examinations for boric acid leakage around RCPB base metal components made from Alloy 600 or weld components made from Alloy 82 or 182 weld filler metal materials, and (c) ASME Code Case N-770-1 for performing ultrasonic tests on piping components in the RCPB made from Alloy 600 base metal material or Alloy 82 or 182 weld material, including those that have been repaired or mitigated with Alloy 52 or 152 weld overlays, onlays, or inlays.

During the audit, the applicant informed the staff that the implementation of LRA AMP B.1.2, Boric Acid Corrosion Program, performs boric acid leakage inspections of nickel alloy components in the RCPB, including those component locations that had been repaired, replaced, or mitigated with Alloy 690 base metal material or Alloy 52, 152, or 52/152 weld filler materials.

During the audit, the staff determined that, when the program elements of the Nickel Alloy Inspection Program (LRA AMP B.1.22) are taken into account with the program elements of the Inservice Inspection Program (LRA AMP B.1.15) and Boric Acid Corrosion Program (LRA AMP B.1.2), the "scope of program," "parameters monitored or inspected," "detection of aging effects," and "monitoring and trending" program elements of the Nickel Alloy Inspection Program are consistent with those in GALL Report AMP XI.M11B. Therefore, this issue is resolved.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience. The staff reviewed a number of condition reports associated with this AMP indicating that the applicant has experienced a number of reactor coolant leaks in nickel alloy RCPB components (e.g., penetration nozzles welded to the upper RVCH, nickel alloy instrumentation nozzles in the RCS hot leg loops and pressurizer, and pressurizer heater sleeves). In order to obtain the information necessary to determine whether the applicant's operating experience supports the sufficiency of the LRA AMP, the staff assessed the following operating experience topics discussed below.

- The staff observed that, in general, the applicant has been appropriately implementing its inspections of nickel alloy component locations in the RCPB in accordance with the augmented inspection requirements and applicable ASME Code Case criteria in accordance with 10 CFR 50.55a. The staff also observed that the applicant has been using its condition report and corrective action program process to repair, replace, or mitigate the RCPB components that experienced leakage. The staff verified that any delays in implementing corrective actions to repair leaking components have been appropriately addressed by the NRC's regional inspection staff that are responsible for reactor oversight of Waterford Unit 3 and corrected by the applicant. The staff also verified that the applicant's corrective actions process includes appropriate measures to address and resolve issues identified by the applicant and the NRC Regional Office with respect to this AMP.

The staff also audited the description of the LRA AMP provided in the FSAR 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, when implementation of LRA AMP B.1.22, "Nickel Alloy Inspection Program," is taken into account with implementation of the program elements of LRA AMP B.1.15, "Inservice Inspection Program," and AMP B.1.2, "Boric Acid Corrosion Program," the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements of LRA AMP B.1.22, "Nickel Alloy Inspection," are consistent with the corresponding program elements in GALL Report AMP XI.M11B. Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.23, Non-EQ Electrical Cable Connections

Summary of Information in the Application. The LRA states that AMP B.1.23, "Non-EQ Electrical Connections," is a new program that will be consistent with the program elements in GALL Report AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirement." To verify this claim of consistency, the staff audited the LRA AMP. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this new program, and the staff's audit addressed only the program elements described in the applicant's basis document.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns of the 4 kV and 6.9 kV switchgear, 230 kV transmission switchyard, transformer yard, 230 kV switching station, fire pump house, water treatment building, auxiliary building, and electrical penetration area. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "connections," "thermography," "loose connection," and "electrical bus."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00009	Aging Management Program Evaluation Results – Electrical	Revision 1, 02/01/2016
2. CR-WF3-2014-01170	Condition Report (while performing quarterly thermography, hot spots were located on the insulator of generator output breaker cable connections)	Revision 0, 04/14/2014
3. EN-DC-310	Predictive Maintenance Program (Thermography)	Revision 7, 06/11/2015
4. ME-004-809	Low/Medium Voltage Power and Control Cable/Conductor Terminations and Splices	Revision 306, 11/06/2015
5. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0, 11/30/2015

Document	Title	Revision/Date
6. WF3-EE14-00001	Electrical Screening and Aging Management Review	Revision 1, 02/01/2016
7. EN-FAP-LR-026	License Renewal Non-EQ Electrical Cable Connection AMP	Revision 4, 10/30/2014
8. WF3-EP-14-00002	Operating Experience Review Results – AERM	Revision 0, 09/13/2015

During the audit of program elements 1 through 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. The staff noted that the applicant has opted to exclude visual inspection as an alternative method of monitoring electrical connections per the "detection of aging effects" element as described in the GALL Report.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience. The review of a sample of work orders did not find any significant or unusual operating experience and no previously unknown or recurring aging effects were identified by the applicant or staff.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "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.E6.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.24, Non-EQ Inaccessible Power Cables (> 400 V)

Summary of Information in the Application. The LRA states that AMP B.1.24, "Non-EQ Inaccessible Power Cables (≥ 400 V) program," is a new program with exception that will be 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. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this new program, and the staff's audit addressed only the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements described in the applicant's basis document. Issues identified but not resolved in this report will be addressed in the SER. During the audit, the staff reviewed the exception associated with this AMP. The exception to the GALL Report AMP is evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns of the fire pump house, water treatment building, turbine building, and locations for manholes M308-NA, M328-NAB, and M329-NAB; and hand holes H331-NA and H330-NAB. The staff also conducted an independent search of the applicant's operating experience database using keywords: "cable," "jacket," "arcing," "thermal," "connection," "contamination," "discoloration," "swelling," "insulation," "vault," "manhole," "submerged," and "moisture."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. 3/CA/31322A	Summary – CA Cable 31322A As-Built	N/A
2. 3/CA/31323D	Summary – CA Cable 31323D As-Built	N/A
3. 3/CA/31322H	Summary – CA Cable 31322H As-Built	N/A
4. WF3-EP-14-00009	Aging Management Program Evaluation Results – Electrical	Revision 1, 2/1/2016
5. WF3-EP-14-00003	Operating Experience Results – Aging Management Program Effectiveness	Revision 0, 11/30/2015
6. WF3-EE-14-00001	Electrical Screening and Aging Management Review	Revision 1, 2/16/2016
7. C349	Yard Duct Runs and Outdoor Lighting	Revision 20, 3/19/2015
8. WF3-EP-14-00002	Operating Review Results AERM	Revision 0, 9/13/2015
9. W3F1-2007-0065	Response to NRC RAI on GL 2007-01, "Inaccessible or Underground Power Cable Failures That Disable Accident Mitigation Systems or Cause Plant Transients"	12/18/2007
10. W3F1-2007-0017	Response to GL 2007-01	5/3/2007
11. EN-DC-346	Cable Reliability Program	Revision 7

The staff conducted its audit of LRA program elements 1 through 6 based on the contents of the new program as modified by the proposed exception.

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. The staff also verified that aspects of the "preventive actions" program element not associated with the exception identified in the LRA are consistent with the corresponding program elements in 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 order to verify that with the exception, the LRA AMP will remain adequate to manage the applicable aging effects, staff will consider issuing an RAI for the subject discussed below.

- The applicant stated that periodic manhole inspections will be performed to assess that cable and cable support structures are intact, but the inspection frequency will not be increased if water is found in the manholes during the inspections. The applicant further stated that because of the elevation of the plant site and manholes, water cannot be prevented from entering the manholes. The applicant concluded that manhole inspections will assess cable and support damage because of exposure to significant moisture, and periodic testing will provide reasonable assurance that each cable will continue to perform its intended function through the period of extended operation. The in-scope inaccessible cables identified by the applicant are the 480V electric motor-driven fire pump and the electric motor-driven jockey fire pump.

  The GALL Report AMP XI.E3 program element "preventive actions" recommends that periodic actions are taken to prevent inaccessible cables from being exposed to significant moisture, such as identifying and inspecting in-scope accessible cable conduit ends and cable manholes for water collection, and draining the water, as needed. In addition, GALL Report AMP XI.E3 also recommends that the inspection frequency for water collection is established and performed based on plant-specific operating experience with cable wetting or submergence in manholes (i.e., the inspection is performed periodically based on water accumulation over time and event-driven occurrences, such as heavy rain or flooding). GALL Report AMP XI.E3 further recommends that If water is found during inspection (i.e., cable exposed to significant moisture), corrective actions are taken to keep the cable dry and to assess cable degradation.

  It is not clear to the staff that the inaccessible power cables supplying the electric motor-driven fire pump and electric motor-driven jockey fire pump, when subjected to significant moisture for extended periods, will continue to perform their intended function during the period of extended operation.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience (e.g., no previously unknown or recurring aging effects were identified by the applicant or staff).

The staff also audited the description of the LRA AMP provided in the FSAR supplement. The staff verified this description, not associated with the exception, is consistent with the description provided in the SRP-LR.

Audit Results. Based on this 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 program elements in GALL Report AMP XI.E3. The staff also verified that for the "preventive actions" program element, the aspects of the LRA AMP program element not associated with the exception are consistent with the corresponding program element in GALL Report AMP XI.E3. The staff's evaluation of aspects of the program element associated with the exception will be addressed in the SER.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement, not associated with the exception, is consistent with the description provided in the SRP-LR.

LRA AMP B.1.25, Non-EQ Sensitive Instrumentation Circuits Test Review

Summary of Information in the Application. The LRA states that AMP B.1.25, "Non-EQ Sensitive Instrumentation Circuits Test Review," is a new program that will be 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. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this new program, and the staff's audit addressed only the AMP program elements described in the applicant's basis document, referenced supporting documentation, and relevant plant-specific operating experience.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns that included viewing an area radiation monitor in the control room annulus. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "excore," "high range rad," "containment rad," "containment area monitor," "ENIINFD000," "neutron flux," "neutron flux detector," "PRMIRE7050," "ARMIRD," "radiation monitor," and "shield wall."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EE-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0, 11/30/2015
2. WF3-EE-14-00001	Electrical Screening and Aging Management Review	Revision 1, 02/01/2016
3. WF3-EP-14-00002	Operating Experience Review Results – Aging Effects Requiring Management (AERM)	Revision 0, 09/13/2015
3. WF3-EE-14-00009	Aging Management Program Evaluation Results – Electrical	Revision 1, 02/01/2016
4. MI-003-101	NI Linear Power Channel Calibration Safety Channel A, B, C, or D	Revision 014, 08/28/2014
5. EN-FAP-LR-027	License Renewal Sensitive Instrumentation Circuits Review AMP	Revision 1, 11/21/2013
6. MI-005-919	Containment Post LOCA Area Radiation Monitor Safety Channel A or B Calibration ARMIR5028, 5029, 5030, 5031	Revision 303, 08/07/2014
7. MI-003-102	NI Log Power Channel Calibration Safety Channel A, B, C, and D	Revision 311, 11/15/2014

Document	Title	Revision/Date
8. MI-003-352	Purge Isolation Area Radiation Monitor Safety Channel Calibration ARMIR5024, ARMIR5025, ARMIR5026, or ARMIR5027	Revision 302, 06/26/2014
9. MI-003-365	Fuel Handling Building Ventilation Monitor Safety Channel A or B Calibration ARMIR0300.1, ARMIR0300.2, ARMIR0300.3, or ARMIR0300.4	Revision 6, 09/26/2006
10. MI-003-371	Fuel Handling Building Ventilation System Emergency Exhaust High Range Noble Gas Radiation Monitor Channel Calibration PRMIR3032	Revision 308, 04/15/2014
11. MI-003-374	Control Room Outside Air Intake Isolation Radiation Monitor Channel Calibration ARMIR0200 1, 2, 5, and 6	09/17/2013
12. MI-003-391	Component Cooling Water System A or Liquid Radiation Monitor Channel Calibration PRMIR7050 A or B	Revision 307, 03/25/2014

During the audit of program elements 1 through 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's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience (e.g., no previously unknown or recurring aging effects were identified by the applicant or staff).

The staff also audited the description of the LRA AMP provided in the FSAR 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," "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.E2, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits."

