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

February 14, 2022

Steven M. Snider
Site Vice President, Oconee Nuclear Station
Duke Energy Carolinas, LLC
7800 Rochester Highway
Seneca, SC 29672-0752

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 – REPORT FOR THE AGING MANAGEMENT AUDIT REGARDING THE SUBSEQUENT LICENSE RENEWAL APPLICATION REVIEW (EPID NO. L-2021-SLR-0000)

Dear Mr. Snider:

By letter dated June 7, 2021 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML21158A193), as supplemented by letters dated October 22, 2021 (ADAMS Accession No. ML21295A035), October 28, 2021 (ADAMS Accession No. ML21302A208), November 11, 2021 (ADAMS Accession No. ML21315A012), December 2, 2021 (ADAMS Accession No. ML21336A001), December 15, 2021 (ADAMS Accession No. ML21349A005), December 17, 2021 (ADAMS Accession No. ML21351A000), January 7, 2022 (ADAMS Accession No. ML22010A129), and January 21, 2022 (ADAMS Accession No. ML22021A000), Duke Energy Carolinas, LLC (Duke Energy or the applicant) submitted an application for the subsequent license renewal (SLR) of Renewed Facility Operating License Nos. DPR-38, DPR-47, and DPR-55 for the Oconee Nuclear Station, Units 1, 2, and 3 to the U.S. Nuclear Regulatory Commission (NRC). Duke Energy submitted the application pursuant to Title 10 of the *Code of Federal Regulations* Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," for SLR.

The NRC staff completed its aging management audit from July 26, 2021 – October 8, 2021, in accordance with the audit plan (ADAMS Accession No. ML21196A076). The audit report is enclosed.

If you have any questions, please contact me by e-mail at Angela.Wu@nrc.gov.

Sincerely,


Signed by Wu, Angela
on 02/14/22

Angela Wu, Project Manager
License Renewal Projects Branch
Division of New and Renewed Licenses
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270 and 50-287

Enclosure:
Audit Report

cc w/encl: Listserv

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 – REPORT FOR THE AGING MANAGEMENT AUDIT REGARDING THE SUBSEQUENT LICENSE RENEWAL APPLICATION REVIEW (EPID NO. L-2021-SLR-0000) DATED: FEBRUARY 14, 2022

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Paul.Guill@duke-energy.com
Reene.Gambrell@duke-energy.com
Arun.Kapur@duke-energy.com

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OFFICE	PM:NRLP:DNRL	LA:NRLP:DNRL	BC:NPHP:DNRL	BC:NCSG:DNRL	BC:NVIB:DNRL
NAME	AWu	SGreen	MMitchell	SBloom	ABuford
DATE	2/3/21	2/8/21	11/1/21	12/6/21	1/20/22
OFFICE	BC:ESEB:DEX	BC:EENB:DEX	BC:SFNB:DSS	BC:NRLP:DNRL	PM:NRLP:DNRL
NAME	JColaccino	JJohnston	RLukes	LGibson	AWu
DATE	11/1/21	11/19/21	11/8/21	2/14/22	2/14/22

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AUDIT REPORT

Aging Management Audit

Oconee Nuclear Station, Units 1, 2, and 3
Subsequent License Renewal Application

July 26, 2021 – October 8, 2021

Division of New and Renewed Licenses
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission

Enclosure

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
DIVISION OF NEW AND RENEWED LICENSES

Docket Nos: 50-269, 50-270 and 50-287

License No: DPR-38, DPR-47, and DPR-55

Licensee: Duke Energy Carolinas, LCC (Duke Energy)

Facility: Oconee Nuclear Station (ONS), Units 1, 2, and 3

Location: Rockville, Maryland

Dates: July 26, 2021 – October 8, 2021

Approved By: Steven D. Bloom, Chief
Corrosion and Steam Generator Branch
Division of New and Renewed Licenses

Angie R. Buford, Chief
Vessels and Internals Branch
Division of New and Renewed Licenses

Joseph Colaccino, Chief
Structural, Civil, Geotech Engineering Branch B
Division of Engineering and External Hazards

Lauren K. Gibson, Chief
License Renewal Projects Branch
Division of New and Renewed Licenses

Jeanne A. Johnston, Chief
Long-Term Operations and Modernization Branch
Division of Engineering and External Hazards

Scott T. Krepel, Chief
Nuclear Systems Performance Branch
Division of Safety Systems

Robert G. Lukes, Chief
Nuclear Methods and Fuel Analysis Branch
Division of Safety Systems

Matthew A. Mitchell, Chief
Piping and Head Penetrations Branch
Division of New and Renewed Licenses

Jennifer Whitman, Chief
PRA Licensing Branch B
Division of Risk Assessment

Brian D. Wittick, Chief
Containment & Plant Systems Branch
Division of Safety Systems

Reviewers:	Name	Organization
	Naeem Iqbal	PRA Licensing B (APLB)/Division of Risk Assessment
	Thinh Dinh	APLB/DRA
	Duc Nguyen	Long Term Operations & Modernization Branch (ELTB)/Division of Engineering and External Hazards (DEX)
	Matthew McConnell	ELTB/DEX
	Jorge Cintron	ELTB/DEX
	Gurcharan (Singh) Matharu	ELTB/DEX
	Hari Kodali	ELTB/DEX
	Andrew Prinaris	Structural, Civil, Geotech Engineering (ESEB)/DEX
	Bryce Lehman	ESEB/DEX
	George Thomas	ESEB/DEX
	George Wang	ESEB/DEX
	Juan Lopez	ESEB/DEX
	Ata Istar	ESEB/DEX
	Zuhan Xi	ESEB/DEX
	Andrew Johnson	Corrosion and Steam Generator (NCSG)/New and Renewed Licenses (DNRL)
	Brian Allik	NCSG/DNRL
	Gregory Makar	NCSG/DNRL
	James Gavula	NCSG/DNRL
	Leslie Terry	NCSG/DNRL
	Lydiana Alvarado	NCSG/DNRL
	Matthew Yoder	NCSG/DNRL
	Paul Klein	NCSG/DNRL
	Tony Gardner	NCSG/DNRL
	David Pratt	NCSG/DNRL
	Ali Rezai	Piping and Head Penetrations (NPHP)/DNRL
	Bart Fu	NPHP/DNRL
	Eric Reichelt	NPHP/DNRL
	Jay Collins	NPHP/DNRL
	John Honcharik	NPHP/DNRL
	Roger Kalikian	NPHP/DNRL
	Seung Min	NPHP/DNRL
	Carolyn Fairbanks	Vessels and Internals (NVIB)/DNRL
	Isaac Anchondo-Lopez	NVIB/DNRL
	David Dijamco	NVIB/DNRL
	Jim Medoff	NVIB/DNRL
	Joel Jenkins	NVIB/DNRL

On Yee	NVIB/DNRL
Gordon Curran	Containment and Plant Systems (SCPB)/Division of Safety Systems (DSS)
Brian Lee	SPCB/DSS
Nageswara Karipineni	SCPB/DSS
Chang Li	SCPB/DSS
Steve Jones	SCPB/DSS
Angelo Stubbs	SCPB/DSS
Christopher Jackson	Nuclear Systems Performance (SNSB)/DSS
Ben Parks	Nuclear Methods and Fuels (SFNB)/DSS
Joey Messina	SFNB/DSS
Angela Wu	License Renewal Projects Branch (NLRP)/DNRL
Marieliz Johnson	NLRP/DNRL
Bill Rogers	NLRP/DNRL

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ACRONYMS

ALE	adverse localized environment
ADAMS	Agencywide Documents Access and Management System
AFW	auxiliary feedwater
AMP	aging management program
AMR	aging management review
ASME	American Society of Mechanical Engineers
BA	boric acid
BACC	boric acid corrosion control
BFB	baffle-former-bolts
BB	baffle-to-baffle
CASS	Cast Austenitic Stainless Steel
CFR	Code of Federal Regulations
CLB	current licensing basis
CB	core barrel
CB-F	core barrel-to-former
CID	changes in dimension
CRGT	control rod guide tube
CSS	core support shield
CR	condition report
CRDM	control rod drive mechanism
CRGT	control rod guide tube
CUF	cumulative usage factor
CUF_{en}	environmentally-adjusted cumulative usage factor
DM	dissimilar metal
dpm	drops per minute
EAF	Environmentally-Assisted Fatigue
EFPY	effective full power years
EPRI	Electric Power Research Institute
FAC	Flow-Accelerated Corrosion
FE	Further Evaluation
FERC	Federal Energy Regulatory Commission
FD	flow distributor
FMP	fatigue monitoring program
ft-lb	foot-pound

GALL-SLR	NUREG-2191, “Generic Aging Lessons Learned for Subsequent License Renewal”
HELB	high energy line break
I&E	inspection and evaluation
IA	instrument air
IASCC	irradiation-assisted stress corrosion cracking
IMI	incore monitoring instrumentation
ISR/IC	irradiation-enhanced stress relaxation or creep
IE	irradiation embrittlement
ISG	Interim Staff Guidance
ISI	inservice inspection
LAR	license amendment request
LBB	leak-before-break
LDs	locking devices
LWs	locking welds
LOFT	loss of fracture toughness
LOM	loss of material
LOP	loss of preload
LCB	lower core barrel
LGA	lower grid assembly
LTS	lower thermal shield
LR	license renewal
LTOP	low temperature overpressure protection
MLDs	modified locking devices
MOV	motor operated valve
MRP	materials reliability program
mV	milliVolt
NAM	no additional measures
NDE	nondestructive examination
NEI	Nuclear Energy Institute
NRC	U.S. Nuclear Regulatory Commission
NSSS	nuclear steam supply system
OBE	operating basis earthquake
OLDs	original locking devices
OpE	operating experience
P-T	pressure-temperature
PTS	Pressurized Thermal Shock

PWR	pressurized-water reactor
PWSCC	primary water stress corrosion cracking
RAI	request for additional information
RCI	request for confirmation of information
RCP	reactor coolant pump
RIS	regulatory issue summary
RPV	reactor pressure vessel
RT_{NDT}	reference temperature nil ductility
RT_{PTS}	reference temperature for pressurized thermal shock
RV	reactor vessel
RVI	reactor vessel internal
SCC	stress corrosion cracking
SE	safety evaluation
SER	safety evaluation report
SG	steam generator
SLR	Subsequent License Renewal
SLRA	subsequent license renewal application
SRP-SLR	NUREG-2192, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants”
SWGR	switchgear
TE	thermal aging embrittlement
TLAA	Time-Limited Aging Analyses
UFSAR	Updated Final Safety Analysis Report
UCB	upper core barrel
UGA	Upper Grid Assembly
USE	upper-shelf energy
UT	ultrasonic testing
UTS	upper thermal shield
VS	void swelling
VT	visual examination
VV	vent valve
WO	work order
WOL	weld overlay

Report for the Aging Management Audit Oconee Nuclear Station, Units 1, 2, and 3 Subsequent License Renewal Application

1. Introduction

The U.S. Nuclear Regulatory Commission (NRC) staff conducted an aging management audit of Duke Energy Carolinas, LLC (Duke Energy, applicant) (1) plant-specific operating experience (OpE), (2) methodology to identify the systems, structures, and components (SSCs) to be included within the scope of license renewal and subject to an aging management review (AMR) (Scoping and Screening Portion), and (3) aging management programs (AMPs), AMR items, Time-Limited Aging Analyses (TLAA) and associated bases and documentation as applicable (AMP and TLAA Portion) for the subsequent license renewal (SLR) of Renewed Facility Operating License Nos. DPR-38, DPR-47, and DPR-55 for Oconee Nuclear Station (ONS), Units 1, 2, and 3.

The purpose of the plant-specific OpE portion of the audit is to identify examples of age-related degradation, as documented in the applicant's corrective action program database. Duke Energy searched their OpE database and provided the results for the associated AMPs and TLAAs for NRC staff review. Additional word searches were performed by Duke Energy upon NRC staff's request, and the results were provided to the NRC staff for review.

The purpose of the Scoping and Screening Portion of the audit is to evaluate the scoping and screening process as documented in the license renewal application, implementing procedures, reports, and drawings, such that the NRC staff:

- Obtains an understanding of the process used to identify the SSCs within the scope of license renewal and to identify the structures and components subject to an AMR.

- Has sufficient docketed information to allow the staff to reach a conclusion on the adequacy of the scoping and screening methodology as documented and applied.

The purpose of the AMP and TLAA Portion of the audit is to:

- Examine Duke Energy's AMPs, AMR items, and TLAAs for ONS;

- Verify Duke Energy's claims of consistency with the corresponding NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," issued in July 2017, AMPs, and AMR items; and

- Assess the adequacy of the TLAAs.

Enhancements and exceptions will be evaluated on a case-by-case basis. The NRC staff's review of enhancements and exceptions will be documented in the safety evaluation report (SER).

The regulatory bases for the audit was Title 10 of the *Code of Federal Regulations (*10 CFR) Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." The staff also considered the guidance contained in NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (SRP-SLR), dated July 2017, and NUREG-2191. The SRP-SLR allows an applicant to reference in its license

renewal application the AMPs described in GALL-SLR Report. By referencing the GALL-SLR Report AMPs, the applicant concludes that its AMPs correspond to those AMPs reviewed and approved in the GALL-SLR Report and that no further staff review is required. If an applicant credits an AMP for being consistent with a GALL-SLR Report program, it is incumbent on the applicant to ensure that the plant program contains all of the elements of the referenced GALL-SLR Report program. The applicant should document this determination in an auditable form and maintain the documentation on-site.

2. Audit Activities

A regulatory audit is a planned, license-related activity that includes the examination and evaluation of primarily non-docketed information. A regulatory audit is conducted with the intent to gain greater understanding of an application, to verify information, and, if applicable, to identify information that will require docketing to support the staff's conclusions that form the basis of the licensing or regulatory decision.

Licensing conclusions or staff findings are not made in the audit reports since licensing and regulatory decisions cannot be made solely based on an audit. Therefore, items identified but not resolved within the scope of the audit will be followed using other NRC processes, such as requests for additional information (RAIs), requests for confirmation of information (RCIs), and public meetings. Licensing conclusions, staff findings, and resolution of audit items will be documented in the staff's SER.

The following sections discuss the subsequent license renewal application (SLRA) areas reviewed by the staff.

SLRA AMP B2.1.1, American Society of Mechanical Engineers (ASME) Section XI Inservice Inspection (ISI), Subsections IWB, IWC, and IWD

Summary of Information in the Application. The SLRA states that AMP B2.1.1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD." To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the enhancements associated with this AMP. The staff will document its review of the enhancements in the SER. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this enhanced program, and the staff's audit addressed the program elements described in the applicant's basis documents.