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.26, Non-EQ Insulated Cables and Connections

Summary of Information in the Application. The LRA states that AMP B.1.26, "Non-EQ Insulated Cables and Connections Program," is a new program that will be consistent with the program elements in GALL Report AMP XI.E3, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Requirements." To verify this claim of consistency, the staff audited the LRA AMP. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this new program, and the staff's audit addressed only the program elements described in the applicant's basis document. 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 provided by the applicant, including corrective actions, work orders, procedures, and surveillance documentation. In addition, the staff conducted walkdowns of the water treatment building, turbine building, fire pump house, transformer yard, switchgear, and electrical penetrations. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "cable," "jacket," "arching," "thermal," "connection," "contamination," "discoloration," "swelling," "insulation," and "moisture."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00009	Aging Management Program Evaluation Results – Electrical	Revision 1, 02/01/2016
2. EN-DC-348	Non-EQ Insulated Cables and Connection Inspection	Revision 5
3. WF3-EP-14-00003	Operating Experience Results – Aging Management Program Effectiveness	Revision 0, 11/30/2016
4. Work Order 00135468	Replace RCP 2B Motor Cables	11/9/2009
5. EN-WM-105	Work Order 135468-01 Equipment RC EMTR1B-8A – Maintenance Support	02/03/2007
6. WF3-EE-14-00001	Electrical Screening and Aging Management Review	Revision 1, 02/16/2016

During the audit of program elements 1 through 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, sufficient information was not available to determine whether it was consistent with the corresponding program elements of the GALL Report AMP. In order to obtain the information necessary to verify whether 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.

- WF3-EP-14-00009, "Aging Program Evaluation Results," Electrical, Section 3.5.B.3.b, "Comparison to WF3 Parameters Monitored or Inspected" states that a representative sample of accessible insulated cables and connections within the scope of license renewal will be visually inspected for cable and connection jacket and connection insulation surface anomalies indicating signs of reduced insulation resistance. This sample of accessible cables will represent, with reasonable assurance, all cables and connections in an adverse localized environment.

  The use of a representative sample of accessible insulated cable and connections as described in WF3-EP-14-00009 does not agree with the applicant's LRA AMP or GALL Report AMP XI.E3, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Requirements." Instead, the applicant's LRA AMP recommends visual inspection of all accessible insulated cables and connections and

GALL Report AMP XI.E3, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Requirements," recommends visual inspection of accessible insulated cables and connections as an acceptable component sampling approach.

It is not clear to the staff that the applicant's "Non-EQ Insulated Cables and Connections Program" will be consistent with the GALL Report because the applicant's aging management program evaluation for the "parameters monitored or inspected" program element describes the applicant's program as inspecting a sample of accessible insulated cables and connections rather than inspecting all accessible cables and connections, as recommended in the GALL Report.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience. No previously unknown or recurring aging effects were identified by the applicant or staff.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "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 X1.E1, "Non-EQ Insulated Cables and Connections Program." The staff also identified certain aspects of the "parameters monitored or inspected" program element of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.27, Oil Analysis

Summary of Information in the Application. The LRA states that AMP B.1.27, "Oil Analysis Program," is an existing program 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.

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

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00007	Aging Management Program Evaluation Results – Non-Class 1 Mechanical	Revision 0
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0
3. EN-CY-103	Diesel Fuel, Lubricating Oil, and Grease Analytical Services	Revision 0
4. EN-DC-310	Predictive Maintenance Program	Revision 6
5. EN-LI-102	Corrective Action Program	Revision 24
6. EN-LI-121	Trending and Performance Review Process	Revision 17
7. UNT-005-007	Safety Related Procedures	Revision 304
8. CR-WF3-2013-05537	Oil Analysis of ACCEMTR3b 6, Auxiliary Component Cooling Water Pump A Motor	11/13/2013
9. CR-WF3-2006-02278	Oil Analysis Results	08/08/2006
10. CR-WF3-2012-02394	Oil Analysis Results	05/11/2012
11. Lube Comparison	Trending Results for Cooling Water Pump Oil	07/13/2016

During the audit of program elements 1 through 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's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "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.M39.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.28, One-Time Inspection

Summary of Information in the Application. The LRA states that AMP B.1.28, "One-Time Inspection," is a new program that will be 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. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this new program, and the staff's audit addressed only the program elements as described in the applicant's basis document. 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 provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "biological," "buried," "crack," and "fouling."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00007	Aging Management Program Evaluation Results, Non-Class 1 Mechanical, One-Time Inspection	Revision 0
2. WF3-ME-14-00010	WF3 License Renewal Project: Aging Management Review of the Fire Protection: Water System	Revision 1
3. Pure Technologies US, Inc. Report	Engineering Report: Condition Assessment of PCCP, Waterford Unit 3 – 132-inch Cooling Water Discharge Line, D-2	3/12/2013

During the audit of program elements 1 through 6, the staff verified that the "scope of program," "preventive actions," "parameters monitored or inspected," "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 "acceptance criteria" program element, sufficient information was not available to determine whether it was consistent with the corresponding program elements of the GALL Report AMP. In order to obtain the information necessary to verify whether 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 "acceptance criteria" program element of the LRA AMP states that the program will verify that unacceptable loss of material or cracking is not occurring or is, "so insignificant that a plant-specific aging management program is not warranted." The GALL Report AMP recommends any indication or relevant conditions of degradation detected are evaluated. It is not clear to the staff that these statements are consistent because the GALL Report recommends evaluating any indication while the AMP evaluates significant indications. It is unclear to the staff how the applicant will determine if an indication is significant.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience. 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 discussed below.

- LRA Section B.1.28, "One-Time Inspection," notes that the program will be used to verify that change in material properties, loss of material and cracking are not occurring for reinforced concrete portions of the circulating water intake piping exposed to raw water. The GALL Report includes AMR items for concrete piping exposed to raw water and recommends XI.M20, "Open-Cycle Cooling Water System," for managing the effects of aging of this material/environment combination. During the audit, the staff reviewed a report prepared by Pure Technologies US, Inc. summarizing a previous inspection

conducted on similar concrete piping in a 132-inch cooling water discharge line. The summary report noted that a majority of the pipe joints exhibited separation and/or spalling and recommended all pipeline joints be cleaned and mortared to prevent corrosion of the joint steel and potential leaks. The report also recommended a re-inspection of the pipeline in approximately 5 years. Based on the operating experience and the GALL Report recommendations, it is unclear to the staff why it is appropriate to manage the effects of aging on concrete portions of the circulating water intake piping exposed to raw water through the one-time inspection program.

The staff found that sufficient information was not available to determine whether the description provided in the FSAR supplement was an adequate description of the LRA AMP. In order to obtain the information necessary to verify the sufficiency of the FSAR supplement program description, the staff will consider issuing an RAI related to acceptance criteria as discussed above. If the response to the RAI leads to an update in the acceptance criteria, the FSAR supplement may need to be updated accordingly.

Audit Results. Based on this audit, the staff verified that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," and "monitoring and trending" program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.M32. The staff identified certain aspects of the "acceptance criteria" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined. In addition, the staff identified a corresponding need for additional information regarding the adequacy of the program description in the FSAR supplement.

Based on this audit, the staff also found that additional information is required before a determination can be made regarding whether the applicant's operating experience supports the sufficiency of the LRA AMP.

LRA AMP B.1.29, One-Time Inspection – Small-Bore Piping

Summary of Information in the Application. The LRA states that AMP B.1.29, "One-Time Inspection – Small-Bore Piping," is a new program that will be 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 provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "weld," "cracking," "crack," "failure," "socket," sockolet," "weldolet," "butt weld," "thermal," "fatigue," and "leakage."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00006	Program Basis Document, Aging Management Program Evaluation Results – Class 1 Mechanical "One-Time Inspection – Small-Bore Piping"	Revision 1, 05/01/2013

Document	Title	Revision/Date
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0, 11/30/2015
3. N/A	Providing Class 1 Small Bore Piping Weld Population	07/28/2016
4. LER-382-2000-003	Shutdown Per TS LCO 3.0.3 due to Cracked Weld	04/05/2000
5. LER-382-2012-003	Cracked Instrumentation Line Affects Fire Protection Safe Shutdown Analysis	11/16/2000
6. LER-382-2003-003	RCS Pressure Boundary Leak due to PWSCC	12/18/2003

During the audit of program elements 1 through 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, sufficient information was not available to determine whether it was consistent with the corresponding program element of the GALL Report AMP. In order to obtain the information necessary to verify whether 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.

> GALL Report AMP XI.M35 states under the "detection of aging effects" program element that "[t]his inspection should be performed at a sufficient number of locations to ensure an adequate sample. This number, or sample size, is based on susceptibility, inspectability, dose considerations, operating experience, and limiting locations of the total population of ASME Code Class 1 small-bore piping locations." LRA Sections B.1.29 and A.1.29 do not provide the total number of in-scope small-bore piping welds. It is not clear to the staff how the inspection sample will be selected and thus whether a sufficient number of locations will be inspected to ensure that cracking will be adequately managed.
>
> LRA Section B.1.29 states that volumetric examinations of butt welds (full penetration welds) using "demonstrated techniques" will be performed. There was insufficient information available during the audit for the staff to determine what constitutes a "demonstrated technique" for volumetric examinations of butt welds. The staff noted that, for butt weld inspections, there are well-established, qualified UT techniques and procedures with flaw-sizing capabilities available. The staff also noted that the applicant has previously performed UT examinations of butt welds using qualified techniques as part of its inservice inspection program. The staff will request clarification related to the examination of butt welds.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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.M35. The staff also identified certain aspects of the "detection of aging effects" program element of the LRA AMP for which additional information and evaluation are required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.30, Periodic Surveillance and Preventive Maintenance

Summary of Information in the Application. The LRA states that AMP B.1.30, "Periodic Surveillance and Preventive Maintenance," is a plant-specific program with enhancements that will be used to manage the aging of components that do not fall within the scope of other aging management programs. The staff reviewed the Periodic Surveillance and Preventive Maintenance program against the elements of an AMP for license renewal as described in SRP-LR, Revision 2, Section A.1.2.3. Issues identified but not resolved in this report will be addressed in the SER. During the audit, the staff reviewed the enhancements associated with this AMP. The enhancements will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "biofoul," "crack," "wall loss," "through wall," "piping," "foul," "loss of material," "leak," and "wear."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00007	Aging Management Program Evaluation Results Non-Class 1 Mechanical Systems	Revision 0
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0
3. WF3-ME-14-00007	Aging Management Review of the Plant Drains	Revision 0
4. WF3-ME-14-00019	Aging Management Review of the Control Room HVAC System	Revision 1
5. WF3-ME-14-00009	Aging Management Review of the Component Cooling Water and Auxiliary Component Cooling Water Systems	Revision 1
6. WF3-ME-14-00008	Aging Management Review of the Emergency Generator System	Revision 1
7. ESSE-WM-309	Dry Cooling Tower "A" Portable Sump Pump	Revision 0, 01/11/2000
8. OP-003-024	Sump Pump Operation	Revision 309

The staff conducted its audit of LRA program elements 1 through 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," "monitoring and trending," and "acceptance criteria" program elements of the LRA AMP are consistent with the corresponding elements described in SRP-LR, Revision 2, Section A.1.2.3. In addition, the staff found that for the "scope of program," "parameters monitored or inspected," and "detection of aging effects" program elements, sufficient information was not available to determine whether they were consistent with the corresponding program elements described in SRP-LR, Revision 2, Section A.1.2.3. In order to obtain the information necessary to verify whether these program elements are consistent with the corresponding program elements described in SRP-LR, Revision 2, Section A.1.2.3, the staff will consider issuing RAIs for the subjects discussed below.

- The following impacts the "scope of program" program element. The program description table states that accumulators, filter housings, piping, pump casings, and valve bodies in the blowdown system will be managed for loss of material. However, LRA Table 3.4.2-5-1, "Blowdown System, Nonsafety-Related Components Affecting Safety-Related Systems," also lists tanks. It is unclear to the staff if tanks in the blowdown system are included within the scope of the program.

- The following impacts the "parameters monitored or inspected" and "detection of aging effects" program elements. It is unclear to the staff if physical manipulation will be used to augment visual inspection of the elastomeric portable smoke-ejector duct in the control room HVAC system. The "parameters monitored or inspected" program element states that polymeric components are inspected for hardening as evidenced by loss of suppleness (i.e., physical manipulation). However, the program description table states that the inspection will consist of a visual inspection and the "detection of aging effects" program element states that established techniques such as visual inspections are used, indicating that physical manipulation will not be used to augment visual inspections. The proposed RAI would request clarification on this issue.

- The following impacts the "detection of aging effects" program element. LRA Table 3.3.2-7, "Emergency Diesel Generator System," states that stainless steel expansion joints exposed to exhaust gas will be managed for cracking using the Periodic Surveillance and Preventive Maintenance program. The program description table in LRA Section B.1.30 states that the program inspection activity for the emergency generator system will be to "monitor the surface condition of the expansion joint to verify the absence of cracking." It is unclear to the staff what inspection activities are included in "monitoring" the surface condition of the stainless steel expansion joints in order to verify the absence of cracking.

- The following impacts the "detection of aging effects" program element. LRA Table 3.3.2-7, "Emergency Diesel Generator System," states that stainless steel heat exchanger tubes externally exposed to lubricating oil, fuel oil, and treated water will be managed for loss of material due to wear using the Periodic Surveillance and Preventive Maintenance program. The program description table in LRA Section B.1.30 states that a visual inspection of the surface condition of a representative sample of stainless steel heat exchanger tubes will be performed to manage loss of material due to wear. Because access to the external surfaces of heat exchanger tubes is typically very limited because of tube spacing, tube supports, etc., it is unclear to the staff whether a visual inspection of the tubes' external surfaces can be reasonably expected to detect loss of material due to wear.

- The following impacts the "detection of aging effects" program element. LRA Table 3.3.2-3, "Component Cooling and Auxiliary Component Cooling Water System," states that aluminum heat exchanger fins and carbon steel heat exchanger tubes exposed to condensation will be managed for reduction of heat transfer using the Periodic Surveillance and Preventive Maintenance program and loss of material using the External Surfaces Monitoring program. However, the program description table states loss of material and reduction of heat transfer will be managed using the Periodic Surveillance and Preventive Maintenance program. It is unclear to the staff if loss of material will be managed using the External Surfaces Monitoring or Periodic Surveillance and Preventive Maintenance program. If loss of material for the fins and tubes will be managed by the Periodic Inspection and Preventive Maintenance program, then it is unclear to the staff how a visual inspection can detect loss of material of carbon steel heat exchanger tubes.

During the audit, the staff made the following observation:

- LRA Table 3.3.2-14, "Plant Drains," states that the external surfaces of gray cast iron pump casings are exposed to air-outdoor and that the internal surfaces of gray cast iron pump casings are exposed to waste water. However, Engineering Report WF3-ME-14-00007, "Aging Management Review of Plant Drains," states that "Dry Cooling Tower Portable Sump Pump casings and foot valves made of gray cast iron are immersed in waste water. Aging effects for the external surfaces of these components are the same as those for the internal surfaces of the same material, exposed to the same environment." During a breakout session, the staff noted that it was unclear whether the external surfaces of the gray cast iron pump casings are exposed to air-outdoor or waste water. In response, the applicant provided drawing ESSE-WM-309, showing that the portable sump pump is located on the floor above the drain sump which is below the floor elevation. In addition, procedure OP-003-024, Section 11.9, provided images showing that the portable sump pumps were above the drain sump exposed to air.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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 "preventive actions," "monitoring and trending," and "acceptance criteria" program elements of the LRA AMP are consistent with the corresponding program elements described in SRP-LR, Revision 2, Section A.1.2.3. The staff also identified certain aspects of the "scope of program," "parameters monitored or inspected," and "detection of aging effects" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience at the plant provides objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended functions will be maintained during the period of extended operation as described in SRP-LR, Revision 2, Section A.1.2.3.10. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.31, Protective Coating Monitoring and Maintenance

Summary of Information in the Application. The LRA states that AMP XI.S8, "Protective Coating Monitoring and Maintenance Program," is an existing program with an enhancement that will be 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. During the audit, the staff reviewed an enhancement associated with this AMP. The enhancement is evaluated in the SER.

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

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. Commitment A8350	Evaluation of Containment Coatings	02/27/1985
2. Commitment P26867	Response to GL 2004-02, "Potential Impact of Debris Blockage of Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors" (Waterford 3)	09/16/2005
3. CR-WF3-2005-02046	Coating Inspections of Service Level I Coatings in 2005	05/05/2005
4. CR-WF3-2011-02987	Coating Inspections of Service Level I Coatings During RFO 17	04/25/2011
5. CR-WF3-2015-08489	Coating Inspections of Service Level I Coatings During RFO 20	11/18/2015
6. EN-DC-220	Safety-Related Coatings Program	Revision 2
7. NOECP-451	Conducting Engineering Inspection of Reactor Containment Building Protective Coatings	Revision 1
8. W3P86-2369	Implementation of Containment Coating Visual Inspections During Refueling Outages	09/09/1986
9. W3P86-2720	Containment Coating Visual Inspections During Refueling Outages	10/13/1986

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

During the audit, the staff verified that the "scope of program," "preventive action," "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, sufficient information was not available to determine whether they were consistent with the corresponding program elements of the GALL Report AMP. In order to obtain the information necessary to verify whether 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 the Protective Coating Monitoring and Maintenance Program manages the effects of aging on Service Level I coatings applied to external surfaces of carbon steel and concrete inside containment. The GALL Report AMP requires that the minimum scope of the program is Service Level I coatings applied to steel and concrete surfaces inside containment to minimize degradation of coatings that can lead to clogging of Emergency Core Cooling Systems (ECCS) suction strainers. This ensures operability of post-accident safety systems that rely on water recycled through the containment sump/drain system. It is not clear to the staff that these statements are consistent because the applicant's inspection program documents do not specify the surfaces to be inspected. In addition, in response to GL 2004-02 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML080650616), the applicant described indeterminate coatings, which are considered failed coatings that transport completely to the sump. Therefore, it is not clear to the staff how these indeterminate coatings are addressed in the applicant's inspection program to effectively manage such coatings inside containment.

- The "acceptance criteria" program element of the LRA AMP states that the Protective Coating Monitoring and Maintenance Program meets the technical basis of ASTM D 5163-08 and provides an effective method to assess coating condition through visual inspections. The GALL Report AMP recommends additional ASTM and other recognized test methods, in addition to visual inspections, for use in characterizing the severity of observed defects and deficiencies. It is not clear to the staff that these statements are consistent since it appears that the applicant has not performed additional tests (e.g., adhesion tests) to properly bound degradation of Service Level I coatings that are present in the Containment Building.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is not bounded by known industry operating experience. 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 discussed below.

- During the audit, the applicant provided information to the staff regarding coating degradation found in containment. The failed coating system was Carboline Carbo Zinc 11 (CZ11) primer top coated with Carboline Phenoline 305. The applicant concluded that the failure mechanism was splitting of CZ11 primer where the primer split, leaving CZ11 on the substrate. The staff noted that the reason for the splitting of the CZ11 primer is unknown. It is not clear to the staff that the operating experience for the applicant's Service Level I coatings is consistent with industry operating experience since a root cause evaluation was not performed to determine the reason for the splitting of the CZ11 primer.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "detection of aging effects," and "monitoring and

trending" program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.S8. The staff also identified certain aspects of the "acceptance criteria" program element of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also found that additional information is required before a determination can be made regarding whether the applicant's operating experience supports the sufficiency of the LRA AMP. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.32, Reactor Head Closure Studs

Summary of Information in the Application. The LRA states that AMP B.1.32, "Reactor Head Closure Studs" is an existing program with enhancements 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. During the audit, the staff reviewed the enhancements associated with this AMP. The enhancements will be evaluated in the SER.

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

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00006	Program Basis Document, Aging Management Program Evaluation Results – Class 1 Mechanical	Revision 1, 05/01/2013
2. WF3-EP-14-00006	Program Basis Document, Aging Management Program Evaluation Results – Class 1 Mechanical, "Reactor Head Closure Studs."	Revision 1, 05/01/2013
3. CR-WF3-2003-03780	Reactor Vessel Head Stud Leakoff Line Pressure High as Indicated by Annunciator	11/28/2003
4. CR-WF3-2003-03620	Vessel Head East Guide Stud was Bound	09/08/2003
5. CR-WF3-2009-06667	Wastage Noticed at Outside Seating Surface Between Stud No. 8 and No. 9	05/11/2009
6. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0, 11/30/2015
7. CR-WF3-2012-05113	Reactor Vessel Flange Leakoff Line	10/13/2012
8. CR-WF3-2008-01931	Boron Trail Detected Due to Flange Leak Near Stud Hole No. 26	05/05/2008
9. CR-WF3-2007-03385	Reactor Vessel Head Flange O-Ring Leak	10/31/2007
10. CR-WF3-2007-03129	Reactor Vessel Head Flange O-Ring Leak	09/04/2007
11. Certificate of Test M-1028-1-74170	The Timeken Company, Canyon, OH 44706 Certificate of Test for Closure Studs for Heat Number 80751	03/05/1973

Document	Title	Revision/Date
12. Contract 74170	List of Piece, Code, and Heat Numbers	03/05/1973
13. UNT-006-032	Coating and Corrosion Program	Revision 0, 03/31/2016

During the audit of program elements 1 through 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's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "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.M3. The staff's evaluation of aspects of the program element associated with enhancements will be addressed in the SER.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in SRP-LR.

LRA AMP B.1.33, Reactor Vessel Internals

Summary of Information in the Application. The LRA states that the Reactor Vessel Internals Program is an existing program with an enhancement that will be consistent with the program elements in GALL Report AMP XI.M16A, "PWR Vessel Internals." 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. During the audit, the staff reviewed the enhancement associated with this AMP. The enhancement will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using keywords: "cracking," "fracture," "loss of material," "stress corrosion cracking," "PWSCC," "cast," "preload," and "SCC."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00006	Aging Management Program Evaluation Results – Class 1 Mechanical	Revision 0

Document	Title	Revision/Date
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0
3. WF3-ME-14-00002	Aging Management Review of the Reactor Vessel Internals	Revision 1
4. CEP-RR-001	ASME Section XI Repair/Replacement Program	Revision 310
5. LTR-CI-03-63	3716 MWt Power Uprate Waterford Unit 3 Reactor Vessel Internals Materials (Proprietary)	Revision 1, 11/16/2004
6. LTR-RIAM-15-22	Summary of Waterford Unit 3 Expert Elicitation Panel Meeting Minutes for Reactor Internals Components and Materials (Proprietary)	Revision 0, 04/08/2015
7. CR-WF3-2008-02131	Condition Report for Reactor Vessel Core Barrel Removal and FME Inspection	05/09/2008
8. CR-WF3-2014-02414	Condition Report for the Identification of Crack (Gap) on the Corner of the Core Shroud (Barrel)	05/07/2014
9. DCP-3398	Incore Instrument Thimble Replacement	05/11/1995
10. No document ID Number Available	Waterford 3 7th Refuel Outage Summary Report	11/09/1995
11. License Renewal Issue No. 98-0030 [1]	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Components	05/19/2000
12. Topical Report No. WCAP-17096-NP[1]	Reactor Internals Acceptance Criteria Methodology and Data Requirements	Revision 2, 05/19/2010
13. NRC Safety Evaluation	Proprietary Safety Evaluation of Topical Report WCAP-17096-NP, Revision 2, "Reactor Internals Acceptance Criteria Methodology and Data Requirements"[1]	05/03/2016
14. Topical Report No. PWROG-15032-NP	Statistical Assessment of PWR RV Internals CASS Materials (A Westinghouse Non-Proprietary Class 3 Report)	Revision 0, 11/30/2015
15. NRC Staff Assessment	Staff Assessment of PWROG-15032	09/06/2016

Notes: [1] Although WCAP-17096-NP was submitted as a nonproprietary report, the NRC safety evaluation for the report includes some proprietary RAI discussions. The referenced safety evaluation is designated as a proprietary safety evaluation that is not available for public review. The publically available, nonproprietary version of this safety evaluation (dated May 3, 2016) is available in NRC ADAMS (Accession No. ML16061A243).