Audit Activities. During its audit, the staff interviewed the applicant's staff, and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicants methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP Evaluation Report	Revision 1
OISI-0169.10-0050-N-716-1	ONS, Fifth Interval Inservice Inspection (ISI) NDE Plan - Risk Informed ISI Basis Calculations for Code Case N-716-1	Revision 2
ON SD 2.1.9	S.D.2.1.9 – ASME Section XI Repair/Replacement	Revision 8 08/11/2020
OISI-0169.20-0050-PTPLAN	ONS–Fifth Inspection Interval Inservice Inspection PT (Pressure Test) Plan–General Requirements Unit 1, 2, and 3	Revision 5 06/08/2020
OISI-0169.10-0050-BASIS DOC	ONS Units 1, 2, and 3 ASME Section XI Program Basis Document for the 5th Inservice Inspection Interval	Revision 001 05/28/2020
OISI-0169.10-0050-AUG-ISI	ONS – Augmented Inservice Inspection NDE Plan – General Requirements and Units Detail Listing	Revision 6 06/10/2020
SLR-ONS-OPEX-0100	ONS Units 1, 2, and 3 - Subsequent License Renewal Operating Experience Review Methodology and Results	Revision 4
AR02337960	Swaglock “T” Near 1CS-IV-0097 Has Large Amount of Boric Acid Accumulation	07/05/2020
AR01905753	Unit 1 RCS Pressure Boundary Leak at 1B2 HPI Injection Nozzle	11/12/2013
AR01909501	During Thermal Fatigue extent of condition examinations for RCE O-13-13168 examination of 1B2 Cold Leg Drain, 1RC-261-Elbow, ASME Code Rejectable Indications Were Detected	11/13/2014
Met Lab Report 5319	ONS 1B2 Cold Leg Drain Line	01/15/2015
AR01871219	Unit 1 RB Tour Results (Mode 3)	11/04/2014
AR01850482	Unit 1 Forced Outage Mode 3 Hot Shutdown Tour was performed at Approximately 1600 on 11/11/13	11/12/2013
AR02166287	QC Identified 3 Linear Indications on the 90° socket weld Fitting at Weld 2-RC-01460-14	11/16/2017
Met Lab Report #5771	ONS 2A2 RCP Injection Line Elbow Indications	01/15/2018
AR02024220	Results from RV Head Penetration ISI Visual Examination	04/27/2016
Met Lab Report #5555	ONS 3 – Reactor Head Smear Analysis	04/29/2016
AR01947660	Heat Exchanger Lifecycle Management	08/27/2015
L-20021-001	BWXT Nuclear Energy, Inc., Report to Duke: “Examination of a Leaking Letdown Cooler from Oconee Unit 3”	07/2015
AR01875841	Areas of Scanning Coverage Limitations Encountered During UT	11/19/2014
AR01794996	Independent Assessment of Oconee 3EOC24 Selected Shutdown Issues Assessment	06/18/2009

During the audit, the staff verified the applicant’s claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP, or will be consistent after implementation of the identified enhancements.

During the audit of the “operating experience” program element, the staff independently searched the plant-specific database to identify any previously unknown or recurring aging effects. The staff will evaluate the identified plant-specific OpE in the SER.

During the audit, the staff observed that the ONS letdown coolers which were subject to aging management review during initial license renewal are not subject to aging management review in the SLRA. The staff held discussions with the applicant related to ONS letdown coolers during the audit. The staff found that additional information may be needed for further evaluation on the letdown coolers, and will consider issuing an RAI.

The staff also audited the description of the SLRA AMP provided in the Updated Final Safety Analysis Report (UFSAR) Supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report/SRP-SLR.

SLRA AMP B2.1.2, Water Chemistry

Summary of Information in the Application. The SLRA states that AMP B2.1.2, "Water Chemistry" is an existing program with enhancements that is consistent with the program elements in GALL-SLR Report AMP XI.M2, "Water Chemistry," as modified by SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance," dated February 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20181A434). To verify this claim of consistency, the staff audited the SLRA AMP. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M2	Water Chemistry AMP Evaluation Report (GALL-SLR Program XI.M2)	Revision 1
AD-CP-PWR-0001	Primary Water Chemistry Program	Revision 2
AD-CP-PWR-0002	Secondary Water Chemistry Program	Revision 1
AD-CP-ALL-0011	Chemistry Startup Program	Revision 0
AD-CP-ALL-1000	Conduct of Chemistry	Revision 6
CSD-CP-ONS-0001	Oconee Primary Chemistry Strategic Plan	Revision 5
CSD-CP-ONS-0002	Oconee Secondary Water Chemistry Strategic Plan	Revision 1
AD-CP-ALL-0008	Chemistry Data Review Program	Revision 3
AR 02243692	Unit 1 Feedwater Sodium Exceeded EPRI Action Level 2	11/14/2018
AR 02300094	Self Assessment AFI: Commenting of Out of Control QA Checks	10/30/2019
AR 02307069	Unit 2 Lithium outside pHt 6.9 limit for criticality	12/11/2019

AR 01818330	Letdown Cooler Reliability is not consistent with overall station importance	01/26/2011
AR 01856672	RCS to CC Leakage is causing challenges in	07/10/2014
AR 01874317	U2 CC System has exceeded the Chemistry administra	11/13/2014
AR 01909374	2014 INPO Plant Evaluation – AFI – Materials Relia	10/23/2014

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

During the audit, the staff observed that the applicant's GALL-SLR consistency statement in the SLRA refers to enhancements, but the staff identified no enhancements to the Water Chemistry program. In response to a staff breakout question during the audit, the applicant deleted the reference to enhancements in a revised GALL-SLR consistency statement in Attachment 7 of SLRA Supplement 1 (ADAMS Accession No. ML21302A208).

The staff also audited the description of the SLRA Water Chemistry program provided in the UFSAR supplement in Appendix A of the SLRA. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.3, Reactor Head Closure Stud Bolting

Summary of Information in the Application. The SLRA states that AMP B2.1.3, "Reactor Head Closure Stud Bolting," is an existing program with enhancements and exceptions that will be consistent with the program elements in GALL-SLR Report AMP XI.M3, "Reactor Head Closure Stud Bolting." To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the exceptions and enhancements associated with this AMP. The staff will document its review of the exceptions to the GALL-SLR Report AMP and the enhancements in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M3	Oconee Nuclear Station, Units 1, 2, and 3 – Reactor Head Closure Stud Bolting AMP Evaluation Report (GALL-SLR Program XI.M3)	Revision 1
Duke responses to breakout questions: file *Breakout Ques TRP 3 RPV Closure Head Studs Duke Resp FINAL Sept 15 2021.pdf*	Oconee SLRA: Breakout Session Questions – TRP 3: Reactor Head Closure Stud Bolting, SLRA Section B2.1.3 – Technical Reviewer: David Dijamco	N/A
Duke responses to breakout questions with follow-up response to question 4.c: file *Breakout Ques TRP 3 RPV Closure Head Studs Duke Resp Revised Sept 19 2021.pdf*	Oconee SLRA: Breakout Session Questions – TRP 3: Reactor Head Closure Stud Bolting, SLRA Section B2.1.3 – Technical Reviewer: David Dijamco	N/A
NRC Regulatory Guide 1.65	Materials and Inspections for Reactor Vessel Closure Studs	Revision 1
AR 01806638	Engineering evaluation of damage to Reactor Vessel Head stud	04/13/2011
AR 02024538	Indication – Washer for Reactor Head Stud #9	04/28/2016
Dominion Engineering Calculation R-3181-003	Reactor Vessel Bolting Evaluations – Oconee Units 1, 2, and 3	Revision 0 01/1996
PIP O-13-15069	Notification of differences between performance demonstration initiative and ASME Code, Section XI, Appendix VIII, Supplement 8	12/29/2013
EPRI NP-5769, Volume 2	Degradation and Failure of Bolting in Nuclear Power Plants	04/1988
RIS 2015-01	NRC Regulatory Issue Summary 2015-01 – Qualification Requirements For Bolt and Stud Non-Destructive Examinations (ADAMS Accession No. ML14169A612)	01/29/2015
Interim bolting protocol for PDI	Performance Demonstration Initiative (PDI): Site Demonstration Protocol for Bolting	Revision A 02/06/2015

During the audit, the staff verified the applicant's claim that the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

The staff noted the exceptions to the "preventive actions" and "corrective actions" program elements and verified the applicant's claim that the aspects of these two program elements not associated with the exceptions identified in the SLRA are consistent with the corresponding program elements in the GALL-SLR Report AMP or will be consistent after implementation of the enhancements stated in the SLRA.

In addition, the staff found that for the exception in the “preventive actions” program element, the staff will consider issuing an RAI in order to obtain the information necessary to verify whether the exception to the program element is acceptable.

During the audit the staff made the following observations:

- In SLR-ONS-AMPR-XI.M3, Revision 1, the applicant stated that Oconee uses double washer configuration for the reactor closure head assembly with no bushings.

- In the responses to the audit breakout questions, the applicant stated that there were no indications or issues identified during the last volumetric examinations performed, as required by Subsection IWB-2500 of ASME Code Section XI, for the 60 reactor closure head studs (Examination Category B-G-1, item No. B6.20) and the 60 threads-in-flange (Examination Category B-G-1, item No. B6.40) of each Oconee unit. The last item No. B6.20 examinations were performed in October 2020, November 2015, and May 2016 for Oconee Units 1, 2, and 3, respectively. The last item No. B6.40 examinations were performed in October 2006, May 2007, and May 2006 for Oconee Units 1, 2, and 3, respectively. By letter dated December 26, 2017 (ADAMS Accession No. ML17331A086), the NRC authorized deferment of the item No. B6.40 examinations for the fifth ISI interval.

- In Appendix D and Appendix E of Dominion Engineering Calculation R-3181-003, the applicant evaluated the thread damage in the reactor head closure studs summarized in OpE 1 in SLRA Section B2.1.3.

- The staff noted that in SLR-ONS-AMPR-XI.M3, Revision 1, some of the ultimate strength data of the material heat applicable to the ONS Unit 1 reactor closure head studs were greater than the value specified in the GALL-SLR report for existing studs. Similarly, some of the ultimate strength data of the material heat applicable to the ONS Unit 2 reactor closure head studs were greater than the value specified in the GALL-SLR report.

- In document PIP O-13-15069, the applicant described the actions performed to evaluate EPRI Nondestructive Evaluation Program Letter 2013 -09, *“*ALERT: Notification of Noncompliance, Performance Demonstration Initiative (PDI) – Implementation of Bolting Qualifications not in compliance with ASME Code, Appendix VIII, Supplement 8,” dated December 18, 2013, as described in OpE 3 in SLRA Section B2.1.3. This alert and NRC Regulatory Issue Summary (RIS) 2015-01 describe discrepancies between the PDI examination program used for the Oconee reactor closure head studs and the examination requirements in ASME Code Section XI, Appendix VIII, Supplement 8.

- In SLRA Section B2.1.3, the applicant stated that the volumetric examinations on the reactor closure head studs of all Oconee units were reperformed and no relevant indications were identified. In the responses to the audit breakout questions posted in the ePortal, the applicant stated that the volumetric examinations that were reperformed closed the discrepancies between the PDI examination program and examination requirements in ASME Code Section XI, Appendix VIII, Supplement 8. Additionally, the applicant stated it has updated its PDI program procedures to comply with ASME Code Section XI, Appendix VIII, Supplement 8 and to reference ASME Code Case N-845, “Qualification Requirements for Bolts and Studs.” Code Case N-845 is an acceptable code case for use without conditions per Regulatory Guide (RG) 1.147, Revision 19.

The staff also audited the description of the SLRA Reactor Head Closure Stud Bolting AMP provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.4, Boric Acid Corrosion

Summary of Information in the Application. The SLRA states that AMP B2.1.4, "Boric Acid Corrosion," is an existing program that is consistent with the program elements in GALL-SLR Report AMP XI.M10, "Boric Acid Corrosion." Issues identified but not resolved in this report will be addressed in the SER.

Audit Activities. To verify its consistency, the staff audited the AMP using in-office technical reviews of the SLRA and information contained in the applicant's ePortal, in conjunction with in-office breakout sessions. No on-site audit activities of OpE or visual observations of areas, equipment conditions, or configurations were conducted for this AMP.

During the audit, the staff interviewed the applicant's staff and reviewed the following documents that were found relevant to the Boric Acid Corrosion program. These documents were provided by Duke Energy or were identified in the staff's review of OpE provided on the ePortal. The staff will document its review of relevant OpE in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M10	Oconee Nuclear Station Units 1, 2, and 3, Boric Acid Corrosion AMP Evaluation Report	Revision 1
SLR-ONS-OPEX-0100	Oconee Nuclear Station Units 1, 2, and 3, Subsequent License Renewal Operating Experience Review Methodology and Results	Revision 4
N/A	BACC List – ONS (1-1-2020 thru 9-13-2021)	09/13/2021
PD-EG-PWR-1611	Boric Acid Corrosion Control Program	Revision 1
AD-EG-PWR-1611	Boric Acid Corrosion Control Program – Implementation	Revision 2
AD-MN-ALL-0006	Fluid Leak Management	Revision 2
AR02336986	AMP Effectiveness Reviews per AD-EG-ALL-1650 and AD-EG-ONS-1650	06/25/2020
AR02325266	Engineering Boric Acid Evaluation	04/14/2020
AR02183573	Active / Excessive Boric Acid Leak	04/4/2018
AR02173332	2C HPI Pump Shaft Has Active Boron Leak	12/20/2017
AR01905621	Remote Video Inspection of Unit 2 Deborating Demineralizer Manway	06/13/2013

During the audit, the staff verified Duke's statements 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

During the audit of the "operating experience" program element, the staff reviewed the plant-specific information associated with this AMP, which was provided by the applicant on its ePortal. The staff will evaluate the identified plant-specific OpE in the SER.

The staff also reviewed the summary description of the program provided in SLRA Appendix A, "UFSAR Supplement," Section A2.4, "Boric Acid Corrosion." The staff verified this description is consistent with the corresponding program description in GALL-SLR Report Table XI-01.