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

During the audit, the staff verified that the "preventive actions" and "parameters monitored/inspected" 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," "monitoring and trending," and "acceptance criteria" program elements, sufficient information was not available to determine whether they were consistent with the corresponding program elements in GALL Report AMP XI.M16A, "PWR Vessel Internals." In order to obtain the information necessary to verify whether these program elements are consistent with the corresponding program elements of the GALL Report AMP, the staff will consider issuing RAIs as needed for the subjects discussed below.

- "Scope of Program" and Response to Applicant/Licensee Action Item (A/LAI) #2 on the Methodology for Implementing MRP-227-A. In its response to A/LAI #2 on the MRP-227-A report, the applicant identified that the following components were not

evaluated in TR No. MRP-191 but are within the scope of the LRA and are subject to an AMR: (a) flow restrictor plugs, (b) core stabilizing shims, (c) core stabilizing dowel pins, and (d) incore instrumentation (ICI) couplings. The applicant stated that these components were evaluated and classified as components not requiring additional aging management beyond that specified for the components in the MRP-227-A report. The applicant also stated that the core stabilizing bolts were evaluated and classified as components that will be inspected in accordance with the "Existing Program" requirements of the Waterford 3 ASME Section XI In-Service Inspection Program. During the audit, the staff reviewed documents that described the expert panel decision process for assessing these components in accordance with MRP-227-A, and the basis for dispositioning the components in accordance with one of four inspection categories for PWR reactor vessel internal (RVI) components in the MRP-227-A report. After reviewing the documents, the staff determined that the applicant's methodology and basis for categorizing these components as either "No Additional Measures" components or "Existing Program" components for the AMP was sufficiently conservative and acceptable. The staff's issue on this matter is resolved.

- "Detection of Aging Effects" Element. In the basis document for the AMP, the applicant stated that the Reactor Vessel Internals Program implements the inspection criteria in the following tables in MRP-227-A: (a) Table 4-3 for "primary" components, (b) Table 4-6 for "expansion" components, and (c) Table 4-9 for "existing program" components. The staff noted that GALL Report AMP XI.M16A indicates that the inspection guidance in Chapter 4 of MRP-227-A should be used to inspect the RVI components at a given PWR facility; MRP-227-A identifies that the following inspection tables in Chapter 4 of the MRP-227-A should be used or referenced for inspections of RVI components that are included in Combustion Engineering (CE)-designed nuclear plants: (a) Table 4-2 for "primary" components, (b) Table 4-5 for "expansion" components, and (c) Table 4-8 for "existing program" components. The staff also observed that the basis document for the Reactor Vessel Internals AMP referenced the inspection tables in MRP-227-A that apply to Westinghouse-designed RVI components, and not the inspection tables in the report for the RVI components at plants designed by CE (including Waterford 3). It is not clear to the staff that these statements are consistent with the "detection of aging effects" program element in GALL Report AMP XI.M16A because the AMP should be referencing the applicable inspection tables in MRP-227-A that apply to CE-designed RVI components, and not those for Westinghouse-designed RVI components.

- "Detection of Aging Effects" Element. In the basis document for the AMP, the applicant states that VT-3 visual methods are applied for the detection of cracking. The program element criteria in GALL Report AMP XI.M16A identify that VT-3 visual methods are acceptable for detecting cracking in redundant components, such as redundant bolts or pins. The GALL Report AMP also states that VT-3 visual methods can be applied to non-redundant components only when the flaw tolerance for a particular component is known and the component has been shown to be tolerant of easily detected large flaws. It is not clear to the staff that these statements are consistent with the "detection of aging effects" element in AMP XI.M16A because the applicant did not initially specify whether the VT-3 visual methods are being applied to redundant or non-redundant components in the RVI design. During the audit, the applicant provided documents demonstrating that the applicant will be using VT-3 methods only for visual inspections of redundant RVI components in the plant design. Consistent with MRP-227-A, EVT-1 visual methods will be used for detection of cracking in non-redundant RVI components

(e.g., non-redundant welds or non-redundant structural or support components). The staff's issue on this matter is resolved.

- "Detection of Aging Effects" and Response to A/LAI #2 on the Methodology for Implementing MRP-227-A. In A/LAI #2, the staff stated that PWR license renewal applicants are responsible for identifying all RVI components that are within the scope of the LRA for its facility and any differences from the assumptions and augmented inspection criteria defined in the MRP-227-A report. The staff also asked the applicant to identify any necessary modifications of the programmatic condition monitoring criteria that are defined for CE-designed RVI components in the MRP-227-A report.

  In the MRP-227-A and MRP-191 reports, the ERPI identifies that loss of material due to wear is an applicable aging effect for the thimble tubes in CE-designed PWRs. In the documentation reviewed during the audit, the staff noted that the applicant stated that "ABB Combustion Engineering has designed a new 'wear resistant' thimble that has replaced the zircaloy in the 'wear zone' with a chrome plated stainless steel section of greater wall thickness." Therefore, the staff verified that the applicant would not need to identify loss of material due to wear as an applicable aging effect requiring management (AERM) for the ICI thimble tubes. The staff's issue on this matter is resolved.

  In MRP-191, EPRI identifies that CE-designed thimble tubes are made from zircaloy materials, and not from stainless steel. The staff verified that the applicant appropriately addressed the difference in material in its LRA evaluation basis for resolving the request in A/LAI #2. Based on its assessment, the applicant identified that a different aging effect and mechanism (i.e., changes in component dimensions induced by irradiation growth) is applicable to the design of the stainless steel ICI thimble tubes at Waterford 3 and proposed a plant-specific basis to manage this aging effect. Specifically, the applicant identified that the Reactor Vessel Internals Program will be adjusted to include physical measurements of the ICI thimble tubes in order to monitor for potential changes in dimensions in the components. The staff noted that this type of plant-specific management basis is consistent with other MRP-defined or PWROG-defined physical measurement bases for managing changes in dimension in RVI components. However, the staff noted that the applicant will need to better define the type of physical measurements that will be performed on the ICI thimble tubes during the period of extended operation. The staff also noted that it is necessary for the applicant to address how the physical measurements will be completed and to define the acceptance criteria that will be applied to the assessment of the physical measurement results.

- <u>"Detection of Aging Effects" Element</u>. In relation to the "detection of aging effects" element for AMP B.1.33, the MRP-227-A report identifies that the following RVI components in CE-designed plants should be inspected for cyclic load-induced cracking using visual EVT-1 methods if the fatigue life of the components cannot be demonstrated by time-limited aging analysis (TLAA): (a) lower flange weld in the core support barrel assembly, (b) core support plate in the lower support structure, and (c) for CE-plants whose core shrouds were designed and assembled with full-height shroud plates, in the fuel alignment plate for the upper internals assembly. The condition monitoring criteria in MRP-227-A for CE-designed fuel alignment plates do not apply to the design at Waterford 3 because the core shroud was not designed and assembled using full height shroud plates (i.e., the shroud is designed with a gap area).

During the audit, the staff identified that LRA Section 4.3.1.2 provides the applicant's metal fatigue TLAA for the RVI components at Waterford 3. However, the staff noted that LRA Section 4.3.1.2 did not specify which of the RVI components at Waterford 3 were evaluated with metal fatigue TLAAs or fatigue waiver TLAAs. Therefore, the staff could not establish whether the lower flange weld in the core support barrel assembly or the core support plate in the lower support structure will be inspected in accordance with the EVT-1 condition monitoring criteria specified for these components in Table 4-2 of the MRP-227-A report. The applicant will need to provide additional clarifications on whether these components will be inspected in accordance with the criteria in the MRP-227-A report during the period of extended operation.

- "Monitoring and Trending" Element. The staff observed that the "monitoring and trending" program element discussion in the LRA AMP did not address the monitoring and trending criteria in the last two paragraphs of the corresponding program element in GALL Report AMP XI.M16A, which include criteria for performing flaw evaluations of both non-redundant and redundant RVI components. During the audit, the applicant stated that consistency with the last two paragraphs in the "monitoring and trending" program element of GALL Report AMP XI.M16A is addressed by a statement in the basis document that inspections and flaw evaluations of the RVI components are performed in accordance with MRP-227-A, as supplemented by guidelines and criteria in Technical Report No. WCAP-17096-NP, Revision 2. The staff reviewed WCAP-17096-NP, Revision 2, as well as the associated safety evaluation for the report and determined that the monitoring and trending criteria for performing potential flaw evaluations are appropriately addressed in the MRP-227-A and WCAP-17096-NP, Revision 2, reports and the applicant's commitments for implementing the Reactor Vessel Internals Program. The staff's issue on this matter is resolved.

- "Monitoring and Trending" Element and Response to A/LAI #7 on the Methodology for Implementing MRP-227-A. In A/LAI #7, the staff requested that the applicants/licensees of CE-designed reactors develop plant-specific analyses of any lower support columns made from cast austenitic stainless steel (CASS) materials to demonstrate that the components will maintain their functionality during the period of extended operation. The staff also applied these recommendations for additional RVI components that may be fabricated from CASS, martensitic stainless steel, or precipitation hardened stainless steel materials. In the LRA, AMR items for the control element assembly (CEA) shroud extension shaft guide and the CEA shroud assembly tubes, the applicant identified that the components are fabricated from CASS materials. The applicant identifies that these components are evaluated in the EPRI MRP-191 report, but under the assumption that the components are made from wrought stainless steel materials.

  During the audit, the applicant provided the staff with an industry-issued technical report (PWROG-15032-NP) that evaluated any CASS RVI components for susceptibility to loss of fracture toughness induced by thermal aging embrittlement. The report indicates that all of the RVI components are made from CASS CF8 materials with sufficiently low levels of ferrite and molybdenum. The staff verified that the report demonstrates that CF8 materials used for fabricating these CASS components are not susceptible to thermal aging embrittlement because the ferrite and molybdenum contents of the materials are lower than those cited in NRC License Renewal Issue Document No. 98-0030 for rending a CASS component as being potentially susceptible to a thermal embrittlement aging mechanism. The staff also verified that Technical Report No. PWROG-15032-NP was endorsed in a safety assessment issued by the staff.

Therefore, the staff confirmed that the applicant has provided sufficient demonstration that any CASS components included in the RVI design are not susceptible to thermal aging embrittlement. The staff's issue on this matter is resolved.

The action in A/LAI #7 also requests that the applicant evaluate any RVI components that are potentially fabricated from either martensitic or precipitation-hardened stainless steel materials. During the audit, the staff confirmed that the applicant did not have any components fabricated from martensitic or precipitation-hardened stainless steel.

The staff's issue on this matter is resolved.

- "Acceptance Criteria" Element. The "acceptance criteria" program element of the LRA AMP states that the acceptance criteria are consistent with Section 5 and Table 5-1 of MRP-227-A. The GALL Report AMP states that Section 5 of MRP-227-A includes Table 5-1 for B&W-designed RVIs, Table 5-2 for CE-designed RVIs, and Table 5-3 for Westinghouse-designed RVIs. It is not clear to the staff that these statements are consistent because the applicant references the applicable table for B&W components (Table 5-1) instead of that for CE components (Table 5-2).

- "Acceptance Criteria" Element. In its response to A/LAI #5 on the MRP-227-A report, the applicant identified the acceptance criteria for the gap between the interfacing plates of the core shroud upper and lower subassemblies. However the applicant did not provide the source used to determine the acceptance criteria. During the audit, the staff confirmed that the source used to establish the acceptance criteria for the gap area in the core shroud is appropriately addressed in Technical Report No. WCAP-17096-NP, Revision 2. The staff's issue on this matter is resolved.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience, including operating experience reported in the MRP-227-A report or in industry alert letters for PWR RVI components.

The staff also audited the description of the LRA AMP provided in the FSAR 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," and "parameters monitored or inspected" program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.M16A. The staff's evaluation of aspects of the program element associated with enhancements will be addressed in the SER. The staff also identified certain aspects of the "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined. In addition, the applicant's responses to A/LAI #2 in the LRA require additional information.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.34, Reactor Vessel Surveillance

Summary of Information in the Application. The LRA states that AMP B.1.34, "Reactor Vessel Surveillance," is an existing program 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.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "capsule," "vessel surveillance," "vessel material," "withdrawal schedule," "removal schedule," and "Appendix H."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00006	Waterford 3 License Renewal Project Aging Management Program Evaluation Results – Class 1 Mechanical, Section 4.6, Reactor Vessel Surveillance Program	Revision 0
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness, Section 3.1.24, Reactor Vessel Surveillance	Revision 0
3. CEP-FTP-W3	Reactor Vessel Fracture Toughness and Surveillance Material Testing at Waterford 3	Revision 0, 07/17/2007
4. WCAP-18002-NP	Waterford Unit 3 Time-Limited Aging Analysis on Reactor Vessel Integrity	Revision 0, June 2015
5. WCAP-17969-NP	Analysis of Capsule 83 from the Entergy Operations, Inc. Waterford Unit 3 Reactor Vessel Radiation Surveillance Program	Revision 0, April 2015
6. WCAP-16002	Analysis of Capsule 263 from the Entergy Operations Waterford Unit 3 Reactor Vessel Radiation Surveillance Program	Revision 0, March 2003
7. WCAP-16088-NP	Waterford Unit 3 Reactor Vessel Heatup and Cooldown Limit Curves for Normal Operation	Revision 1, September 2003
8. CR-WF3-2015-04833	Required Reporting of Reactor Vessel Material Surveillance Program (FSAR 5.3.1.6) Related to WCAP-17969-NP for Capsule 83	07/22/2015
9. CR-WF3-2015-01196, CA 145	Update FSAR 5.3-10 To Include the Actual Removal EFPY and Fluence for Capsule 83 and the Target Removal EFPY and Fluence for Capsule 277 as Provided by the TLAA Report WCAP-18002-NP, Revision 0	08/24/2015
10. LR-LAR-2016-00015, CA 19	Update FSAR 5.3-10 To Include the Actual Removal EFPY and Fluence for Capsule 83	03/21/2016
11. LR-LAR-2016-00015, CA 20	Update the Target Removal EFPY and Fluence for Capsule 277 as Provided by the TLAA Report WCAP-18002-NP, Revision 0 (NRC approval is required)	03/21/2016
12. CR-WF3-2013-01996	RF-001-016, Reactor Surveillance Capsule Assemblies, Referenced the Incorrect Capsule Location to Be Removed at 26 EFPY	04/22/2013

Document	Title	Revision/Date
13. CR-WF3-2004-00734	Need to Officially Request NRC Approval To Implement the Revised Vessel Specimen Withdrawal Schedule (Withdrawal of the third capsule at 26 EFPY)	03/10/2004
14. W3F192-0094	GL 92-01, Revision 1, Response	07/06/1992
15. C-PENG-ER-004	Revision 0, Reactor Vessel Group Record Evaluation Program Phase II Final Report for the Waterford 3 Reactor Pressure Vessel Plates, Forging, Welds and Cladding, Page 124	Revision 0, October 1995

During the audit of program elements 1 through 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, sufficient information was not available to determine whether they were consistent with the corresponding program elements of the GALL Report AMP. In order to obtain the information necessary to verify whether 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 GALL Report AMP recommends withdrawal and testing of one capsule at an outage in which the capsule receives a neutron fluence of between one and two times the 60-year peak reactor vessel fluence. The GALL Report also states that, in accordance with 10 CFR Part 50, Appendix H, an applicant submits its proposed withdrawal schedule for approval before implementation. During the audit, the staff noted that the applicant identified a need to withdraw and test Capsule 277 at 48 effective full-power year (EFPY) to represent the fluence exposure for the period of extended operation. In contrast, the applicant did not submit a withdrawal schedule for this capsule for NRC approval. Additional information is necessary because the absence of a staff-approved withdrawal schedule for this capsule is not consistent with the GALL Report AMP.

- The "scope of program" program element of the GALL Report AMP states that the program includes all reactor vessel beltline materials as defined by 10 CFR Part 50, Appendix G, Section II.F. LRA Section 4.2.1 and Table 4.2-1 identify the reactor vessel beltline materials that are exposed to 60-year (55-EFPY) fluence greater than $1x10^{17}$ n/cm^2 (E > 1 MeV). Specifically, LRA Table 4.2-1 indicates that 55-EFPY fluence for the upper shell plates and welds at the clad/metal interface is $5.82x10^{17}$ n/cm^2 (E > 1 MeV). The 40-year (32-EFPY) fluence for these upper shell materials is approximately estimated as $3.37x10^{17}$ n/cm^2 (E > 1 MeV) by linear interpolation, which suggests these materials are also identified as beltline materials for 32 EFPY. In contrast, these upper shell materials are not identified as beltline materials in the evaluation for the 32-EFPY pressure-temperature (P-T) limits described in WCAP-16088-NP, Revision 1, including Table 2-2. Clarification is needed to reconcile this potential inconsistency in identifying these upper shell plates and welds as beltline materials between the 32-EFPY evaluation and 55-EFPY evaluation.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff found that sufficient information was not available to determine whether the description provided in the FSAR supplement was an adequate description of the LRA AMP. In order to obtain the information necessary to verify the sufficiency of the FSAR supplement program description, the staff will consider issuing an RAI for the subject discussed below.

- Table 3.0-1 of SRP-LR, Revision 2, includes an example FSAR supplement for the summary description of an aging management program consistent with GALL Report AMP XI.M31, "Reactor Vessel Surveillance." In contrast with the FSAR supplement in SRP-LR, Revision 2, the staff noted that the LRA Section A.1.34 does not include the following important attributes of the program: (a) any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the staff before the implementation, and (b) untested capsules placed in storage must be maintained for future insertion. Additional information is necessary to resolve this concern.

Audit Results. Based on this audit, 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 program elements in GALL Report AMP XI.M31. The staff also identified certain aspects of the "scope of program" and "detection of aging effects" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff identified a need for additional information regarding the adequacy of the program description in the FSAR supplement.

LRA AMP B.1.35, Selective Leaching

Summary of Information in the Application. The LRA states that AMP B.1.35, "Selective Leaching," is a new program that will be consistent with the program elements in GALL Report AMP XI.M33, "Selective Leaching," as modified by LR-ISG-2011-03, "Changes to the Generic Lessons Learned (GALL) Report Revision 2 Aging Management Program XI.M41, 'Buried and Underground Piping and Tanks.'" To verify this claim of consistency, the staff audited the LRA AMP. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this new program, and the staff's audit addressed only the program elements described in the applicant's basis document and a search of plant-specific operating experience. 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 provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "dealloy," "degraph," "dezinc," "leach," and "zinc."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00007	Aging Management Program Evaluation Results Non-Class 1 Mechanical, Selective Leaching	Revision 0
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness, Section 3.2.11, "Selective Leaching"	Revision 0

During the audit of program elements 1 through 7, 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. For the "corrective actions" program element, sufficient information was not available to determine whether it was consistent with the corresponding program elements of the GALL Report AMP. In order to obtain the information necessary to verify whether 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 program description of the LRA AMP states "[f]ollow-up for unacceptable inspection findings includes an evaluation using the corrective action program and possible expansion of the inspection sample size and location." The "corrective actions" program element of the GALL Report AMP recommends that, "[u]nacceptable inspection findings result in additional inspection(s) being performed, which may be on a periodic basis, or in component repair or replacement. It is not clear to the staff that these statements are consistent because GALL Report AMP XI.M33 recommends that additional inspections be conducted when inspections result in unacceptable results; whereas, the LRA AMP states there might be additional inspections. This issue also impacts the LRA FSAR description of the Selective Leaching program.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR supplement. With the exception of the issue identified in the "corrective actions" program element, above, 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," "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.M33, as modified by LR-ISG-2011-03. The staff also identified certain aspects of the "corrective actions" program element of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff identified a need for additional information regarding the adequacy of the program description in the FSAR supplement.

LRA AMP B.1.36, Service Water Integrity

Summary of Information in the Application. The LRA states that AMP B.1.36, "Service Water Integrity," is an existing program with enhancements that will be consistent with the program elements in GALL Report AMP XI.M20, "Open-Cycle Cooling Water." 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. During the audit, the staff reviewed the enhancements associated with this AMP and their evaluation will be documented in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff walked-down portions of Wet Cooling Towers, Dry Cooling Towers, and other portions of the CCW and auxiliary component cooling water (ACCW) systems. The staff also conducted an independent search of the applicant's operating experience database using keywords: "corr," "erosion," "cavit," "foul," "mic," "service water," and "leak."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00002	Operating Experience Review Results – Aging Effects Requiring Management	Revision 0
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness, Section 3.1.25 Service Water Integrity	Revision 0
3. WF3-EP-14-00007	AMP Evaluation Results – Non-Class 1 Mechanical, Section 4.12 Service Water Integrity	Revision 1
4. WF3-ME-14-00009	Aging Management Review of the Component Cooling and Auxiliary Component Cooling Water Systems	Revision 1
5. EN-DC-184	NRC GL 89-13 Service Water Program	Revision 3
6. EN-DC-340	Microbiologically Influenced Corrosion	Revision 3
7. SEP-HX-WF3-001	GL 89-13 Heat Exchanger Test Basis	Revision 0
8. W3F1-93-01	GL 89-13 Implementation Confirmation Letter	1/29/1993
9. W3P90-0207	GL 89-13 Response	1/29/1990
10. PE-004-021	CCW Heat Exchanger Performance Test	Revision 4
11. PE-004-033	Wet Cooling Tower Thermal Performance Test Report	2/27/2014
12. W3-DBD-4	Component Cooling Water Auxiliary Component Cooling Water, Design Basis Document	Revision 303
13. PMID 00005814-01	Inspect Cooling Towers	N/A
14. WO 52506463 01	ACCMTWR0001 A Inspect Basin and Submerged Components, PMID 00005814-04	11/18/2015
15. PMRQ 34924-01	Create New PM To Open/Close Valves CW MVAAA402, CW MVAAA403A&B Once Every Refuel	N/A
16. Isometric No. 22000	Blowdown Heat Exchanger Line No. 7CW16-31	0

Document	Title	Revision/Date
17. Flow Diagram G164 Sheet 5	Miscellaneous Reactor Auxiliary System	Revision 15
18. CR-WF3-2007-02364	WF3 may not be in compliance with PE-004-015, "GL 89-13 Heat Exchanger Test Basis" for EDGs.	N/A
19. CR-WF3-2007-01084	PMRQ561-02 & 5562-02 (remove spool piece between ACC127B and ACC126B and inspect piping for erosion)	N/A
20. CR-WF3-2008-04388	Algae seen exhausting from Wet Cooling Tower "B" fans when fans started.	N/A
21. CR-WF3-2009-00599	CCW HxB thermal performance analysis indicates a degrading trend (12/9/2008 vs 12/11/2001).	N/A
22. CR-WF3-2009-00614	Cavitation erosion, incipient cavitation damage in valve body ACC-126A. Same as CR-WF3-2009-00852 for valve 126.	N/A
23. CR-WF3-2009-00843	Blockage due to sediment when opening drain line ACC-120B.	N/A
24. CR-WF3-2009-01622	Severe piping corrosion on pipe directly above ACC water basin.	N/A
25. CR-WF3-2009-01717	External corrosion of CMU supply piping to Wet Cooling Tower A.	N/A
26. CR-WF3-2011-06856	Dried dark green filmy material in small pieces were observed collecting on the ground at the +21 elevation outside the WCT "B."	N/A
27. CR-WF3-2012-06401	While performing fill and vent of ACCW B train, valve ACCMVAAA122B was clogged and could not be used for venting.	N/A
28. CR-WF3-2013-01106	Damage to WCT fill. WCT A fill had experienced damage previously as documented in CR-WF3-2003-0090 and CR-WF3-2005-0182.	N/A
29. CR-WF3-2014-004930	Identified a leak from one of the tubes in Dry Cooling Tower B. The cause of this leak was determined to be external corrosion.	N/A
30. CR-WF3-2014-004930	Apparent Cause Evaluation Dry Cooling Tower B Bundle #1 Tube Leak	0
31. CR-WF3-2015-00463	On 1/24/15, several Dry Cooling Tower tube bundles were inspected as part of Extent of Condition.	N/A
32. CR-WF3-2015-00756	Drain valves ACC-120/1201B and ACC-118B are clogged.	N/A
33. CR-WF3-2015-05067	Aug-3-2015 black paper-like substance floating down into the WCT A basin.	N/A
34. CR-WF3-2015-08543	Piping downstream of ACC-137A inside ACC "A" basin has corroded to the point that welding cannot be performed as planned.	N/A