SLRA AMP B2.1.5, Cracking of Nickel Alloy Components and Loss of Material Due to Boric Acid Induced Corrosion in Reactor Coolant Pressure Boundary Components

Summary of Information in the Application. The SLRA states that AMP B2.1.5, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components," is an existing program that is consistent with the program elements in GALL-SLR 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." To verify this claim of consistency, the staff audited the SLRA AMP.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. The staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M11B	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components AMP Evaluation Report. This report serves as technical basis document.	Revision 1
AD-EG-ALL-1630	Alloy 600 Program Implementation – The applicant has periodically updated its fleet program to support evolving Alloy 600 inspection and mitigation for better management of a susceptibility to primary water stress corrosion cracking (PWSCC) degradation.	Revision 2 / 03/28/2019
AR 02248993	This discusses a correction action program to review Regulatory Issue Summary (RIS) 2018-06, "Clarification of the Requirements for Reactor Pressure Vessel Upper Head Bare Metal Visual Examinations," and update applicant's fleet procedures for performing the bare metal visual examination of vessel upper head.	12/14/2018

Document	Title	Revision / Date
AR 01566581	This discusses a correction action program to evaluate industry OE regarding the axial flaws in Alloy 82/182 dissimilar metal (DM) weld that the ultrasonic testing (UT) did not detect but later were discovered during machining of a pressurized water component. The applicant made program enhancement to its fleet's UT of DM welds in accordance with the latest industry guidance in Electric Power Research Institute (EPRI) Technical Report 1018181, "Nondestructive Evaluation: Guideline for Conducting Ultrasonic Examinations of Dissimilar Metal Welds."	05/2012
AR 02048732-05	The applicant performed an Alloy 600 program self-assessment to review programmatic, industry, and regulatory compliance. No gabs were noted.	10/2016
OISI-0169.10-0050-AUG-ISI	Oconee Nuclear Station – Augmented Inservice Inspection NDE [Nondestructive Examination] Plan – General Requirements and Units Detail Listing	6/10/2020
CSD-CP-ONS-0001	Oconee Primary Chemistry Strategic Plan	Revision 5 / 8/7/2019
AR02307465	MRP-384 Revision 1 Released: EPRI Report #3002017288, "Materials Reliability Program: Guideline for Nondestructive Examination of Reactor Vessel Upper Head Penetrations, Revision 1 (MRP-384)"	12/16/2019
NDE-NE-ALL-001	Level III Oversight of Complex NDE	9/10/2020
AR00759793, Assignment 24	RIS 2015-10, "Applicability of ASME Code Case N-770-1 as Conditioned in 10 CFR 50.55a, "Codes and Standards," to Branch Connection Butt Welds"	11/24/2015

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

During the audit, the staff made the following observations:

- From review of the program basis document, the staff verified that this document provides supporting evidence that a replacement or mitigation of the components made of Alloy 600/82/182 with Alloy 690/52/152 materials accompanied by an augmented inservice inspection (ISI) performed as part of this AMP has been effective in mitigating and detecting the primary water stress corrosion cracking (PWSCC) degradation in the nickel-alloy welds and components as well as identifying the presence of boric acid residues. As an example, the Oconee, Units 1, 2, and 3 original reactor vessel heads made of Alloy 600/82/182 materials were replaced with Alloy 690/52/152 materials. Alloy 690/52/152 is known to be less susceptible to PWSCC. The applicant has utilized ASME Code Case N-853, "PWR Class 1 Primary Piping Alloy 600 Full Penetration Branch Connection Weld Metal Buildup for Material Susceptible to Primary Water Stress Corrosion Cracking Section XI, Division 1," to mitigate several Alloy 600 small-bore branch connection nozzle welds at Oconee, Units 1, 2, and 3. The staff's review of Oconee's OE revealed no PWSCC degradations or boric acid residues on the nickel-alloy welds and components.

- The staff's review of Oconee OpE revealed that the applicant made an enhancement to its fleet nondestructive examination (NDE) practices to include the latest industry guidance and best practices developed for the ultrasonic examinations of DM welds based on lessons learned from the 2012 industry OpE in an effort to improve the overall UT reliability. This latest industry guidance for the DM welds examinations are to be implemented under Nuclear Energy Institute (NEI) 03-08 implementation criteria.

- The staff noted that the applicant has reviewed RIS 2018-06 for applicability to their Alloy 600 management plan at Oconee, Units 1, 2, and 3.

- The staff interviewed the applicant and verified that the applicant has reviewed RIS 2015-10 for applicability to Oconee, Units 1, 2, and 3. The applicant provided documentation to confirm its implementation at Oconee.

- From interviewing the applicant, the staff verified that the applicant has reviewed the guidance in Electric Power Research Institute (EPRI) Report 3002017288, "Materials Reliability Program: Guideline for Nondestructive Examination of Reactor Vessel Upper Head Penetrations, Revision 1 (MRP-384)," as required under NEI 03-08 implementation criteria, and has implemented the guidance at Oconee, Units 1, 2, and 3. The applicant provided documentation to confirm the guidance implementation at Oconee.

The staff also audited the description of the SLRA Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR.

SLRA AMP B2.1.6, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)

Summary of Information in the Application. The SLRA states that AMP B2.1.6, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel," is a new condition monitoring program that will be consistent with the program elements in GALL-SLR Report AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel." To verify this claim of consistency, the staff audited the SLRA AMP.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and documentation provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal. Furthermore, the staff conducted additional OpE searches on the applicant's CAP database.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPRXI.M12	SLR-ONS-AMPR-XI.M12 Thermal Aging Embrittlement of CASS	Revision 1
NCR02227944	Effective Review Plan	02/28/2019
AR02206577	VT-2 3351-19 Leaks	05/05/2018
NCR01783988	Inspection of Unit 2 Pressurizer Heat Insulation Indicates Repairs	05/03/2018
NCR01875860	Examination of CASS Nozzle to Stainless Steel Safe-End Weld	11/20/2014

During the audit, the staff verified the applicant's claim that the "scope of program," "preventive actions," "parameters monitored or inspected," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

For the audit of the "operating experience" program element, the staff reviewed the OpE provided by the applicant in the AMP basis document and on the ePortal. The staff performed a search of the OpE database using keywords: "flaw tolerance evaluation," "N-481," "pump casing," "weld overlay," "CF8M," "thermal aging," "surge nozzle examination," "embrittlement," "CASS" and "cast stainless steel." The staff will document its review of relevant OpE in the SER.

The staff also audited the description of the SLRA AMP provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.7, Pressurized Water Reactor (PWR) Vessel Internals

Summary of Technical Information in the Application. The SLRA states that AMP B2.1.7, "PWR Vessel Internals" is an existing program that, with an enhancement, will be consistent with the program elements in GALL-SLR Report AMP XI.M16A, "PWR Vessel Internals," as updated in NRC Interim Staff Guidance (ISG) No. SLR-ISG-2021-01-PWRVI. To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the enhancement associated with this AMP. The staff will document its review of the enhancement in the SER. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this enhanced program, and the staff's audit addressed only addressed the status of the applicant's AMP, as modified by the results of the applicant's gap analysis prior to incorporation of the program elements of the AMP into the implementation procedures for the AMP. The staff will address issues identified but not resolved in this audit report or more complex RVI management issues in the staff evaluation of SLRA AMP B2.1.7, "PWR Vessel Internals Program" (including the gap analysis impact on the I&E protocols of the AMP) in the SER.

Appropriate Background Information. The applicant's AMP is defined as a living, sampling-based condition monitoring program that is based on the latest staff-approved version of EPRI Materials Reliability Program (MRP) Report MRP-227, and any industry supplemental guidelines issued and used to supersede or supplement the inspection and evaluation guidelines in MRP-227. The applicant implements the program in accordance with the industry

initiative protocols in the most recent version of NEI Report No. NEI 03-08 and the implementation guidance in Chapter 7 of the current version of MRP-227 being used for the AMP. The staff reviewed the basis for the applicant's categorizing of components using the EPRI MRP's interactive functionality analysis and failure modes, effects, and critical analysis bases for ranking the components for inspection, as defined in Chapter 2 of MRP-227.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date[1]
Updated Final Safety Analysis Reports Sections		
ONS Updated Final Safety Analysis Report	Section 4.5.1, "Reactor Vessel Internals"	12/31/2019
ONS Updated Final Safety Analysis Report	Section 4.5.4, "Internals Tests and Inspections"	12/31/2019
ONS Updated Final Safety Analysis Report	Section 4.5.5, "Internals Vent Valves Tests and Inspections"	12/31/2019
Applicable SLRA Sections		
SLRA Appendix A, UFSAR Supplement Section A2.7	PWR Vessel Internals	Revision 0
SLRA Appendix B, AMP Section B2.1.7	PWR Vessel Internals	Revision 0
SLRA Section 3.1.2.2.9	Aging Management of Pressurized Water Reactor Vessel Internals (Applicable to Subsequent License Renewal Periods Only)	Revision 0
Basis Document Records and Relevant NRC, NEI, EPRI MRP, Vendor, or PWROG Documents		
SLR-ONS-AMPR-XI.M16A	Oconee Nuclear Station, Units 1, 2, and 3, PWR Vessel Internals AMP Evaluation Report (GALL-SLR Program XI.M16A)	Revision 1
EPRI Non-Proprietary Report No. 3002017168	Material Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227, Revision 1-A)	December 2019 (ADAMS Accession No. ML20175A112)
NEI 03-08	Guideline for the Management of Materials Issues	Revision 4, Oct. 2020 (ADAMS Accession No. ML20315A536)
NEI 14-12	Nuclear Energy Institute, Aging Management Program Effectiveness	Revision 0, 12/2014 (ADAMS Accession No. ML15090A665)
NRC Interim Staff Guidance (ISG) No. SLR-ISG-2021-01-PWRVI	Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors	January 2021 (ADAMS Accession No. ML20217L203)
NRC Safety Evaluation for MRP-227, Revision 1-A	Final Safety Evaluation for Electric Power Research Institute Topical Report MRP-227, Revision 1, "Materials Reliability Program: Pressurized Water	04/25/2019 (ADAMS Accession No. ML19081A001)

Document	Title	Revision / Date[1]
	Reactor Internals Inspection and Evaluation Guideline"	
NRC Verification Letter to EPRI MRP	U.S. Nuclear Regulatory Commission Verification Letter for Electric Power Research Institute Report MRP-227, Revision 1, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guideline"	02/19/2020 (ADAMS Accession No. ML20006D152)
EPRI Report No. MRP 2014-009, Parts 1 and 2	Biennial Report of Recent MRP-227-A Reactor Internals Inspection Results	05/12/2014 (ADAMS Accession Nos. ML14135A383, ML14135A384 for Part 1, and ML14135A385 for Part 2)
EPRI Report No. MRP 2016-008	Biennial Report of Recent MRP-227-A Reactor Internals Inspection Results	May 18, 2016 (ADAMS Accession No. ML16144A789)
EPRI Report No. MRP 2020-0155	Biennial Report of Recent MRP-227-A Reactor Internals Inspection Results	08/14/2020 (ADAMS Accession No. ML20229A000)
Framatome Portal Document (on behalf of Duke Energy Carolinas)	TRP 15, PWR Vessel Internals, Oconee SLRA Responses to NRC Breakout Questions 1 – 14 [2]	Revision 0
Framatome Portal Document (on behalf of Duke Energy Carolinas)	TRP 15, PWR Vessel Internals, Oconee SLRA Responses to NRC Breakout Questions 15 – 31 and Follow-Up from 10-1-2021 Breakout [2]	Revision 0
Framatome Proprietary [[XX]]	Oconee-Specific RV Internals Aging Management Strategy Development and Inspection Categorization for SLR	11/11/2021
AREVA Proprietary [[XX]]	RV Internals Fabrication Records Search and Review of Operation for ONS Units	09/13/2010
AREVA Proprietary [[XX]]	Records Search of Selected B&W RV Internals Castings for PWROG	03/05/2010
AREVA Proprietary [[XX]]	B&W 177FA Reactor Internals MRP-175 Screening Parameter Records Search	06/10/2014
Framatome Proprietary [[XX]]	ONS3 Lower Grid-to-IMI Spider Casting Weld B8-YL Indication Fracture Mechanics Analysis	03/12/2018
Framatome Proprietary [[XX]]	One-Cycle Justification for Oconee Unit 1 Baffle-to-Former Bolts	11/05/2020
Framatome Proprietary [[XX]]	Summary of Structural Analysis to Assess Core Barrel Bolt Inspection Results for B&W Plants	08/27/2015
AREVA Proprietary [[XX]]	Oconee RV Internals Clamping Task	10/09/2009
AREVA Proprietary Report No. ANP-3449P	Extension of the Inspection Interval for Select Oconee Nuclear Stations Reactor Vessel Internals Bolts	Revision 0
AREVA Proprietary [[XX]]	Assessment of April 2014 In-Core Instrument (IMI) Guide Tube Spider Inspection Results – Oconee Unit 3	04/30/2014
MRP-227-A Reporting Tables	Tables for ONS Fall 2020 Outage O1R31	Revision 0
B&W Owners Group Report Proprietary No. BAW-1843PA	Evaluation of Internals Bolting Concerns in 177 FA Plants	01/1986
PWROG Non-Proprietary Report No. PWROG-15032-NP	PA-MSC-1288, Statistical Assessment of PWR RV Internals CASS Materials	Revision 0

Document	Title	Revision / Date[1]
		(ADAMS Accession Nos. ML16068A245 and ML16068A246)
Action Requests (ARs)		
AR 01909411	Preparation Needed for Re-examination of Indication Found on Lower Grid Section	11/06/2014
AR 02275269	MRP-2019-017, "Notification of Recent PWR Thermal Shield Attachment Bolting Failures and Flexure Cracking Operating Experience and Recommended Plant Actions"	05/31/2019
AR 02034366-01	MRP 2016-014, "Notification of PWR Baffle-Former Bolt Operation Experience and Recommended Actions"	Revision 1
AR 02307115-01	PWROG019029-P, Revision 0m "Review of B&W-Designed Core Barrel Information for Applicability of St. Lucie Unit 1 Operating Experience"	Revision 1, 11/2019
AR 01850417	Visual Indications Found in Reactor Vessel Vent Valve Jack Screw Locking Cups (NCR)	11/09/2013
AR 01847393	Anomaly Noted During Performance of WO #02078219, Exercise Reactor Vessel Vent Valves in Core Barrel	10/17/2013
AR 01869129	Unusual Indications During Reactor Vessel Vent Valve Inspection	04/19/2014
AR 01830379	Reactor Vessel Vent Valve Has Cracked Jackscrew (Unit 1)	11/10/2012
AR 01870699	Cracklike Indication Discovered During IMI Guide Tube Spider Casting Inspection	04/26/2014
AR 2336986 [3]	Aging Management Program (AMP) Effectiveness Review Template	Revision 19
AR 01847131	INPO PWR Materials Review Visit Report	07/10/2013
AR 02352039	Framatome Customer Service Bulleting (CSB) 20-01, "Post Stress Relief in the B&W Core Barrel Cylinder"	10/06/2020
AR 2355692	Baffle-to-Former Bolt UT Indications Were Detected	No Date Given

Table Notes:

1. For referenced AREVA or Framatome proprietary engineering information records, the referenced dates represent the official vendor managerial sign-off date of the record. For the referenced Framatome calculation summary sheet, the referenced date is the date given in the upper right hand corner on the first page of the calculation sheet.
2. This note corrects a minor administrative error in the titles of these audit portal documents. The applicable NRC Technical Review Package (TRP) assignment for the staff's review of the PWR Vessel Internals AMP and related AMR items is TRP 16, and not TRP 15.
3. AMP Effectiveness report provides a good summary of past RVI component-specific inspections performed at ONS Units 1, 2, 3, and the results of those inspections.