The staff conducted its audit of LRA program elements 1 through 6 based on the contents of the existing program as modified by the proposed enhancements. During the audit, the staff verified that the "monitoring and trending" and "acceptance criteria" program elements of the LRA AMP are consistent with the corresponding elements of the GALL Report AMP. However, the staff found that for the "scope of program," "preventive actions," "parameters monitored or inspected," and "detection of aging effects" program elements, sufficient information was not available to determine whether they were consistent with the corresponding program elements of the GALL Report AMP. In order to obtain the information necessary to verify whether 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 ACCW system includes distribution nozzles in the Wet Cooling Tower that are being managed for loss of material. However, the piping upstream of the flow nozzles is periodically wetted and dried during various operational modes that can promote more aggressive internal corrosion and can lead to flow blockage due to fouling. It is unclear to the staff whether flow blockage of the Wet Cooling Tower flow distribution nozzles needs to be managed by the Service Water Integrity program.

The nonsafety-related chemical addition and filtration system takes a suction from the Wet Cooling Tower basin but it has several "siphon breaker holes" to eliminate the potential for inadvertently removing water from the Wet Cooling Tower basin. This system is not within the scope of license renewal. It is unclear to the staff whether failure of the siphon breaker holes (i.e., flow blockage due to fouling) could prevent satisfactory accomplishment of an ACCW system intended function, requiring inclusion of a portion of the system to be within the scope of license renewal.

The Service Water Integrity program manages aging effects as described in Waterford's response to NRC GL 89-13. Waterford's response for Action III states that components from the ACCW system will be added to its "Erosion/Corrosion" program. The system susceptibility evaluation for Flow-Accelerated Corrosion program (previously called the "Erosion/Corrosion" program) shows that the ACCW system is excluded from that program's scope. It is unclear to the staff if and how the prior GL 89-13 commitment was changed and how the activities for Action III of GL 89-13 will be accomplished during the period of extended operation.

There are discrepancies between the program basis documents and the information in the LRA. Onsite program documentation for the ACCW system (WF3-ME-14-00009) states that the One-Time Inspection program will manage loss of material in the carbon steel circulating water intake piping. However, LRA Table 3.3.2-3, which addresses components for that system, does not show carbon steel piping as being managed by the One-Time Inspection program. In addition, LRA Table 3.3.2-3 shows that carbon steel piping with internal coatings will be managed for loss of material and coating integrity by the Coating Integrity program. However, WF3-ME-14-00009 does not include the Coating Integrity program as managing components in the ACCW system.

In addition, in order to verify that the enhancements will make the AMP adequate to manage the applicable aging effects, the staff will consider issuing an RAI for the subject discussed below.

The Service Water Integrity program manages aging effects as described in Waterford's response to GL 89-13 and includes an enhancement to monitor the ACCW basins for biological fouling by visual inspections and analysis of water for biological activity. However, Waterford's response to GL 89-13 Action I states that it already monitors the ACCW basin for biological fouling by visual inspection and analysis of water for biological activity. It is unclear to the staff if and how the prior GL 89-13 commitment was changed, such that a new commitment to monitor the ACCW basins for biological fouling is needed for the period of extended operation.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by

known industry operating experience. However, the staff could not determine whether the applicant had adequately evaluated and incorporated the operating experience related to this program. 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 discussed below.

> Condition report CR-WF3-2009-00843 documents blockage due to sediment for a drain line in the ACCW system. Although makeup water to the ACCW system is demineralized water and chemical corrosion inhibitors maintain a low corrosion rate, sufficient fouling appears to be present in some portions of the system to cause blockage. It was unclear to the staff whether prior changes were made to the Service Water Integrity program as a result of this operating experience in light of the need to enhance the program procedures for the period of extended operation to flush stagnant lines to ensure there is no blockage.

The staff also audited the description of the LRA AMP provided in the FSAR supplement in LRA Section A.1.36. 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 "monitoring and trending," and "acceptance criteria" program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.M20. The staff's evaluation of aspects of the program elements associated with enhancements will be addressed in the SER. The staff also identified certain aspects of the "scope of program," "preventive actions," "parameters monitored or inspected," and "detection of aging effects" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. However, additional information is required to determine whether the applicant had adequately evaluated and incorporated the operating experience related to this program. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.37, Steam Generator Integrity

Summary of Information in the Application. The LRA states that AMP B.1.37, "Steam Generator Integrity," is an existing program that is consistent with the program elements in GALL Report AMP XI.M19, "Steam Generators." To verify this claim of consistency, the staff audited the LRA AMP.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "steam generator," "tubesheet weld," "channel head," "divider plate," and "loose part."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. 5817-13787	Flange/Port Drawing	Revision 0
2. 5817-13807	Recirculation Nozzle Drawing	Revision 0
3. CEP-SG-001	Steam Generator Primary Side Examinations and Maintenance	Revision 1
4. CEP-SG-002	Steam Generator Secondary Side Examinations and Maintenance	Revision 0
5. CEP-SG-003	Steam Generator Integrity Assessment	Revision 1
6. ECR 0000016360	Waterford 3 – Steam Generator Strategic Plan	06/17/2014
7. ECR 0000017215	Generate a Degradation Assessment for RF19 First ISI Inspection of W3 Replacement SG per NEI 97-06 and EN-DC-317	06/30/2014
8. EN-DC-317	Steam Generator Program	Revision 8
9. SEP-SG-WF3-001	WF3 Steam Generator Program	Revision 0
10. TM 1440-C396, Volume 2	Steam Generator Technical Manual	Revision 1
11. WF3-EP-14-00003	Operation Experience Review Results – Aging Management Program Effectiveness	Revision 0

During the audit of program elements 1 through 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's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "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.M19.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.38, Structures Monitoring

Summary of Information in the Application. The LRA states that AMP B.1.38, "Structures Monitoring," is an existing program with enhancements that will be 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. During the audit, the staff reviewed the enhancements associated with this AMP. The enhancements to the LRA AMP will be evaluated in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns of the reactor auxiliary building, fuel handling building, dry and Wet Cooling Towers, shield building (exterior), and turbine building. The staff also conducted an independent search of the applicant's operating experience database using keywords: "concrete," "steel," "crack," "corrosion," "leak," "SCC," "ASR," "settlement," "rust," and "leach."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00008	Aging Management Program Evaluation Report Civil/Structural	Revision 1
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0
3. EN-DC-150	Condition Monitoring of Maintenance Structures	Revision 6, 11/21/2013
4. EN-MA-15	Maintenance Standard for Torque Applications	Revision 3, 04/25/2014
5. EN-DC-178	System Walkdowns	Revision 7, 11/21/2013
6. LOU 1564.723	[Specification] Structural Steel Seismic I & II	Revision 16
7. W-CS-2003-001-00	Maintenance Rule Walkdown for Evaluation of Structures	Revision 0, 10/09/2003
8. WF3-CS-11-00001	Maintenance Rule Walkdown for Evaluation of Structures	Revision 0, 01/12/2011
9. WF3-CS-16-00006	Maintenance Rule Walkdown for Evaluation of Structures	Revision 0, 05/11/2016
10. CR-WF3-2016-4480	Degraded Gap Seal on the Q-Deck	07/12/2016
11. CR-WF3-2016-4481	Corroded Bolt/Nut on the Column Near WCT B Basin Window	07/12/2016
12. CR-WF3-2016-4482	Exposed Rebar on the Concrete Wall Near the Passage From WCT B to DCT B	07/12/2016
13. CR-WF3-2016-4484	Abandoned Pipe Penetrating the Shield Building Not Grouted and Exposed	07/12/2016
14. CR-WF3-2015-00947	Ongoing Issue with the Identification, Evaluation, and Resolution of External Corrosion	02/19/2015
15. CR-WF3-2006-00755	External Corrosion in Structural Steel, Equipment, and Component	2006
16. UNT-006-032	Coating and Corrosion Program	Revision 0
17. LOU-1564, G-780	Drawing: Turbine Area Column Schedules	Revision 7, 07/03/1991
18. LOU-1564, G-793	Drawing: Turbine Building Sections & Details	Revision 8 03/24/1983
19. LOU-1564, G-599	Drawing: Turbine Generator Pedestal Mat-Masonry	Revision 5 06/19/1979

The staff conducted its audit of LRA program elements 1 through 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," "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," "parameters monitored or inspected," and "detection of aging effects" program elements, sufficient information was not available to determine whether they were consistent with the corresponding program elements of the GALL Report AMP. In order to obtain the information necessary to verify whether 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 "parameters monitored or inspected," and "detection of aging effects" program elements of the GALL Report AMP X1.S6 recommend that high-strength (actual measured yield strength ≥ 150 ksi or 1,034 MPa) structural bolts greater than 1 inch (25 mm) in diameter be monitored for SCC, and that visual inspections be supplemented with volumetric or surface examinations to detect cracking. During the AMP audit, the staff noted that the applicant excluded managing the aging effects of SCC in high-strength structural bolts and stated, in part, that "since molybdenum disulfide thread lubricants are not used at WF3, for structural bolting applications, SCC of high-strength structural bolting is not an aging effect requiring management at WF3." It is not clear to the staff that this statement is consistent because the GALL Report does not credit the molybdenum disulfide thread lubricant as the only contributor to the aging mechanism of SCC in high-strength bolts. Also the staff is not clear whether high-strength structural bolts greater than 1 inch in diameter are used in structural applications, or how supplemental examinations are performed for these bolts because the plant's structural specifications and drawings do not preclude the use of high-strength structural bolts with diameter greater than 1 inch when specified or noted as such in the drawing details.

In order to verify that the enhancements will make the AMP adequate to manage the applicable aging effects, the staff will consider issuing an RAI for the subject discussed below.

- The LRA AMP states an enhancement to the "preventive actions" program element. The enhancement states that the plant procedure will be revised to include "preventive actions for storage of ASTM A325, ASTM F1852, and ASTM A490 bolting from Section 2 of Research Council on Structural Connections publication." The GALL Report AMP XI.S6 recommends that if structural bolting consists of ASTM A325, ASTM F1852, and/or ASTM A490 bolts, the preventive actions for storage, lubricants, and stress corrosion cracking potential discussed in Section 2 of RCSC (Research Council for Structural Connections) publication need to be used. During the AMP audit the staff noted that the applicant excluded the use of preventive actions for lubricants, and stress corrosion cracking potential and stated that a review of Section 2 of the RCSC publication concluded that "only storage is address[ed] and the RCSC publication does not address the preventive actions for lubricants and stress corrosion cracking potential for these bolts" (WF3-EP-14-00008, Revision 1.) It was not clear to the staff that these statements are consistent, and if the above enhancement is adequate to make the LRA AMP consistent, because (1) the enhancement description does not include the RCSC Section 2 preventive actions for *"lubricants" and "stress corrosion cracking potential,"* and (2) the related justification provided in the AMPER document appears to interpret the standard in a manner that is inconsistent with the consideration

in the GALL Report AMP. The staff also noted that this is a common issue across LRA AMPs B.1.6, "Containment Inservice Inspection – IWE"; B.1.16, "Inservice Inspection – IWF"; and B.1.38, "Structures Monitoring."