During the audit, the staff verified the applicant's claim that the "scope of program," "preventative actions," parameters monitored," "detection of aging effects," and "corrective actions" program elements of the SLRA AMP as consistent with the corresponding program elements of the GALL-SLR Report AMP, or will be consistent after implementation of the identified enhancements.

In addition, the staff found that, for the "monitoring and trending," "acceptance criteria" program elements of the AMP (as subject to the results of the AMP's gap analysis), sufficient information was not available to determine whether the program elements were consistent with the corresponding program elements in GALL-SLR AMP XI.M16A, as updated in Interim Staff Guidance Report No.SLR-ISG-2021-01-PWRVI. Additionally, the staff found that the impact of the gap analysis could have an impact on the adequacy of the "confirmation process" program element for the AMP because some inspection category or specified "expansion"-link changes

made in the AMP gap analysis would require the applicant to define and establish additional confirmation process controls for the AMP not yet defined or covered by the current MRP-227 or WCAP-17096 report versions used for the AMP. The staff will consider issuing RAIs in order to obtain the information necessary to verify whether these program elements are consistent with the corresponding program elements of the GALL-SLR Report AMP. During the audit, the staff made the following observations relative the program element criteria that are defined for the AMP:

- "Scope of Program" program element: The staff observed that the AMP did not firmly establish all supplemental EPRI MRP or industry guidelines that are within the scope of the AMP (i.e., in addition to reference of MRP-227, Revision 1-A or MRP-189, Revision 3). The staff discussed this matter with the applicant during the audit breakout session on October 1, 2021, for the AMP. During audit breakout session of October 1, 2021, the applicant identified all additional EPRI MRP interim or Framatome guidelines that are being applied to the scope of the AMP; the staff confirmed that the applicant placed these reports and guidelines onto the audit portal for the SLRA and the reports and guidelines are specified in the document list above. This matter is closed for the audit.

- "Scope of Program," Parameters Monitored or Inspected," "Detection of Aging Effect," "Monitoring and Trending," "Acceptance Criteria," and Corrective Actions," and "Administrative Controls" program elements: The staff observed that the AMP did not identify whether Westinghouse Non-Proprietary Class 3 WCAP-17096 is within the scope of the AMP and used for component-specific data analysis monitoring criteria and acceptance bases for the AMP (and if applied to the AMP, it was not clear which version of the report is being applied to the AMP). The staff discussed this matter with the applicant during the audit breakout session on October 21, 2021 for the AMP. The applicant confirmed that it is applying the latest staff-approved version of WCAP-17096 (currently Revision 2-A) for the scope of the AMP. This matter is closed for the audit.

During the audit, the staff made the following observations related to the methodology for the gap analysis performed in the AMP and the component-specific gap analysis results in the AMP, as defined in SLRA AMP B2.1.7:

- The staff observed that the applicant did not include a formal gap analysis in SLRA Appendix C or identify and include a formal gap analysis document for the ONS RVI components in the audit portal for the SLRA. The staff discussed this matter with the applicant during the audit breakout session on October 21, 2021, for the AMP. During audit breakout session, the applicant stated that the formal gap analysis is given in Framatome Proprietary Report [[XX]], "Oconee-Specific RV Internals Aging Management Strategy Development and Inspection Categorization for SLR." The staff reviewed this document as part of the audit activities for AMP. Matters in Framatome Proprietary Report [[XX]], "Oconee-Specific RV Internals Aging Management Strategy Development and Inspection Categorization for SLR" not fully resolved during the audit will be addressed in the SER. RAIs may potentially be issued.

- The staff observed that, in the gap analysis of the AMP, the applicant makes the following statement regarding the need for performing VT-3 visual inspections of RVI bolt component locking devices: "*General: removed visual VT-3 examination of high-strength bolt locking devices.*" The staff noted that the applicant did not formally identify which of the "Primary" or "Expansion" category bolt locking devices were subject to this gap analysis statement. The staff also noted that this could potentially impact the final

inspection categories for a number of “Primary” or “Expansion” category bolt locking devices by downgrading the locking device types into the “No Additional Measures [NAM]” category for the AMP without formally identifying these bolt locking device category changes in the AMP. During the audit breakout session of October 21, 2021, the applicant identified the five types of RVI bolt locking devices that are within the scope of the “high strength” locking device material statement. Additionally, the staff observed that in the “operating experience” program element discussion for the AMP, the applicant reported relevant OpE with ONS missing locking device welds that could potentially have an impact on the basis of the applicant’s high strength material argument used to establish NAM inspection categorization of the specified bolt locking devices. Thus, this matter remains unresolved for the audit and the staff may consider the need for issuance of an RAI on the locking device inspection categorization topic.

- The staff observed that, in the gap analysis of the AMP, the applicant identifies that the initial physical measurements of the plenum cover and core support shield (CSS) clamping device have been completed. The staff noted that the applicant did not identify the dates when the physical measurements of the plenum cover rib pads, support flange and support rings and the CSS top flange were completed. The staff discussed this matter with the applicant during the audit breakout session of October 21, 2021. The applicant clarified that the applicable physical measurements of the plenum cover and CSS top flange components were completed in the fall of 2006 for ONS Unit 1, the fall of 2008 for ONS Unit 2, and the fall of 2007 for ONS Unit 3. The applicant also clarified that the physical measurements did not result in identification of distortion in the components or in unacceptable fit-ups for the component configurations. The staff confirmed that the information in AREVA Proprietary Report [[XX]], “Oconee RV Internals Clamping Task” (as posted to the SLRA audit portal) provides a summary of the physical measurements performing on the plenum cover and CSS flange component, and provides sufficient information that the components can be age managed through implementation of VT-3 visual inspections that are specified for the components in MRP-227, Revision 1-A. The staff observed that the information in EPRI MRP Report Nos. MRP 2014-009 and MRP 2016-008 confirms that the applicant performed subsequent VT-3 visual inspections of these “Primary” category components in 2012 for ONS Unit 1, 2013 for ONS Unit 2, and 2014 for ONS Unit 3, with no relevant conditions being recorded. The staff also noted that the information in the referenced reports support the applicant’s basis that subsequent VT-3 visual inspections of the plenum cover components and CSS top flange components may continue to be performed on a 10-year reinspection interval basis for the program. This matter is closed for the audit.

- The staff observed that, in the gap analysis of the AMP, the applicant identifies that the gap analysis resulted in the removal of the “Expansion” link to the vent valve (VV) bodies that might otherwise be triggered by the results of VT-3 visual inspections performed on the “Primary” category control rod guide tube (CRGT) spacer castings per item B2 in Table 4-1 of the MRP-227, Revision 1-A report. The staff noted that the applicant used the basis in the MRP-189, Revision 3 to justify that the VV bodies are not susceptible to LOFT/TE and to justify that the VV bodies could be placed into the “No Additional Measures” (NAM) category of the AMP. The staff noted that the gap analysis inspection category basis for the VV bodies was in opposition to the AMR line item for the VV bodies in SLRA Table 3.1.2-2. The staff addresses this informational gap later in the AMR item review portion of this audit report input for AMP B2.1.7.

Subsequent to the staff audit breakout sessions of October 1 and 6, 2021, the staff confirmed that the information in AREVA Proprietary Report [[XX]], "Records Search of Selected B&W RV Internals Castings for PWROG" (as placed on the SLRA audit portal and audited by the staff) and in PWROG Non-Proprietary Report No. PWROG-15032-NP (ADAMS Accession Nos. ML16068A245 and ML16068A246) provides sufficient demonstration that the delta-ferrite contents in the CASS VV bodies are less than the delta-ferrite content threshold value used in MRP-189, Revision 3 for screening in LOFT/TE as an applicable aging effect/aging mechanism combination for CASS components. However, given the complexity of these technical matters, the staff will address the adequacy of the final inspection category for the VV bodies in the SER, which may include the potential need for issuance of an RAI on the final inspection category for the VV bodies.

- The staff observed that, in the gap analysis of the AMP, the applicant states that *expansion*-link notes were added to the I&E criteria for the "Primary" category LCB bolts, UCB bolts, and FD bolts and that the notes state that the primary-expansion relationship between the upper core barrel, lower core barrel, and flow distributor bolts and the upper thermal shield and lower thermal shield bolts/studs "is for stress corrosion cracking only." The staff noted that it appears that the change in the *expansion*-link criteria for the LCB, UBC, and FD bolts could be the result of an underlying change in the underlying assumptions of the MRP-227-based methodology. The staff discussed these matters with the applicant during the audit session of October 1, 2021; however, given the complexity of these matters, the staff will address the adequacy of the final *expansion*-link criterion for the LCB/UCB/FD bolt-to-LTS/UTS inter-relationships in the SER, which may include the potential need for issuance of an RAI on the *expansion*-link criteria for these types of bolting components.

- The staff observed that, in the gap analysis of the AMP, the applicant states: "The core barrel-to-former bolts are Category A for void swelling, so expansion does not apply." The staff noted that it would need further discussions on this matter (including whether the gap analysis was downgrading the inspection category for the core barrel-to-former [CB-F] bolts to "No Additional Measures" [NAM] category), given that the EPRI MRP categorizes the CB-F bolts as "Expansion" category components in MRP-227, Revision 1-A (i.e., as linked to the "Primary" baffle-to-former [BF])bolts) based on aging mechanisms of irradiation-assisted stress corrosion cracking (IASCC), wear, fatigue, irradiation embrittlement (IE), and irradiation-enhanced stress relaxation or creep (ISR/IC), and not void swelling (VS).

  During the audit breakout session of October 1, 2021, the applicant clarified that the CB-F bolts remain as appliable "Expansion" category components that are linked to the Primary BF bolts in the reactor units, but only for the mechanisms of IASCC, wear, fatigue, IE, and ISR/IC (and not for VS). The staff will address the adequacy of the *expansion*-link criterion between the "Primary" category BF bolts and the linked "Expansion" category CB-F bolts in the SER, which may include the need for issuance of an RAI on the reduced *expansion*-link basis for the CB-F bolts.

- The staff observed that, in the gap analysis of the AMP, the applicant states: "*Core barrel cylinder (including vertical and circumferential seam welds) and lower grid rib section were removed as expansion links. Former plates were retained as an expansion link.*" The staff noted that it would need further discussions on these matters, including:

- Clarifications on the technical basis for only elevating the inspection category of the core barrel (CB) cylinder circumferential seam welds in Unit 2 to "Primary" inspection category status, and whether the corresponding CB cylinder circumferential welds in Units 1 and 3 were being downgraded to NAM category status. Additionally, clarifications on whether the design of the CB cylinders in Units 1, 2 and 3 include any axial seam welds, and if so, the basis for placing the CB cylinder axial seam welds in the NAM category. The staff discussed this topic with the applicant during the audit breakout session of October 1, 2021.

  During the audit breakout session of October 1, 2021, the applicant clarified that (with the exception of the Unit 2 CB cylinder-to-flange circumferential seam welds) the gap analysis methodology resulted in a downgrading of ONS Units 1, 2 and 3 CB cylinder base metal components and cylinder axial/circumferential seam weld components to the NAM category of the program. The applicant further clarified that the downgrade of these components to NAM category was based on the applicant's confirmation that the components had been subjected to a proprietary-designated fabrication process that led to the applicant's conclusion the process would either prevent cracking or IE from occurring in the components through the end of the subsequent period of extended operation. The staff will address the adequacy of the final EPRI MRP gap analysis categorization of all ONS CB cylinder and cylinder seam weld components (except for the newly-elevated "Primary" category CB cylinder-to-flange circumferential seam welds in ONS Unit 2) in the SER. There may be a need to issue an RAI on the NAM categorizations for these CB cylinder components.

  For CB cylinder-to-flange circumferential seam welds in Unit 2 (which were elevated to "Primary" category in the gap analysis), clarifications on whether the welds are accessible to visual inspection equipment, given that the CB cylinder seam welds for B&W-designed PWRs have been identified as being inaccessible to inspection per Item B10.1 in Table 4-4 of MRP-227, Revision 1-A. The staff discussed this matter with the applicant during the October 1, 2021 audit breakout session with the applicant. The applicant clarified that, for the Unit 2 CB cylinder-to-flange welds elevated to "Primary" category status, the welds are at least partially acceptable to inspection by EVI-1 visual inspection equipment. The staff observed that scheduling the Unit 2 CB cylinder-to-flange circumferential seam welds for "Primary" category EVT-1 visual inspections during the subsequent period of extended operation is conservative practice relative to the current EPRI MRP "Expansion"-based categorization and criteria for the welds in MRP-227, Revision 1-A. This matter is closed for the audit.

- The staff observed that, in the gap analysis of the AMP, the applicant identifies that the ONS lower grid rib sections located on the lower grid fuel assemblies of the ONS units are being elevated from "Expansion" category to "Primary" category components for the SLRA. The staff will address this matter and the basis for this change in the SER.

- The staff observed that, in the gap analysis of the AMP, the applicant identifies that thermal aging embrittlement (TE) was removed as an applicable aging mechanism for the incore monitoring instrumentation (IMI) guide tube spiders. The staff noted that it would need further clarifications on this matter, including discussions on the specific document and basis used to remove TE as an aging mechanism for the IMI guide tube spiders, and whether this leaves the IMI guide tube spiders as designated Primary" category components solely on an aging effect and mechanism combination of LOFT/IE.

The staff discussed these matters with the applicant during the audit breakout session of October 1, 2021. The applicant clarified that the information in gap analysis leaves the IMI tube spiders as applicable "Primary" category components only for the aging effect and aging mechanism combination of LOFT/IE. Due to the complexity of this issue, the staff will address the final inspection category for the IMI guide tube spiders and spider in the SER. An RAI may be needed on the inspection categorization or *expansion*-link criteria for these components.