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is generally bounded by known industry operating experience (e.g., no previously unknown or recurring aging effects were identified by the applicant or staff). However, the staff identified plant-specific operating experience in which corrosion of steel structures and components has been identified. The staff's evaluation of the identified plant-specific operating experience will be addressed in the SER. 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 discussed below.

- The staff reviewed condition reports CR-WF3-2006-00755, CR-WF3-2009-06945, and CR-WF3-2010-05582, which documented corrective actions to address several plant-specific operating experiences associated with corrosion on structural steel, supports, and components. The staff also reviewed CR-WF3-2015-00947, which summarizes the history (since January 2010) of several condition reports associated with the keyword "corrosion." The corrective actions associated with this condition report resulted in further inspections of areas susceptible to external corrosion and the development of an external corrosion and coating inspection procedure (UNT-006-032) for safety-related systems and components. During the walkdowns, the staff also observed corroded bolts/nuts from a steel column, exposed concrete rebar, and structural steel with different levels of corrosion in several structures located outdoors (e.g., CR-WF3-2016-4481, CR-WF3-2016-4482.) Based on the staff review of this plant-specific operating experience and staff observed conditions during the audit walkdowns, it is not clear to the staff (1) how the structures monitoring program captures the operating experience (e.g., the existing corrosion concerns from recent inspections) and whether the conditions and operating experience at the plant is bounded by the conditions and operating experience for which the GALL Report program was evaluated in Section XI.S6, and (2) whether and how the structures monitoring program specified inspection frequency of 5 years remains adequate, considering the recent operating experience, to ensure no loss of intended functions during the period of extended operation for those structures with ongoing exterior corrosion concerns.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "monitoring and trending," and "acceptance criteria" program elements of the LRA AMP are consistent with the corresponding program elements in GALL Report AMP XI.S6. The staff's evaluation of aspects of the program elements associated with enhancements will be addressed in the SER. The staff also identified certain aspects of the "preventive actions," "parameters monitored or inspected," and "detection of aging effects" program elements of the LRA AMP for which additional information or additional evaluation is required before consistency can be determined.

Based on this audit, the staff also verified that the operating experience at the plant is generally bounded by the operating experience for which the GALL Report program was evaluated; however, the staff also found that additional information is required before a determination can be made regarding whether the applicant's operating experience supports the sufficiency of the

LRA AMP. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.39, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)

Summary of Information in the Application. The LRA states that AMP B.1.39, "Thermal Embrittlement of Cast Austenitic Stainless Steel (CASS)," is a new program that will be consistent with the program elements in GALL Report AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)." To verify this claim of consistency, the staff audited the LRA AMP. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this new program, and the staff's audit addressed only the program elements described in the applicant's basis document.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The staff also conducted an independent search of the applicant's operating experience database using the keywords: "CASS," "cast," "embrittlement," "ferrite," "thermal aging," and "CF8."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-ME-14-00002	Aging Management Review of the Reactor Vessel Internals	Revision 1, 1/12/2016
2. WF3-ME-14-00003	Aging Management Review of the Reactor Coolant System and Pressurizer	Revision 1, 9/13/2015
3. WF3-EP-14-00006	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program Book	Revision 0
4. CE NPSD-1214	Generic Aging Management Review Report – Reactor Coolant System	Revision 0

During the audit of program elements 1 through 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, the staff made the following observations:

- The staff reviewed the applicant's Generic Aging Management Report for the RCS and noted CASS components and piping with a ferrite content above the 20 percent criteria for susceptibility to thermal aging embrittlement. The staff further noted that there is one component with a ferrite content above 25 percent.

- The staff reviewed the applicant's Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program Book and confirmed that the applicant will evaluate flaws in accordance with ASME Section XI, Section IWB-3500 or IWC-3500 for CASS components with up to 25 percent ferrite content and will evaluate flaws for CASS

components with a greater than 25 percent ferrite content on a case-by-case basis using fracture toughness data.

During the audit of the "operating experience" program element, the staff's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "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.M12.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.40, Water Chemistry Control – Closed Treated Water Systems

Summary of Information in the Application. The LRA states that AMP B.1.40, "Water Chemistry Control – Closed Treated Water Systems," is an existing program with enhancements that will be consistent with the program elements in GALL Report AMP XI.M21A, "Closed Treated Water Systems" as modified by LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Tanks, and Corrosion Under Insulation." To verify this claim of consistency, the staff audited the LRA AMP. During the audit, the staff reviewed the enhancements associated with this AMP and will document their evaluation in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. In addition, the staff conducted walkdowns of portions of the component cooling system, including heat exchangers, pumps, and the Dry Cooling Towers. The staff also conducted an independent search of the applicant's operating experience database using keywords: "biofoul," "corr," "eros," and "treated."

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00002	Operating Experience Review Results – Aging Effects Requiring Management	Revision 0
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness, Section 3.1.28 Water Chemistry Control – Closed Treated Water Systems	Revision 0
3. WF3-EP-14-00007	AMP Evaluation Results – Non-Class 1 Mechanical, Section 4.13 Water Chemistry Control – Closed Treated Water Systems	Revision 1

Document	Title	Revision/Date
4. CE-001-004	Periodic Analysis Scheduling Program	Revision 315
5. CE-002-007	Maintaining CCW Chemistry	Revision 305
6. CE-002-013	Maintaining Essential Services Chill Water Chemistry	Revision 303
7. CE-002-014	Maintaining Supplementary Chill Water	Revision 302
8. CE-002-019	Maintaining Diesel Generator Jacket Water Cooling Water Chemistry	Revision 301
9. CR-WF3-2006-02537	The Component Cooling Water flow rate to Containment Fan Cooler D has degraded from approximately 975 gpm on 8/30/06 to approximately 640 gpm on 9/4/06.	N/A
10. CR-WF3-2007-02867	This condition report was written to document a very slight rise in CCW Surge Tank Level.	N/A
11. CR-WF3-2007-03455	While performing cleaning activities on WO00116217, a pin hole leak developed on pipe 7CC4-199.	N/A
12. CR-WF3-2014-00448	Leak identified in Dry Cooling Tower B Bundle 1B.	N/A
13. CR-WF3-2014-004930	Identified a leak from one of the Dry Cooling Tower B. The cause of this leak was determined to be external corrosion.	N/A
14. CR-WF3-2014-004930	Apparent Cause Evaluation Dry Cooling Tower B Bundle #1 Tube Leak	Revision 0
15. CR-WF3-2015-00463	On 1/24/15, several Dry Cooling Tower tube bundles were inspected as part of Extent of Condition.	N/A

The staff conducted its audit of LRA program elements 1 through 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's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience and the applicant had adequately evaluated and incorporated the operating experience into this program.

The staff also audited the description of the AMP provided in the FSAR supplement in LRA Section A.1.40. 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," "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.M21A, as modified by LR-ISG-2012-02. The staff's evaluation of aspects of the program elements associated with enhancements will be addressed in the SER. The staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated and the applicant had adequately evaluated and incorporated the operating experience into this program. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

LRA AMP B.1.41, Water Chemistry Control – Primary and Secondary

Summary of Information in the Application. The LRA states that AMP B.1.41, "Water Chemistry Control – Primary and Secondary," 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.

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

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

Relevant Documents Reviewed

Document	Title	Revision/Date
1. WF3-EP-14-00007	Aging Management Program Evaluation Results – Non-Class 1 Mechanical	Revision 0
2. WF3-EP-14-00003	Operating Experience Review Results – Aging Management Program Effectiveness	Revision 0
3. CE-001-004	Periodic Analysis Scheduling Program	Revision 315
4. CE-002-001	Maintaining Steam Generator Chemistry	Revision 308
5. CE-002-002	Maintaining Condensate and Feedwater Chemistry	Revision 305
6. CE-002-005	Maintaining Makeup Demineralizer Chemistry	Revision 016
7. CE-002-006	Maintaining Reactor Coolant Chemistry	Revision 314
8. CE-002-008	Maintaining Condensate Storage Pool Chemistry	Revision 302
9. CE-002-009	Maintaining Boron Management System Chemistry	Revision 301
10. CE-002-010	Maintaining Safety Injection Tank Chemistry	Revision 17
11. CE-002-011	Maintaining Spent Fuel Pool Chemistry	Revision 10
12. CE-002-020	Maintaining Primary Water Chemistry	Revision 13
13. CE-002-025	Maintaining Refueling Water Storage Pool Chemistry	Revision 14
14. CE-002-027	Maintaining Condensate Storage Tank and Demineralized Water Storage Tank	Revision 10
15. EN-CY-100	Conduct of Chemistry	Revision 0
16. EN-LI-102	Corrective Action Program	Revision 24
17. WF3-Chem-Sec-001-08	Strategic Secondary Water Chemistry Plan	Revision 8
18. Program Basis Document	Primary Strategic Water Chemistry Plan	Revision 5
19. CR-WF3-2010-00192	Samples From Condensate Discharge Pump	01/12/2010
20. CR-WF3-2007	Condensate Storage Pool Sample	09/26/2007

Document	Title	Revision/Date
21. CR-WF3-2007-03960	Steam Generator Sulfate Concentration Trend	11/01/2007
22. CR-WF3-2007-03832	Steam Generator Samples Elevated	10/23/2007
23. CR-WF3-2008-01712	Oxygen Concentration at Indeterminate Amount in Make-Up Water	04/28/2008
24. CR-WF3-2008-02625	Condensate Storage Tank Dissolved Oxygen Above Specification Limit	05/29/2008
25. CR-WF3-2009-02539	Condensate Oxygen Exceeding Action Levels	05/26/2009

During the audit of program elements 1 through 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's independent database search found that the operating experience provided by the applicant is bounded by known industry operating experience.

The staff also audited the description of the LRA AMP provided in the FSAR 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," "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.M2.

Based on this audit, the staff also verified that the operating experience at the plant is bounded by the operating experience for which the GALL Report program was evaluated. In addition, the staff verified that the description provided in the FSAR supplement is consistent with the description provided in the SRP-LR.

Staff Review of Select AMR Items Associated with Elastomeric and Polymeric Components

Summary of Information in the Application. During the audit, the staff reviewed plant documentation associated with the following AMR items:

- LRA Table 3.3.2-15-11, "Component Cooling Water System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation"

- LRA Table 3.3.2-8, "Fire Protection – Water System Summary of Aging Management Evaluation"

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed onsite documents provided by the applicant. The table below lists the documents that were reviewed

by the staff and were found relevant to the review of these AMR items. These documents were provided by the applicant.

Relevant Documents Reviewed

Document	Title	Revision/Date
1. LRA-G160 sheet 2	Flow Diagram Component Closed Cooling Water System	Revision 0
2. WO 309583-01	Relocate Fire Hydrant 9 Shutoff and Isolation Valves per EC 35260	09/10/2012

Audit Results. During the audit, the staff made the following observations:

- The staff noted that drawing LRA-G160 sheet 2, location A-5, states that the CCW corrosion rate monitor is constructed of PVC piping. The monitor is located inside the plant and is not exposed to sunlight. The AMR items are cited in LRA Table 3.3.2-15-11.

- The staff noted that WO 309583-01 step 4.33.1 states that the fire hydrant shutoff valve piping implemented by EC 35260 was embedded in controlled low-strength material. The AMR item is cited in LRA Table 3.3.2-8.

LRA Section 4.1, Identification of Time-Limited Aging Analyses

Summary of Information in the Application. LRA Section 4.1, "Identification of Time-Limited Aging Analyses," provides the applicant's methodology for identifying analyses, evaluations, assessments, or calculations that meet the definition of a TLAA in 10 CFR 54.3(a) and a summary of the results of the applicant's TLAA search. LRA Section 4.1 also provides the applicant's methodology for identifying regulatory exemptions that were granted in accordance with 10 CFR 50.12 based on a TLAA, as required by 10 CFR 54.21(c)(2).