During the audit, the staff also audited the ONS unit-specific OpE for RVI components reported in the "operating experience" program element of the AMP. From a risk-perspective, the staff did not feel any need to search the applicant's plant-specific database for unknown or recurring aging effects because the aging effects and mechanisms for PWR RVI components managed by AMP are already well known and accounted for in the MRP-227, Revision 1-A methodology that applies to the program. The staff did not identify any aging effects or mechanisms outside of the those already identified for the AMP in the "parameters monitored or inspected" program element for the AMP. However, he staff discussed the following OpE related matters with the applicant during the audit breakout session of October 1, 2021:

- *Whether age-related OpE detected in lower grid rib sections, baffle-to-former (BF) bolts, CB-F bolts, LCB, bolt, UCB bolts, FD bolts, and IMI guide tube spiders, or associated locking welds (or other specified RVI components) has been forwarded to the EPRI MRP for disposition*. During the audit breakout session of October 1, 2021, the applicant clarified that all relevant OpE with ONS RVI components was disseminated to the EPRI MRP for evaluation consistent with "confirmation process" controls established for RVI component-specific OpE in Chapter 7 of the MRP-227, Revision 1-A report. The staff observed that this is consistent with the MRP-227, Revision 1-A report, which calls for the applicant to disseminate component-specific operating to the EPRI MRP for evaluation. This matter is closed for the audit.

- *Flaw evaluation(s) used to disposition cracking in the IMI guide tube spiders and the IMI guide tube spider-to-lower grid rib section welds*. During the audit breakout session of October 1, 2021, the applicant clarified that the flaw evaluation of the IMI guide tube spiders and the IMI guide tube spider-to-lower grid rib section welds are given in Framatome Proprietary Calculation [[XX]], "ONS3 Lower Grid-to-IMI Spider Casting Weld B8-YL Indication Fracture Mechanics Analysis," AREVA Proprietary Report [[XX]], "Assessment of April 2014 In-Core Instrument (IMI) Guide Tube Spider Inspection Results – Oconee Unit 3," and EPRI MRP Report No. MRP 2020-015; the applicant placed these documents onto the SLRA audit portal. The applicant clarified that the evaluation in AREVA Proprietary Report [[XX]], "Assessment of April 2014 In-Core Instrument (IMI) Guide Tube Spider Inspection Results – Oconee Unit 3" involved a finite element analysis of the IMI spider casting with the confirmed flaw indication. The staff observed that the information in the cited records support that the IMI spiders may remain in service without repair and that the re-inspections of the IMI guide tube spiders and spider-to-lower grid rib section welds may be performed on a 10-year augmented inspection interval basis. Additionally, the staff observed that OpE supports the applicant's decision to elevate the lower grid rib sections to the status of "Primary" category components for the version of the PWR Vessel Internals AMP that will be implemented during the subsequent period of extended operation. This matter is closed for the audit.

- *Flaw evaluation(s) and augmented inspection intervals for BF and CB-F bolts*. During the audit breakout session of October 1, 2021, the applicant informed the staff that the statement on SLRA page B-80 regarding cracking of the ONS Unit 3 CB-F bolt was a typographical error in the SLRA, and that the applicable cracked bolt was another BF bolt that had been detected to contain crack-like indications. The applicant stated that there are not any CB-F bolts in ONS Units 1, 2, or 3 that had been inspected as "Expansion" category components and found to contain relevant indications of cracking. The applicant stated that it would correct that statement in an upcoming SLRA Supplement. The staff will address this matter in the SER.

  For the year 2012, 2014, and 2013 UT inspections the BF bolts of ONS Units 1, 2, and 3 (respectively), the applicant clarified that the component-specific assessment summaries of the BF bolts are given in MRP 2014-009, Part 1 for the BF bolts in ONS Unit 1, MRP 2014-009, Part 2 for the BF bolts in ONS Unit 2 and MRP 2016-008 for the BF bolts in ONS Unit 3, with the Year 2012 inspections of the BF bolts in Unit 1 being re-evaluated in Framatome Proprietary Report [[XX]], "One-Cycle Justification for Oconee Unit 1 Baffle-to-Former Bolts." The staff confirmed that these reports are docketed in ADAMS or were placed onto the SLRA audit portal. The applicant clarified that BF bolts found inaccessible for inspection are assumed to be cracked. The applicant clarified there was no detected clustering of BF bolts with relevant crack-like conditions in any of the reactor units.

  The staff observed that there are over 800 BF bolts in each of the reactor units and that the maximum number of bolts with detected relevant conditions or assumed to be cracking if inaccessible do not currently support the need to perform *expanded* UT inspections of the CB-F bolts and baffle-to-baffle (BB) bolts based on total number of bolts with detected or assumed conditions or based on clustered cracked bolt configurations. The staff observed that, for ONS Unit 1, the staff confirmed that the applicant is scheduling the cycle UT re-inspections of the BF bolts in Unit 1 for Year 2022 based on the applicant's performance of the Unit 1 plant-specific analysis in Framatome Proprietary Report [[XX]], "One-Cycle Justification for Oconee Unit 1 Baffle-to-Former Bolts" which justified performing the reinspection of the ONS Unit 1 BF bolts in 2022. The staff also observed that the referenced MRP reports support continuing the re-inspections of the BF bolts in Units 2 and 3 on a 10-Year augmented inspection interval. These matters are closed for the audit.

- *Type of flaw evaluations used to disposition cracking detected in LCB, UCB, and FD bolts; whether past age-related OpE associated with cracking of LCB bolts, UCB bolts, FD bolts has triggered "Expansion" category inspections of the LTS and UTS bolts in the reactor units based on total number of bolted with detected crack-like indications or based on clustered groupings of bolts with detected crack-like indications; and unit-specific OpE with missing LCB, UCB, FD, LTS or UST bolt locking devices*. The staff observed that the SLRA indicates that LCB, UCB, and FD bolts in ONS Unit 1 were inspected in 2012 and that the applicant detected flaw indications in five of the LCB bolts (the inspections of the UCB and FD bolts did not reveal any evidence of degradation in the bolts). The staff observed that the SLRA indicates that LCB, UCB, and FD bolts in ONS Unit 2 were inspected in 2013 and that the applicant detected flaw indications in one of the LCB bolts and two of the FD bolts (the inspections of the UCB bolts did not reveal any evidence of degradation in the bolts). The staff observed that the SLRA indicates that LCB, UCB, and FD bolts in ONS Unit 4 were inspected in 2014 and that

the applicant detected flaw indications in three of the LCB bolts, two of the UCB bolts and one of the FD bolts.

During the audit breakout session of October 1, 2021, the applicant identified that flaws detected in the in LCB, UCB, and FD bolts were evaluated with the criteria for LCB, UCB, and FD bolted assemblies in PWROG Report No. 17096-NP-A, Revision 2, and that the flaw evaluations are given in Framatome Proprietary Report [[XX]], "Summary of Structural Analysis to Assess Core Barrel Bolt Inspection Results for B&W Plants." The staff observed that, in EPRI MRP Non-Proprietary Report No. 2014-009, Parts 1 and 2, the EPRI MRP identifies that there are a total 116 LCB bolts, 108 LCB bolts, and 96 FD bolts (95 FD bolts for Unit 1 due to removal of one FD bolt during the 1981 inspections of the FB assembly) in the applicable bolted assemblies and there were not enough bolts with detected crack-like conditions to justify repair or replacements of the bolts or expansion of the UT inspections to the LTS bolts and UTS bolts in the units. The staff noted that this supports the applicant's basis for continuing re-inspections of the LCB, UCB, and FD bolts on a 10-Year augmented reinspection basis. The staff will assess the OpE associated with the UCB bolts, LCB bolts and FD bolts in the SER.

The staff observed that the applicant reported past degradation in the "Expansion" category LTS bolts in 1981 and replaced the original LTS bolts made from A286 stainless steel with replacement LTS bolts made from X-750 Nickel-based alloy materials. The staff observed that the applicant is maintaining the LTS bolts (and the UTS bolts) as "Expansion" category components for the AMP, but only from the perspective of confirming that any cracking in the LCB, UCB, or FD bolts (presuming the number of "Primary" bolts in the respective assemblies exceed 10% of the population of bolts in the assemblies) had been initiated from a SCC type of cracking mechanism. The staff also observed that the EPRI MRP designates that -LTS/UTS bolts made from both A286 stainless steel materials and X-750 Nickel-based alloy materials are susceptible to SCC. Thus, the staff observed that the material of fabrication (X-750) for the replacement LTS bolts could have an impact on the appropriate EPRI MRP category that would need to be designated and applied to the LTS bolts for the 80-Year version of the PWR Vessel Internals Program that will be implemented by the applicant during the subsequent period of extended operation. The staff will evaluate this matter in the SER. The evaluation may include an RAI on the applicant's inspection category basis for the LTS bolts.

The staff's audit observations and statements regarding the OpE associated the missing LTS bolt locking device in ONS Unit 1 was discussed earlier in this audit report section.

- The staff confirmed that other RVI component OpE (e.g., the sole OpE associated with a cracked VV jackscrew locking device) did not rise to the level of OpE that could impact the final inspection categories, augmented inspection intervals or component-specific *expansion*-link criteria for the AMP.

The staff will evaluate the applicant's identified plant-specific OpE for RVI components in the SER.

The staff also audited the description of the SLRA PWR Vessel Internals Program provided in the UFSAR supplement (i.e., SLRA Section A2.7). The staff found that sufficient information was not available to determine whether the description provided in SLRA Section A2.7 was an

adequate description of the SLRA PWR Vessel Internals Program. The staff will evaluate the UFSAR supplement summary description of the PWR Vessel Internals Program as part of the staff's evaluation of the PWR Vessel Internals Program in the SER. The evaluation may include consideration of an RAI in order to obtain the information necessary to verify the sufficiency of the UFSAR supplement program description for the AMP.

STAFF REVIEW OF AMR ITEM DETAILS

Summary of Information in the Application. During the audit, the staff reviewed the commodity group-based AMR line items and plant documentation associated with SLRA Table 3.1.2-2, "Reactor Vessel Internals – Summary of Aging Management Evaluation," against the corresponding bases for the components or commodity grouping of components in SLRA AMP B2.1.7, including SLRA Table B2.1.7-1, B2.1.7-2 or B2.1.7-3 in the AMP. The table below lists the documents (i.e., in addition to the SLRA) that were reviewed by the staff and were found relevant to the review of these items. These documents were provided by the applicant or constitute staff or industry documents related to PWR RVI components that are listed and include as applicable NRC records in the ADAMS.

Document	Title	Revision / Date
NRC Subsequent License Renewal Interim Staff Guidance (SLR-ISG) Document No. SLR-ISG-2021-01-PWRVI	Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors	01/08/2021 (ADAMS Accession No. ML20217L203)
NUREG-2191, Volume 1	Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report	02/07/2017 (ADAMS Accession No. ML16274A389)
Electric Power Research Institute (EPRI) Report No. 3002017168	Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227, Revision 1-A)	12/2019 (ADAMS Accession No. ML20175A112)
Duke Energy Audit Breakout Question Response Document for ONS SLRA AMR Items on PWR Internals	TRP 15, PWR Vessel Internals, Oconee SLRA, Responses to NRC Breakout Questions 15 -31 and Follow-up from 10-1-2021 Breakout [1]	Revision 0

Table Notes:

1. In the title of this Duke Energy record, the applicant cites the TRP number as TRP 15. The actual TRP assignment for the staff's review of the AMP and AMR that applies to the RVI components is TRP 16, not TRP 15. However, the staff considers the inconsistency in the title of this record to be an administrative error that will have no impact on the staff's review of SLRA AMP B2.1.7, "PWR Vessel Internals," and related AMR items for the RVI components.

During the audit, the staff discussed the following AMR-related matters with the applicant in relation to the AMR line items that the applicant included in SLRA Tables 3.1.1 and 3.1.2-2 for the RVI components:

- AMR item and subitems for BF bolts, BB bolts, and CB-F bolts/screws (SLRA Table 3.1.2-2, pages 3-110 and 3-111); For this AMR item, the staff requested clarifications on the following AMR-related matters:

  - Identification of those components in the BF/BB/CB-F bolt commodity grouping that are made from Nickel alloy material, as linked to AMR subitems linked to NEI Note F.

  - Confirmation that, if the bolts are made from Nickel alloy, the BF bolts remain as designated "Primary" category components for the AMP, and that the CB-F bolts and BB bolts remain as "Expansion" category components for the AMP.

  - Regarding the BB bolt locking devices, internal and external BB bolt locking devices, and CB-F bolt/screw locking devices, the staff asked for clarification and identification of those locking devices (if any) that are subject to the following gap analysis statement in the AMP: "*General: removed visual VT-3 of high strength bolt locking devices.*" The staff observed that such a statement could be placing the specific bolt locking devices into the applicant's NAM category of the AMP. If the BF bolt locking devices or internal BB bolt locking devices are subject to this statement, the staff asked for clarification on the basis for referencing GALL-SLR item IV.B4.RP-241a and SLRA item 3.1.1-051a for cracking of the locking devices or GALL-SLR item IV.B4.RP240a and SLRA item 3.1.1-058a for non-cracking effects in the locking devices. Similarly, if the CB-F bolt locking devices or external BB bolt locking devices are subject to this statement, the staff asked for clarification on the basis referencing GALL-SLR item IV.B4.RP-244 and SLRA item 3.1.1-051b for cracking of the locking devices or GALL-SLR item IV.B4.RP-243a and SLRA item 3.1.1-058b for non-cracking effects in the locking devices. If any of these bolt locking devices are categorized as NAM, the staff asked for clarification on why the change in the inspection category status has not been reflected in SLRA AMP B2.1.7, Tables B2.1.7-1, B2.1.7-2, or B2.1.7-3, as appropriate.

- AMR items for specified NAM components or commodity groupings in SLRA Table 3.1.2-2 that are referenced to SLRA Table 1 NAM item 3.1.1-055a: For those RVI components or commodity groups specifically identified in Table 3.1.2-2 as being linked to SLRA item 3.1.1-055a, the staff asked for clarification on whether there would be any technical or regulatory reason (e.g., OpE related) for elevating the inspection category of the specified component or commodity grouping from NAM to either "Primary" or "Expansion" inspection category status. The staff also asked for clarification on the RVI assemblies containing the following RVI NAM category components: (1) clamping ring on SLRA page 3-113; (2) orifice plugs on SLRA page 3-126; (3) reinforcing plates and rib-to-ring screws on SLRA page 3-128, (4) support post pipes on SLRA page 3-129, and (5) top flange-to-cover bolts on SLRA page 3-130.

- AMR item for CRGT spacer castings versus the AMR item for CRGT spacer screws in SLRA Table 3.1.2-2, page 3-114: The staff observed that the applicant included separate AMR items for the CRGT spacer castings (as designated) "Primary" category components and the CRGT spacer screws (as designated NAM category component. The staff requested further clarifications on the NAM-basis for the CRGT spacer screws given that, in item B2 of Table 4-1 of the MRP-227, Revision 1-A report, the EPRI MRP includes the "Primary" category inspections of the CRGT spacer screws as part of the "Primary" inspections that are applied to the CRGT spacer castings.

- AMR item and subitems for the CB cylinders and cylinder seam welds "Expansion" category components in SLRA Table 3.1.2-2, page 3-115: The staff sought clarifications on which components are included in the AMR item for the CB cylinders on SLR page 3-115. Specifically, the staff requested clarifications of the following:

  - Whether the AMR item for the CB cylinder commodity grouping includes the cylinder seam welds and whether the design of the CB cylinders in Units 1, 2, and 3 includes axial seam welds. If the AMR item for the CB cylinder commodity grouping on SLRA page 3-115 includes the cylinder seam welds, the staff requested that the applicant clarify whether the inspection category for the cylinder and cylinder seam welds (i.e., other than that for the Unit 2 CB cylinder circumferential seam weld, which was

upgraded to “Primary” category status in the gap analysis) would be changing from the “Expansion” category for the components in item B10.1 of Table 4-4 in MRP-227, Revision 1-A (and accordingly, whether additional changes to SLRA Table B2.1.7-1, B2.1.7-2 or B2.1.7-3 might be necessary).

  - The staff noted the elevation of the Unit 2 CB cylinder-to-flange circumferential seam weld and the Unit 2 CB cylinder center circumferential seam weld to “Primary” inspection category status in the gap analysis, which appears to imply that, at least for Unit 2, these CB cylinder circumferential seam welds are accessible to performance of a visual inspection; the staff observed that performance of the visual inspections would be used to monitor for evidence of surface breaking cracking in the welds. However, the staff also observed that, in item B10.1 of Table 4-4 in MRP-227, Revision 1-A, the EPRI MRP identifies that the CB cylinder and cylinder seam welds are inaccessible for inspection and that if “Expansion” to the CB cylinder is necessary, further service of the CB cylinder assembly is to be justified by component-specific analysis or justified repair/replacement schedule. Thus, the staff sought additional clarifications on whether the CB cylinders in ONS Units 1, 2, and 3 are actually accessible to inspection.

- AMR item and subitems for core barrel-to-thermal shield bolts in SLRA Table 3.1.2-2, pages 3-115 and 3-116: The staff sought confirmation that the AMR line items for these bolts on SLRA pages 3-115 and 3-116 only cover the UTS bolts and bolt locking devices located in the CB assembly, and that the corresponding AMR items for the LTS bolts and bolt locking devices are given in SLRA pages 3-125 and 3-126. The staff also sought clarifications on the following matters:

  - Whether the UTS bolt locking devices are made from high strength stainless steel materials and whether the EPRI MRP inspection category status for the UTS bolt locking devices was being downgraded from the EPRI MRP “Expansion” category to the NAM category. If this is the case, and the change to NAM category status could be justified, the staff asked for clarification on why the AMR subitems for the locking devices was referencing SLRA item 3.1.1-051b and new GALL-SLR item IV.B4.RP-246d (as given in the SLR-ISG-2021-01-PWRVI) for managing cracking of the UTS bolt locking devices and SLRA item 3.1.1-058b and new GALL-SLR item IV.B4.RP-246d in the SLR-ISG for managing LOM/wear and CID/VS or distortion in the UTS bolt locking devices.

  - The staff observed that on SLRA pages 3-115 and 3-116, the applicant included three AMR subitems that reference use of GALL-SLR item IV.B4.RP-248, IV.B4.RP-248a, or IV.B4.RP-248b for managing cracking in the UTS bolts or UTS bolt locking devices or LOM/wear and CID/VS or distortion in the UTS bolt locking devices. The staff sought clarifications on these AMR subitems because: (1) the referenced GALL-SLR items (as updated in SLR-ISG No. SLR-ISG-2021-01-PWRVI) pertain to management of cracking the UCB bolts or UCB bolt locking devices and LOM/wear and CID/VS or distortion in the UCB bolt locking, and (2) the applicant already addresses cracking of the UCB bolts and cracking, LOM/wear, and CID/VS or distortion of the UCB bolt locking devices through the appropriate AMR subitems for those components on SLRA pages 3-117 and 3-118.

- AMR item and subitems for core support shield-to-core barrel bolts in SLRA Table 3.1.2-2, pages 3-117 and 3-118: The staff sought confirmation that the AMR line items for these bolts on SLRA pages 3-117 and 3-118 only cover the UCB bolts and bolt locking devices located in the CSS assembly, and that the corresponding AMR items for the LCB bolts and

bolt locking devices in the CB assembly are given in SLRA pages 3-123 and 3-124. The staff also sought clarifications on the following:

- Whether the UCB bolt locking devices are made from high strength stainless steel materials and whether the EPRI MRP inspection category status for the UCB bolt locking devices was being downgraded from the EPRI MRP "Expansion" category to the NAM category. If this is the case, and the change to NAM category status could be justified, the staff asked for clarification on why the AMR subitems for the UCB locking devices were referencing SLRA item 3.1.1-051a and GALL-SLR item IV.B4.RP-248 and IV.B4.RP-248a for managing cracking in the locking devices and SLRA item 3.1.1-058a and GALL-SLR item IV.B4.RP-248b for managing LOM/wear and CID/VS or distortion in the UCB bolt locking devices.

- AMR item and subitems for LGA support pad items (including supports pads, pad-to-rib section welds, Alloy X-750 dowels, caps screws and their locking welds) in SLRA Table 3.1.2-2, pages 3-118 and 3-119 and associated UGA support pad items in SLRA Table 3.1.2-2, page 3-120: The staff sought further clarifications on whether the locking welds for the referenced LGA and UGA cap screws are considered high strength welds and whether the applicant is downgrading the support pad cap screw locking devices from "Expansion" category to NAM category. If downgrading of the locking welds is applicable and can be justified, the staff requested further clarification on why the AMR items for the LGA and UGA support pad items do not include separate subitems for the support pad locking welds that reference use of SLRA item 3.1.1-055a and GALL-SLR item IV.B4.RP-236 (which would be the appropriate Table 1 and 2 AMR items for categorizing the LGA/UGA cap screw locking welds as NAM category components).

- AMR item and subitems for guide blocks and bolts in SLRA Table 3.1.2-2, pages 3-120 and 3-121: For this AMR item, the requested clarifications on the following AMR-related matters:

  - The staff observed that the specified commodity grouping for the AMR item is in reference to the guide blocks that are located in the LGA. The staff also observed that the applicant's AMR item appears to imply that (for the ONS design) the guide blocks are bolted assembly components. The staff requested further discussions on this matter because: (1) the applicable guide blocks are within the scope of EPRI MRP "Primary" category item B13 in Table 4-1 of the MRP-227, Revision 1-A, and (2) in item B13, the EPRI MRP identifies the applicable guide blocks are welded (and not bolted) components. Thus, the staff requested further audit breakout clarifications on how the I&E criteria in items B13 of Tables 4-1 and 5-1 in the MRP-227, Revision 1-A report would need to be modified for ONS if the referenced LGA guide blocks in the reactor units were based on a bolted guide block design configuration instead of a welded design configuration. This includes needed clarifications on how SLRA Tables B2.1.7-1, B2.1.7-2, or B2.1.7-3 would need to be adjusted if the LGA guide blocks were designed with a bolted guide block configuration.

  - The staff observed that the AMR item for the guide blocks includes subitems that reference use of GALL-SLR item IV.B4.RP-261 and SLRA item 3.1.1-051b for management of cracking in the guide blocks and use of GALL-SLR item IV.B4.RP-260 and SLRA item 3.1.1-058b for management of LOFT/IE in the guide blocks. The staff observed that the SLRA 3.1.1-051b and 3.1.1-058b are the applicable SLRA Table 1 AMR items for managing cracking and non-cracking mechanisms in designated EPRI

MRP "Expansion" category components. Thus, the staff requested further clarifications on use of the SLRA 3.1.1-051b and 3.1.1-058b item references given that the B&W-design LGA guide blocks are designated as EPRI MRP "Primary" category components in item B13 of Table 4-1 in the MRP-227, Revision 1-A report.

  - The staff observed that the AMR item for the LGA guide blocks includes two subitems that reference to GALL-SLR item IV.B4.RP-246 under either Note A or Note B. However, the staff observed that GALL-SLR item IV.B4.RP-246 (as updated in SLR-ISG-2021-01-PWRVI) is the AMR item for managing cracking in the LTS bolts and bolt locking devices (which are EPRI MRP-defined "Expansion" category components in MRP-227, Revision 1-A). Thus, the staff requested further clarifications on the use of the two subitems for the LGA guide blocks that reference GALL-SLR item IV.B4.RP-246.

- AMR item for the incore guide tube components in SLRA Table 3.1.2-2, pages 3-121 and 3-122 and AMR item for incore guide tube spider castings in SLRA Table 3.1.2-2, page 3-122: The staff requested clarification on whether the IMI guide tube spider-to-lower grid rib section welds are included in either the AMR item for the incore guide tube components or the AMR item for the incore guide tube spider castings, as the spider casting welds are not included in either of the commodity group descriptions for the AMR items.

- AMR item and subitems for lower grid rib sections in SLRA Table 3.1.2-2, pages 3-122 and 3-123: The staff observed that, in the gap analysis of SLRA AMP B2.1.7, the applicant elevated the inspection category for the for the lower grid rib sections to "Primary" category status. If the lower grid rib sections are now "Primary" category components for ONS, the staff requested clarification on whether the AMR item for the rib sections should reference the updated version of GALL-SLR item IV.B4.RP-424 in SLR-ISG-2021-01-PWRVI and SLRA item 3.1.1-058a to manage LOM/wear and CID/VS or distortion in the rib sections and to reflect the change in the inspection category status for the rib sections. Additionally, in order to properly upgrade to "Primary" category status, the staff requested clarifications on whether corresponding changes would need to be made to SLRA Table B2.1.7-2 (i.e., showing deletion of the previous "Expansion" categorization for the rib sections) and to B2.1.7-3 (i.e., to define the acceptance criteria for the new Primary inspection category of the lower grid rib sections).

  - AMR item and subitems for LCB bolts and bolt locking devices in SLRA Table 3.1.2-2, pages 3-123 and 3-124: The staff sought confirmation that the AMR line items for these bolting components on SLRA pages 3-123 and 3-124 only cover the LCB bolts and bolt locking devices located in the CB assembly, and that the corresponding AMR items for the UCB bolts and bolt locking devices are given in SLRA pages 3-117 and 3-118. The staff also sought clarifications on whether the LCB bolt locking devices are made from high strength stainless steel materials and whether the EPRI MRP inspection category status for the LCB bolt locking devices was being downgraded from the EPRI MRP "Expansion" category to the NAM category. If this is the case, and the change to NAM category status could be justified, the staff asked for audit breakout session clarifications on why the AMR subitems for the locking devices were referencing SLRA item 3.1.1-051a and new GALL-SLR item IV.B4.RP-247a (as given in the SLR-ISG-2021-01-PWRVI) for managing cracking of the LCB bolt locking devices and SLRA item 3.1.1-058a and new GALL-SLR item IV.B4.RP-247b for managing LOM/wear and CID/VS or distortion in the LCB bolt locking devices (i.e., rather than referencing GALL-SLR

item IV.B4.RP-236 and SLRA item 3.1.1-055a for the NAM status of the LCB bolt locking devices).

- AMR item and subitems for LTS bolts and bolt locking devices in SLRA Table 3.1.2-2, pages 3-125 and 3-126: The staff sought confirmation that the AMR line items for these bolting components on SLRA pages 3-125 and 3-126 only cover the LTS bolts and bolt locking devices located in the LGA, and that the corresponding AMR items for the UTS bolts and bolt locking devices are given in SLRA pages 3-115 and 3-116. The staff also sought audit clarifications on whether the LTS bolt locking devices are made from high strength stainless steel materials and whether the EPRI MRP inspection category status for the LCB bolt locking devices was being downgraded from the EPRI MRP "Expansion" category to the NAM category. If this is the case, and the change to NAM category status could be justified, the staff asked for audit breakout session clarifications on why the AMR subitems for the locking devices were referencing SLRA item 3.1.1-051b and GALL-SLR item IV.B4.RP-246a (as updated in the SLR-ISG-2021-01-PWRVI) for managing cracking of the LTS bolt locking devices and SLRA item 3.1.1-058b and new GALL-SLR item IV.B4.RP-246b (as updated in the SLR-ISG-2021-01-PWRVI) for managing LOM/wear and CID/VS or distortion in the LTS bolt locking devices (i.e., rather than referencing GALL-SLR item IV.B4.RP-236 and SLRA item 3.1.1-055a for the NAM status of the LTS bolt locking devices).

- AMR item and subitems for FD bolts and bolt locking devices in SLRA Table 3.1.2-2, page 3-128: The staff sought audit clarifications on whether the FD bolt locking devices are made from high strength stainless steel materials and whether the EPRI MRP inspection category status for the FD bolt locking devices was being downgraded from the EPRI MRP "Expansion" category to the NAM category. If this is the case, and the change to NAM category status could be justified, the staff asked for audit breakout session clarifications on why the AMR subitems for the locking devices were referencing SLRA item 3.1.1-051a and GALL-SLR item IV.B4.RP-256a (as updated in the SLR-ISG-2021-01-PWRVI) for managing cracking of the FD bolt locking devices and SLRA item 3.1.1-058a and new GALL-SLR item IV.B4.RP-256b (as updated in the SLR-ISG-2021-01-PWRVI) for managing LOM/wear and CID/VS or distortion in the FD bolt locking devices (i.e., rather than referencing GALL-SLR item IV.B4.RP-236 and SLRA item 3.1.1-055a for the NAM status of the LTS bolt locking devices).

- AMR item and subitems for vent valve original locking devices and modified locking devices (VV OLDs and VV MLDs) in SLRA Table 3.1.2-2, page 3-131: The staff observed that the VV OLDs are in reference to the pressure plates, springs and spring retainers, U-covers, key rings and pins in the VV assemblies. The staff also observed that the VV MLDs are in reference to the bolt locking cups, jackscrew locking cups, and bolted blocks in the VV assemblies. Staff requested confirmation that the VV OLDs or VV MLDs would remain as "Primary" category for the applicant's program even if the components were made from nickel alloy materials.