Audit Activities. During its audit (July 25–29, 2016), the staff interviewed the applicant's staff and reviewed onsite documentation provided by the applicant. The applicant is required by the criteria in 10 CFR 54.21(c)(2) to identify all exemptions that were granted based on a TLAA in accordance with the exemption acceptance provisions in 10 CFR 50.12. Prior to the AMP audit for the LRA, the staff reviewed the list of regulatory exemptions in the NRC's ADAMS database that were granted in accordance with the requirements of 10 CFR 50.12. The staff did not identify any regulatory exemptions that were based on a TLAA. Therefore, the staff did not perform an audit of the applicant's basis for demonstrating compliance with the requirements in 10 CFR 54.21(c)(2).

The staff audited the information in LRA Section 4.1 to confirm if the applicant had omitted any analyses, evaluations, assessments, or calculations from the scope of the LRA that would need to be identified as TLAAs. The table below lists additional documents that were reviewed by the staff and were found relevant to the staff's audit of LRA Section 4.1. These documents were provided by the applicant or were identified in the staff's search of the applicant's operating experience database.

Relevant Documents Reviewed

Document and Number	Title	Revision/Date
1. Engineering Calculation No. ECC12-009	Stress Report for Steel Containment Vessel[1]	Revision 0
2. NUREG-0787	Safety Evaluation Report Related to the Operation of Waterford Steam Electric Station, Unit No. 3, Docket No. 50-382	07/1981
3. ER-W3-99-0184-02-00,-01, and -03	Weld Repair of Inconel Instrument Nozzles on the Pressurizer	03/08/2000, 10/13/2000, and 10/27/2000
4. ER-W3-99-0184-01 -00, -01	Weld Repair of Inconel Instrument Nozzles on the RCS Hot Legs	03/09/2000 and 03/13/2000
5. ER-W3-99-0184-01-00, -01, -03, and -06,	Repair of Inconel Alloy 600 Pressurizer Heater Sleeves	10/24/2000, 10/27/2000, 09/19/2001, and 07/02/2003
6. Structural Integrity Associates Report No. SIR-06-302	Fracture Mechanics Evaluation of Potential Remnant Crack in Waterford-3 Pressurizer Small Bore Nozzles [2]	Revision 2, 10/05/2016
7. Structural Integrity Associates Report No. SIR-94-080	Relaxation of Reactor Coolant Pump Flywheel Inspection Requirement[2]	Revision 0, 05/22/1995
8. Proprietary Structural Integrity Associates Report No. SIR-08-092-NPS	Design Report for Preemptive Repairs of Pressurizer and Hot Leg Alloy 600 Components, Waterford Steam Electric Station, Unit[2]	Revision 3, 12/10/2010
9. ASME Section III	ASME Boiler and Pressure Vessel Code, Division 1	1971 Edition

The applicant is required to identify and evaluate all analyses, assessments, evaluations, or calculations (hence, termed as analyses) that qualify as TLAAs in accordance with requirements in 10 CFR 54.21(c)(1). As specified in 10 CFR 54.21(c)(1), analyses are TLAAs if they conform to all six of the criteria in 10 CFR 54.3(a) for defining TLAAs. During the audit, the staff reviewed the applicant's methodology for identifying potential sources of TLAAs. The staff also reviewed generic, site-specific, and corporate-specific documents in the CLB that may include potential sources of TLAAs. For generic, site-specific, or corporate-specific documents that were determined to contain time-dependent analyses, the staff reviewed applicable analyses against the six criteria for TLAA identification, as defined in 10 CFR 54.3(a). The staff's evaluation of the methodology for identifying TLAAs and the TLAA results for the application will be provided in FSER Section 4.1. However, during the audit, the staff discussed the following topics with the applicant:

(a) topical or technical reports (TRs) that may contain potential TLAAs

(b) evaluations of potential TLAAs associated with repair or crack-mitigation designs (e.g., half-nozzle repair designs or weld overlay repair or mitigation designs) for nickel alloy base metal or weld components in the RCPB

[1]The fatigue waiver analysis for the SCV is described on pages 151 and 152 of the stress report.
[2]Given the proprietary nature of Report No. SIR-08-092-NPS, the staff treated its audit review of Report Nos. SIR-06-302 and SIR-94-080 as a review of proprietary documents.

(c) whether the metal fatigue analyzes for large-bore, Class 1 valves in the CLB are TLAAs

(d) whether the CLB includes a fatigue waiver analysis for metal containment structure and whether this analysis needs to be identified as a TLAA for the LRA

(e) whether the cyclical loading analysis (i.e., fatigue flaw growth analysis) for reactor coolant pump (RCP) flywheels in the CLB needs to be identified as a TLAA

The staff's audit assessments of these aspects of the LRA are given in the subsections that follow.

- *Review of Topical Reports That May Be Potential Sources of TLAAs*

  In LRA Section 4.1.1, the applicant stated that the methodology for identifying potential sources of TLAAs included a review of WCAP reports that were issued by the Westinghouse Electric Company and are applicable to the CLB for Waterford 3. During the audit, the staff asked the applicant whether its review of TRs was limited only to WCAP reports issued by the Westinghouse Electric Company and whether the TR review statement in LRA Section 4.1 should be interpreted to mean that the applicant had reviewed all TRs included in the Waterford 3 CLB. The applicant noted that the statement in LRA Section 4.1 was intended to mean that the applicant had reviewed all applicable TRs that apply to the CLB. The applicant stated that the review also included but was not limited to TRs issued by the Combustion Engineering Company, its owners group, and other applicable vendors, such as Chicago Bridge and Iron-Work (CB&I) Company or Structural Integrity Associates, Inc.

  During the audit, the staff verified that the applicant's review of applicable TRs included those from other vendor sources as discussed in the previous paragraph. Thus, the staff finds that the applicant adequately reviewed applicable TRs to identify TLAAs and the applicant's review scope was not limited only to those issued by the Westinghouse Electric Company. The staff will document this audit result in Section 4.1 of the FSER for the LRA.

- *Design Analyses for Repaired or Mitigated Nickel Alloy Components in the RCPB*

  During the audit, the staff verified that the following cyclical loading analyses for repaired or mitigated Alloy 600 base metal locations or Alloy 82/182 weld component locations in the RCBP were based on time-dependent assumptions that went beyond the period of extended operation (e.g., those given in the applicable Structural Integrity Associates reports for repaired instrumentation nozzles in the RCS hot legs or pressurizer, or repaired pressurizer heater sleeves). Specifically, the staff verified that the assessment of design transient cycles for the applicable flaw growth or fracture mechanics evaluations were based on a 45-year projection basis. Since Waterford 3 was licensed to operate in March 1985, the staff observed that these flaw evaluations would be TLAAs if the overlay modifications were installed between March 1985 and March 2000. However, the staff verified that the applicant performed the repair activities after March 2000.

  Since the repairs of these components were conducted after March 2000, the analyses are projected beyond the period of extended operation for Waterford 3 (i.e., 60 years of operation) and these analyses are not based on time-dependent assumptions defined by

the current operating period. Therefore, the staff finds that these analyses do not meet the third criterion in 10 CFR 54.3(a), and are not identified as TLAAs. The staff will document this audit result in FSER Section 4.1 for the LRA.

- *Metal Fatigue Analyses for Large Bore, Class 1 Valves in the RCPB*

  The staff noted that FSAR Table 3.9-9 identifies that the plant design includes large bore (greater than 4-inch nominal point size (NPS)), Class 1 valves in the RCBP as follows: (a) four 8-inch header-to-reactor coolant loop inboard containment isolation valves in the low pressure safety injection system, (b) four 12-inch safety injection tank outlet check valves, (c) four 12-inch safety injection header check valves, (d) two 14-inch reactor coolant loop shutdown cooling upstream suction isolation valves, and (e) two 14-inch reactor coolant loop shutdown cooling suction inboard containment isolation valves. The staff also noted that FSAR Section 3.9.1.1.2 indicates that the CLB for Waterford 3 includes applicable cyclical loading and transient analyses for these valves. However, the staff also observed that the applicant did not clearly address the cyclical loading analyses for these valves in the metal fatigue analysis section for ASME Code Class 1 components in the LRA (i.e., LRA Section 4.3.1 with its subsections).

  During the audit, the staff asked the applicant to clarify whether LRA Section 4.3.1 includes a metal fatigue analysis for the ASME Class 1, large bore valves. The applicant explained that the metal fatigue analyses for the ASME Code Class 1, large bore valves are included in LRA Section 4.3.1.7 because the valves are considered piping components. The staff reviewed the information in LRA Section 4.3.1.7 to verify the validity of this statement by the applicant.

  The staff observed that the cyclical loading analyses (i.e., fatigue analyses) for the Class 1 piping components are discussed in FSAR Section 5.4.3. Similarly, the cyclical loading analyses for Class 1, large bore valves are discussed in FSAR Section 5.4.12. The staff also noted that, although LRA Section 4.3.1.7 appropriately discusses the fatigue analyses for the piping consistent with the information in FSAR Section 5.4.3, including the applicant's basis for accepting these analyses in accordance with 10 CFR 54.21(c)(1)(iii), the LRA section does not reference the metal fatigue analysis (i.e., cyclical loading and design transient assessment) for the large bore, Class 1 valves that is included in FSAR Section 5.4.12. Therefore, during the exit meeting for the audit (July 28, 2016), the staff informed the applicant that the LRA does not include the appropriate metal fatigue TLAA for the ASME Code Class 1, large bore valves in LRA Section 4.3.1.7 because the section does not make any reference to the assessment in FSAR Section 5.4.12. The staff informed the applicant that an administrative amendment will need to be made to LRA Section 4.3.1.7 to reference the metal fatigue analyses for the large bore, Class 1 valves and the assessment of these valves in FSAR Section 5.4.12. The staff will consider issuing an RAI on this matter and will document this in Sections 4.1 and 4.3.1.7 of the FSER.

- *Fatigue Waiver Analysis for the Metal Containment Vessel*

  During the audit, the staff noted that the applicant's CLB includes a fatigue waiver analysis for the metal containment vessel as performed to demonstrate conformance with the six criteria for fatigue waiver specified in the ASME Code Section III, paragraph NB-3222.4 (d). The staff identified that the applicable analysis is included in the stress analysis for the metal containment vessel, as performed by the Chicago

Bridge and Iron-Works Company (CBI) on behalf of the applicant. The staff also reviewed the fatigue waiver analysis and verified that the analysis was not based on any time-dependent assumptions defined by the current operating period. Therefore, the staff has confirmed that the fatigue waiver analysis for the metal containment vessel does not conform to the third Criterion in 10 CFR 54.3(a) and, therefore, is not identified as a TLAA for the LRA. The staff will document this determination in Section 4.1 of the FSER for this LRA.

- *Fatigue Flaw Growth Analysis for the Reactor Coolant Pump Flywheels*

  As part of the audit activities, the staff reviewed the vendor report that was used to assess the structural integrity of the RCP flywheels in the plant design. The staff verified that the fatigue flaw growth analysis included in the report assessed flaw growth in the flywheels using a number of pump startup-shutdown cycles more than two times the number of pump startup-shutdown cycles assumed in the 40-year plant design. Based on this review, the staff has confirmed that the fatigue flaw growth analysis for the RCP flywheels is not based on time-dependent assumptions defined by the current operating period, as the time frame for assessing cycles in the analysis extends beyond the proposed 60-year period of extended operation. Therefore, the staff determined that the applicant has provided an adequate basis in the LRA for concluding that this analysis does not meet the criteria for the definition of a TLAA in 10 CFR 54.3(a). The staff will document this topic and the related discussion in Section 4.1 of the FSER for this LRA.

Audit Results. Based on this audit, with the exception of the metal fatigue analyses (i.e., cyclical loading and design transient analyses) for the large bore, Class 1 valves, the staff has verified that the applicant has implemented a sufficient methodology for identifying TLAAs in the LRA, and has identified all applicable TLAAs in the LRA, as required by 10 CFR 54.21(c)(1).

The staff is considering the issuance of an RAI to resolve the administrative TLAA identification issue for large bore, Class 1 valves at the plant.