- AMR item and subitems for vent valve original locking devices and modified locking devices (VV OLDs and VV MLDs) in SLRA Table 3.1.2-2, page 3-131: The staff observed that in the AMR item and subitems for the VV bodies, the applicant references SLRA item 3.1.1-058b and GALL-SLR item IV.B4.RP-252a for management of LOFT/TE in the CASS VV bodies, which reflect an "Expansion" category status for the VV bodies consistent with the criteria for VV bodies as "Expansion" category components per Item B2.1 in Table 4-4 of the MRP-227, Revision 1-A. However, the staff observed that, in

the gap analysis the applicant downgraded the inspection category for the VV bodies to NAM category based on a gap analysis determination that the CASS materials for the VV bodies were not susceptible to TE. The staff requested further discussion on the appropriate inspection category for the VV bodies given the gap on the inspection category conveyed for the VV bodies by the applicable AMR item versus the inspection category for the VV bodies conveyed in the gap analysis of the AMP.

The staff will evaluate these AMR-related matters and reconcile any staff noted apparent inconsistencies in the AMR items through the staff's review RVI component gap analysis for SLRA AMP B2.1.7 (including the staff's review of the applicant's actions to resolve matters raised in RAIs issued for the AMP or AMP gap analysis results) and document its findings in Sections 3.0.3.2 and 3.1.2.2.9 of the SER. The staff's review may include consideration of one or more RAIs on the AMR items for specified RVI components in SLRA Table 3.1.2-2.

SLRA AMP B2.1.8, Flow-Accelerated Corrosion

Summary of Information in the Application. The SLRA states that AMP B2.1.8, "Flow-Accelerated Corrosion," is an existing program with enhancement that will be consistent with the program elements in GALL-SLR Report AMP XI.M17, "Flow-Accelerated Corrosion." To verify this claim of consistency, the staff audited the SLRA 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 and will document its evaluation in the SER.

Audit Activities. During its audit, the staff interviewed applicant staff and reviewed documentation contained in the SLRA and provided by the applicant through its ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the Flow-Accelerated Corrosion (FAC) program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M17	Flow-Accelerated Corrosion AMP Evaluation Report	Revision 1
PD-EG-ALL-1610	Flow Accelerated Corrosion Program	Revision 1
BP-2017-0041-TR-01	Duke Energy Oconee Nuclear Station Unit 1 Erosion Susceptibility Analysis	Revision 0, 05/18/2018
AD-EG-ALL-1610	Flow Accelerated Corrosion Implementation	Revision 5
CSD-FAC-ALL-1610.005	Susceptible Non-Modeled Program [SNM], Selection and Inspection of FAC SNM Components	Revision 0
CSD-FAC-ALL-1610.003	Instructions for Performing a CHECWORKS Pass 2 Analysis and Disposition of Results	Revision 0
CSD-FAC-ALL-1610.001	Outage Inspection Planning	Revision 3

Document	Title	Revision / Date
CSD-FAC-ALL-1610.002	Sample Expansion	Revision 0
CSD-FAC-ALL-1610.005	MARKUP - Susceptible Non-Modeled Program, Selection and Inspection of FAC SNM Components	Revision 0
AD-EG-ALL-1610	MARKUP - Flow Accelerated Corrosion Implementation	Revision 4
CSD-FAC-ALL-1610.003	MARKUP - Instructions for Performing a CHECWORKS Pass 2 Analysis and Disposition of Results	Revision 0
CSD-FAC-ALL-1610.002	MARKUP - Sample Expansion	Revision 0
SM/0/B/8530/001	MARKUP - Flow Accelerated Corrosion Component Inspection – Preparation and Marking	Revision 005
AD-IT-ALL-0002	Software Quality Assurance (SQA) Program Administration	Revision 9
EPRI 3002005530	Recommendations for an Effective Program Against Erosive Attack	07/2015
Action Request (AR) 02025795	3C1 Main Condenser – severe outside diameter erosion of top row tubes	05/03/2016
AR02297177	Review of NRC Information Notice 2019-08 (Operating Experience Evaluation)	01/6/2020
AR02253135	Small bore FAC Program finding – Unit 2 2nd stage vent piping	01/17/2019
AR02231854	Indian Point Unit 2 Steam Leak on MSR [moisture separator reheater] 2nd stage drain piping (Operating Experience Evaluation)	09/19/2018
AR02336986	License Renewal AMP effectiveness reviews	05/25/2020
AR01823513	Piping downstream of 3FDW-355 and the valve itself are being damaged by cavitation	04/23/2012
AR01822156	Pin Hole Leak in 3B MDEFWP RECIRC. PIPE Wall	12/12/2011
Work Order (WO) 20308149 01	Replace 1.5” and 2” 2B1 MSR 2nd Stage Vent Piping	11/15/2020 (Task Status Closed)
OPEX [operating experience] Report – long description	Searched document for ARs related to FAC and erosion (AR01788433, AR02301299, AR02301287, AR01861642, AR01803293, AR02251348)	V1

During the audit, the staff verified that for the program elements that the applicant declared were consistent, the “preventive actions,” “parameters monitored or inspected,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

In addition, the staff found that for the “scope of the program” and “detection of aging effects” program elements, sufficient information was not available to determine whether they were consistent with the corresponding program element of the GALL-SLR Report AMP. The staff will consider issuing RAIs in order to obtain the information necessary to verify whether the program elements are consistent with the corresponding program element of the GALL-SLR Report AMP.

During the audit, the staff made the following observations:

- Aging management review items for managing erosion are not included for most copper alloy components exposed to treated water because the components are subject to low temperature and flow conditions, and there has been no copper alloy erosion OpE at Oconee.

- Heat exchangers are managed for wall thinning due to FAC and/or erosion and are represented by the component type "piping and piping components."

- Due to boundary drawings, the steam separator and some piping and piping components in the Vacuum System are captured in SLRA Table 3.4.2-8, "Steam and Power Conversion Systems – Main Steam System – Aging Management Evaluation."

During the audit of the "operating experience" program element, the staff reviewed a search of results of the plant-specific database to identify any previously unknown or recurring aging effects. The staff will evaluate the identified plant-specific OpE in the SER.

The staff also audited the description of the SLRA FAC program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.9, Bolting Integrity

Summary of Information in the Application. The SLRA states that AMP B2.1.9, "Bolting Integrity," is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M18, "Bolting Integrity." To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the enhancements associated with this AMP. The staff will document its review of the enhancements in the SER. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this enhanced program, and the staff's audit addressed only the program elements described in the applicant's basis document. The staff will address issues identified during the audit in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLE-ONS-AMPR-XI.M18	Bolting Integrity AMP evaluation Report	Revision 1
AD-MN-ALL-0006	Fluid Leak Management	Revision 2
MP/0/A/1800/003	Flange-to-Flange Connections	Revision 53
MP/0/A/1800/003A	Retorquing – Body/Bonnet, Hinge Pin, Flange Manway, and Miscellaneous Bolted Mechanical Connections	Revision 30
MP/0/A/1200/108	Valve-Removal and Installation of Flanged Valves or Wafer Valves to Piping	Revision 66
PCMG	Duke Energy Company Power Chemistry Material Guide Program, SDQA Plan “D”	Revision 31
AD-EG-ALL-1213	System Walkdowns	Revision 4
AD-EG-PWR-1611	Boric Acid Corrosion Program – Implementation	Revision 4
AD-OP-ALL-0109	Operator Rounds	Revision 3
OP/1/A/1102/028	Reactor Building Tour (Unit 1)	Revision 16
OP/2/A/1102/028	Reactor Building Tour (Unit 2)	Revision 15
OP/3/A/1102/028	Reactor Building Tour (Unit 3)	Revision 18
	OPEX Report – Long Description	Revision 1
AR 02120157	Dry Boron Deposit with Active Leak at 1BS-17 and 1BS-4	4/27/2017
AR 02170701	BWST Manway Cover Leaking	12/07/2017
AR 01782069	Unit 3 RB Tour Results (Mode 4)	04/19/2010
AR 01784696	Results from Auxiliary Building Room Surveillance	03/18/2009
AR 01785117	Unit 1 RB Tour Results (Mode 3)	10/10/2009
AR 01787671	2-HPI-IV-0047 has an Active Boric Acid Leak	04/20/2009
AR 01792731	PDW Flange Leak	11/30/2009

During the audit, the staff verified the applicant’s claim that the “scope of program,” “parameters monitored or inspected,” and “monitoring and trending” program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

In addition, the staff found that for the “preventive actions,” “detection of aging effects,” “acceptance criteria,” and “corrective actions” program elements, sufficient information was not available to determine whether they were consistent with the corresponding program elements of the GALL-SLR Report AMP. The staff will consider issuing RAIs in order to obtain the information necessary to verify whether these program elements are consistent with the corresponding program elements of the GALL-SLR Report AMP.

During the audit, the staff made the following observations:

- The proposed SLRA enhancements, associated with leakage that are difficult to detect, seeks to implement new actions, either as a new procedure or as enhancement of existing procedure(s), to ensure that closure bolting in locations that preclude detection of joint leakage will be adequately managed during the subsequent period of extended operations.

- For the "preventive actions" program element, current procedures implement recommendations and guidelines delineated in EPRI Report 1015336, EPRI Report 1015337, and NUREG-1339. The proposed SLRA enhancement seeks to provide additional clarification of its current use within their procedures.

- During the review of plant procedures associated with the selection and use of lubricants, the staff noted inconsistencies in the action credited to prevent the use of molybdenum disulfide (MoS2) as a lubricant.

- During the review of AD-MN-ALL-0006, "Fluid Leak Management," the staff noted that procedure actions are in place to ensure that leakage is identified, tracked, and trended by maintaining a database.

The staff also audited the description of the SLRA Bolting Integrity program provided in the UFSAR supplement. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR supplement was an adequate description of the SLRA Bolting Integrity program. The staff will consider issuing an RAI in order to obtain the information necessary to verify the sufficiency of the UFSAR supplement program description.

SLRA AMP B2.1.10, Steam Generators

Summary of Information in the Application. The SLRA states that AMP B2.1.10, "Steam Generators," is an existing program that is consistent with the program elements in GALL-SLR Report AMP XI.M19, "Steam Generators." To verify this claim of consistency, the staff audited the SLRA 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 documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal. The table below lists documents that were reviewed by the staff and were found relevant to the Steam Generators (SGs) program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
Action Request (AR) 02161918	Foreign material found during initial breach of 2B1 Feedwater Heater	10/31/2017
AR02336986	License Renewal AMP Effectiveness Reviews	06/25/2020
AR02062987	Steam Generator 2D Primary Channel Head Cladding	09/20/2016
AR02079963	System Engineering to Review 1A ROTSG [replacement once through steam generator] Loose Parts Intrusion	11/17/2016
AR02163957	FME [foreign material exclusion] Discovered in U2 “B” Steam Generator Lower Channel Head	11/8/2017
OPEX [operating experience] Report – long description	Reviewed document for ARs related to steam generators	
SLR-ONS-AMPR-XI.M19	Steam Generators AMP Evaluation Report	Revision 1
AD-EG-PWR-1816	Steam Generator Regulatory Reports	Revision 3
AD-EG-PWR-1812	Steam Generator Tube Repair List	Revision 3
O-ISISG-0169.030.0050	Fifth Interval Steam Generator Inservice Inspection Plan	Revision 1
CSD-CP-ONS-0200	Oconee Nuclear Station Primary-to-Secondary Leak Rate Monitoring Program	Revision 0
AD-EG-PWR-1814	Steam Generator Condition Monitoring	Revision 2
AD-EG-PWR-1811	Steam Generator Dispositioning Guidelines	Revision 2
AD-EG-PWR-1813	Steam Generator Degradation Assessments	Revision 3
AD-EG-PWR-1815	Steam Generator Operational Assessments	Revision 2
PD-EG-PWR-1801	Steam Generator Management Program	Revision 7
PD-EG-PWR-1801	Steam Generator Management Program	Revision 8
ML21042B298	Oconee Unit 1, Refuel 31 (O1R31) Inservice Inspection and Steam Generator Inservice Inspection Reports	02/11/2021
ML20070H575	Oconee Unit 2, Refuel 29 (O2R29) Inservice Inspection and Steam Generator Inservice Inspection Reports	03/10/2020
ML18235A502	Oconee Unit 3, Refuel 29 (O3R29) Inservice Inspection and Steam Generator Inspection Report	08/15/2018

During the audit, the staff verified that for the program elements that the applicant declared were consistent, the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

In addition, the staff found that for the “scope of the program” program element, sufficient information was not available to determine whether it was consistent with the corresponding

program element of the GALL-SLR Report AMP. The staff will consider issuing RAIs in order to obtain the information necessary to verify whether the program element is consistent with the corresponding program element of the GALL-SLR Report AMP.

During the audit, the staff observed that the applicable environment for the auxiliary feedwater nozzle inlet header is steam since this component is in the steam space of the SG.

During the audit of the "operating experience" program element, the staff reviewed a search of results of the plant-specific database to identify any previously unknown or recurring aging effects. The staff will evaluate the identified plant-specific OpE in the SER.

The staff also audited the description of the SLRA SGs program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.11, Open-Cycle Cooling Water System

Summary of Information in the Application

The SLRA states that AMP B2.1.11, "Open-Cycle Cooling Water System," is an existing program with enhancements and an exception that will be consistent with the program elements in GALL-SLR Report AMP XI.M20, "Open-Cycle Cooling Water System." To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the exception and enhancements associated with this AMP. The staff will document its review of the exception to the GALL-SLR Report AMP and the enhancements in the SER. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this enhanced program, and the staff's audit addressed only the program elements described in the applicant's basis document. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M20	Open-Cycle Cooling Water System AMP Evaluation Report	Revision 1
GL 89-13	Response to Generic Letter 89-13	01/26/1990
1022980	Guidance for an Effective Heat Exchanger Program	09/2011
AD-EG-ALL-1211	System Performance Monitoring and Trending	Revision 8

AD-CP-ALL-0010	Open Cooling Water Chemistry Program	Revision 1
PD-EG-ALL-1312	Raw Water Program	Revision 0
AD-EG-ALL-1312	Raw Water Program Implementation	Revision 0
AR 02160027	Thin Piping Identified at UT Location C1LPS031 (Corrosion)	10/23/2017
AR 02336986	License Renewal AMP effectiveness reviews	06/25/2020
AR 022941173	Leak found at branch connection weld upstream of 1-LPSW-109	09/26/2019
AR 02280231	Pinhole leak downstream of 1-LPSW-356	07/02/2019

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

The staff also audited the description of the SLRA AMP for the Open-Cycle Cooling Water System provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.12, Closed Treated Water Systems

Summary of Information in the Application. The SLRA states that AMP B2.1.12, "Closed Treated Water System," is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M21A, "Closed Treated Water Systems." To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the enhancements associated with this AMP. The staff will document its review of the enhancements in the SER. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M21A	Closed Treated Water Systems AMP Evaluation Report	Revision 001
3002000590	EPRI Closed Cooling Water Chemistry Guideline	Revision 2

AR 02336986	Complete AMP effectiveness review for Chemistry Control AMP	09/04/2020
AR 01736421	Ammonia concentration in 102 RCW System exceeded specification	08/13/2003
AR 01908967	pH out of specification on both A and B SSF Diesel Jacket Water Systems	07/15/2014
Metallurgy File #4386-G	ONS 2 - Corrosion Coupons from CC System (Oct 2013)	01/14/2014
Metallurgy File #2723-M	ONS Corrosion Coupons – June 2014	01/11/2014

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

The staff also audited the description of the SLRA AMP for the Closed Treated Water System provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.13, Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

Summary of Information in the Application. The SLRA states that AMP B2.1.13 "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-SLR 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 SLRA AMP. During the audit, the staff also reviewed the enhancements associated with this AMP. The staff will document its review of the enhancements in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
OE-3 AR 02336986 03	Complete AMP effectiveness review for Crane program	09/03/2020
OE-2 AR 02099481	Corrosion on Crane 84 / Keowee intake	02/13/2018
OE-1 AR 01997470	Polar Crane Inspections not being performed	04/15/2015
OPEX Report	Checked the long description of OPEX Report, listed below	N/A

OE 1797788	100T SF bay crane holds the loaded SFC in suspension for extended period of time	07/08/2009
OE 02071973	Mobile crane malfunction	10/20/2016
OE 02076108	Polar Crane Buss Bar found distorted	11/05/2016
OE 02099481	Corrosion on Crane 84/ Keowee intake – corrosion identified on the crane structure	02/13/2017
OE 02151936	25T Turbine Isle Crane – severe wear on the wheels and the track of the crane	09/19/2017
OE 02205467	Equipment failure of the Unit 3 drive trolly.	05/10/2018
SLR-ONS-AMPR-XI.23	Inspection of Overhead Heavy Load and Light Loads (Related to Refueling) Handling Systems	Revision 1
PD-MN-ALL-0009	Nuclear Rigging and Lifting Program	Revision 7
AD-MN-ALL-0010	Nuclear Rigging and Lifting Forms	Revision 6
MP/0/A/1710/028	Crane - Load and Function Teat	Revision 10
MP/0/A/1710/011	Crane – Frequent/Quarterly Safety Inspection and Preventive Maintenance	Revision 22
MP/0/A/1710/008	Hoist – Chain Hand and Electric – Safety Inspection	Revision 21
ONS UFSAR	Section 3.12 Cranes and Control of Heavy Loads	

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

The staff also audited the description of the Inspection of Overhead Heavy Load and Light Loads (Related to Refueling) Handling Systems AMP provided in the UFSAR supplement in Section A2.13 of the SLRA." The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.14, Compressed Air Monitoring

Summary of Information in the Application. The SLRA states that AMP B2.1.14, "Compressed Air Monitoring," is an existing program with an enhancement that will be consistent with the program elements in GALL-SLR Report AMP XI.M24, "Compressed Air Monitoring." To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the enhancement associated with this AMP. The staff will document its review of the enhancement in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M24	Compressed Air Monitoring AMP Evaluation Report	Revision 1
7.3.11	Oconee Nuclear Station Response to SOER 88-1	Revision 1
7.3.13	Duke Revised Response to GL-8814	08/12/1991
AR 02080514	Investigate/Repair “B” Primary Instrument Air Dryer	11/20/2016
AR 02274018	Need to Inspect/Replace Filter Due to Failure of PT	05/22/2019
AR 01822711	The Instrument Air Quality Test	02/21/2011
AR 01899782	Instrument Air System Failures	12/14/2013

During the audit, the staff verified the applicant’s claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP, or will be consistent after implementation of the identified enhancements.

The staff also audited the description of the SLRA AMP Compressed Air Monitoring provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.15, Fire Protection

Summary of Information in the Application. The SLRA states that AMP B2.1.15, “Fire Protection,” is an existing program with an enhancement that will be consistent with the program elements in GALL-SLR Report AMP XI.M26, “Fire Protection.” To verify this claim of consistency, the staff audited the SLRA 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 and will document its evaluation in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed documentation contained in the SLRA and provided by the applicant through its ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant’s methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-SCOP-0003	Subsequent License Renewal Scoping for Fire Protection (10 CFR 50.48)	Revision 1

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M26	Fire Protection AMP Evaluation Report	Revision 1
Technical Specifications (TS)	TS Section 16.9.5, “Fire Barriers”	Revision 003
MP/0/A/1705/019	Fire Protection – SLC [Selected Licensing Conditions] – Related Fire Doors – HELB [High Energy Line Break] Doors – Annual and Bi-Monthly Inspections	Revision 027
PT/0/A/0400/002	SSF [Standby Shutdown Facility] CO_2 Fire Protection System Test	Revision 034
MP/3/A/1705/018	Fire Protection – Penetration – Fire and Flood Barrier – Inspection and Minor Repair	Revision 046
MP/1/A/1705/018	Fire Protection – Penetration – Fire and Flood Barrier – Inspection and Minor Repair	Revision 059
MP/0/A/1705/040	Fire Protection – Periodic Inspection of SLC Required Fire Dampers	Revision 002
MP/2/A/1705/018	Fire Protection – Penetration – Fire and Flood Barrier – Inspection and Minor Repair	Revision 052
PT/0/A/0400/002	SSF CO_2 Fire Protection System [Markup for Enhancement]	DRAFT
O-15-00068	Cracked and degraded threshold seal	01/5/2015
O-10-05461	Crossover fire dampers have paint on them that may interfere with their operation	07/10/2010
O-09-05448	Fire barrier damming board had fallen off	08/30/2009
O-09-02309	Penetration not airtight	04/17/2009
OPEX [operating experience] Report – long description	Reviewed document for action requests related to fire protection	V1

During the audit, the staff verified that for the program element that the applicant declared were consistent, the “preventive actions,” “monitoring and trending,” and “corrective actions” program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

The staff also verified the applicant’s claim that aspects of the “parameters monitored or inspected,” “detection of aging effects,” and “acceptance criteria” program elements not associated with the enhancement identified in the SLRA are consistent with the corresponding program elements in the GALL-SLR Report AMP.

In addition, the staff found that for the “scope of the program” program element, sufficient information was not available to determine whether it was consistent with the corresponding program element of the GALL-SLR Report AMP. The staff will consider issuing RAIs in order to obtain the information necessary to verify whether the program element is consistent with the corresponding program element of the GALL-SLR Report AMP.

During the audit of the "operating experience" program element, the staff reviewed a search of results of the plant-specific database to identify any previously unknown or recurring aging effects. The staff will evaluate the identified plant-specific OpE in the SER.

The staff also audited the description of the SLRA Fire Protection program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.16, Fire Water System

Summary of Information in the Application. The SLRA states that AMP B2.1.16, "Fire Water System," is an existing program with exceptions and enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M27, "Fire Water System." To verify this claim of consistency, the staff audited the SLRA 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 and will document its evaluation in the SER.

Audit Activities. During its audit, the staff interviewed applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant through its ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M27	Fire Water System AMP Evaluation Report	Revision 001
MP/0/A/1600/032	Strainer-Zurn-HPSW-Maintenance	Revision 007
MP/0/B/1800/121	Elevated Water Storage Tank Civil Inspection	Revision 011
PT/0/A/0250/025	HPSW Pump and Fire Protection Flow Test	Revision 068
PT/3/A/0250/010 B	Fire Suppression Systems Test	Revision 021
PT/1/A/0250/010 C	Fire Suppression Systems Dry Pipe Test	Revision 022
MP/0/B/1705/012	Fire Protection – Fire Hose – Hydrostatic Pressure Test	Revision 018
MP/0/A/1705/0321	Fire Hose Houses – Inspection	Revision 006
PT/0/A/0250/024	Fire Protection System Three Year Flow Test	Revision 035
PT/2/a/0250/010 C	Fire Suppression Systems Dry Pipe Test	Revision 020
MP/0/A/1705/022	Fire Protection – Fire Hydrants and Post Indicator Valves – Periodic Inspection	Revision 016
O-12-03724	3HPSW-37 has 30 dpm [drips per minute] leak	04/09/2012
AR01830499	Cracked tee fitting spraying water during 3T Transformer Mulsifyre Wet Test	06/03/2012

Document	Title	Revision / Date
AR01905182	Degraded HPSW [High Pressure Service Water] Fire Protection Header Pipe	04/25/2012
AR01938414	HPSW-479 Leaking	08/012015
AR01826859	Keowee Hydro Station Fire Pump KO-FPS-PU-001 Fail	01/19/2012
O-13-09872	50 gpm [gallons per minute] Leak on HPSW Fire Protection Piping at the CCW [Component Cooling Water] Intake Structure	09/11/2013
WO02043113	3HPS-112 and 0HPS-450 Replace 4" Piping Between Valves	01/22/2021
O-15-00860	2" Pipe Downstream of HPSW-769 has a small thru wall leak	01/29/2015
O-11-09633	Water Leaking from HPSW header on Unit 3 Auxiliary Building 1st Floor	08/13/2011
O-12-07602	Leak at Inlet Piping of Retarding Chamber for 1HPSW-688	06/22/2012
O-14-09536	Piping Leak Upstream of HPS-VA-0856	09/02/2014
O-12-03274	3HPSW-37 has 30 dpm leak	04/05/2012
WO20248932	PT/0A/0250/024 Fire Protection System Flow Test	01/22/2021
OPEX Report – long description	Reviewed document for action requests related to water-based fire protection system components	V1

During the audit, the staff verified that for the program element that the applicant declared was consistent, the "preventive actions" program element of the SLRA AMP, is consistent with the corresponding element of the GALL-SLR Report AMP.

The staff also verified the applicant's claim that aspects of the "parameters monitored or inspected," "monitoring and trending," and "corrective actions" program elements not associated with the exceptions and enhancements identified in the SLRA are consistent with the corresponding program elements in the GALL-SLR Report AMP.

In addition, the staff found that for the "scope of the program," "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-SLR Report AMP. The staff will consider issuing RAIs in order to obtain the information necessary to verify whether the program elements are consistent with the corresponding program elements of the GALL-SLR Report AMP.

During the audit, the staff made the following observations:

- The elevated water storage tank does not have a flat bottom.
- The fire hydrants are not exposed to concrete.

During the audit of the "operating experience" program element, the staff reviewed a search of results of the plant-specific database to identify any previously unknown or recurring aging effects. The staff will evaluate the identified plant-specific OpE in the SER.

The staff also audited the description of the SLRA Fire Water System program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.17, Outdoor and Large Atmospheric Metallic Storage Tanks

Summary of Information in the Application. The SLRA states that AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," is a new program that will be consistent with the program elements in GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks." To verify this claim of consistency, the staff audited the SLRA 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. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M29	Outdoor and Large Atmospheric Metallic Storage Tanks	Revision 1
AR 02207532	Rainwater Intrusion into Unit 1, 2, and 3's BWST Enclosures	05/19/2018
AR 01905240	Rain Water in Unit 3 Cask Decon Room	10/02/2012

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

The staff also reviewed the summary description of the program provided in SLRA Appendix A, "UFSAR Supplement," Section A2.17, "Outdoor and Large Atmospheric Metallic Storage Tanks." The staff verified this description is consistent with the corresponding program description in GALL-SLR Report Table XI-01.

SLRA AMP B2.1.18, Fuel Oil Chemistry

Summary of Information in the Application. The SLRA states that AMP B2.3.18, "Fuel Oil Chemistry," is an existing program with enhancements that is consistent with the program elements in GALL-SLR Report AMP XI.M30, "Fuel Oil Chemistry." To verify this claim of consistency, the staff audited the SLRA AMP. Issues identified but not resolved in this report will be addressed in the SER. During the audit, the staff also reviewed the enhancements associated with this AMP. The staff will document its review of the enhancements in the SER.

The SLRA states that AMP "Fuel Oil Chemistry," is an existing plant-specific AMP. The staff audited the SLRA AMP to determine consistency with SRP-SLR Section A.1.2.3, "Aging Management Program Elements."

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the Fuel Oil Chemistry program. These documents were provided by Oconee. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
Procedure No. CSM 3.38 Electronic Reference No. OP00964C	Guidance for Deviation from Chemistry Sample Frequencies and Limits	Revision 03
Procedure No. CSM 3.42 Electronic Reference OP009645	Chemistry Abnormal/Elevated Source Term Response	Revision 002
SLR-ONS-AMPR-XI.M30	Oconee Nuclear Station Units 1, 2 and 3 Fuel Oil Chemistry AMP Evaluation Report (GALL-SLR Program XI.M30)	Revision 1
Procedure No CSM 3.8	Duke Energy Oconee Nuclear Station Secondary Lab. Sampling Frequencies Specifications and Corrective Actions	Revision 048
Procedure No. OP/0/A/1600/003	Duke Energy Oconee Nuclear Station SSF Fuel Oil System Operation	Revision 025
PIP Serial No. 0-12-09334	ST 3532 PIP Detail Report	Report 12/21/2020 8:49:59 A.M.

During the audit, the staff verified Oconee's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

During the audit of the "operating experience" program element, the staff reviewed OpE to identify any previously unknown or recurring aging effects. The staff will evaluate the identified plant-specific OpE in the SER.

The staff also audited the description of the SLRA AMP provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.19, Reactor Vessel Material Surveillance

Summary of Information in the Application. The SLRA states that AMP B2.19, "Reactor Vessel Material Surveillance," is an existing program with three exceptions that will be consistent with the program elements in GALL--SLR Report AMP B2.19, "Reactor Vessel Material Surveillance." To verify this claim of consistency, the staff audited the SLRA AMP. During the

audit, the staff also reviewed the exceptions associated with this AMP. The staff will document its review of the exceptions to the GALL-SLR Report AMP in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The staff notes that OpE related to the reactor vessel material surveillance program (which is based on the requirements 10 CFR Part 50, Appendix H) is also summarized in reactor vessel material surveillance program summary technical reports that are generated in accordance with the reporting requirements in 10 CFR Part 50, Appendix H. These summary technical reports were included in the review. The table below lists the documents that were reviewed by the staff and were found relevant to the reactor pressure vessel material surveillance described in SLRA Section B2.1.19.

Document	Title	Revision / Date
OE 2 – BAW – 1543	Supplement to the Master Integrated Reactor Vessel Surveillance Program	Revision 4, Supplement 7-A, 03/2018
AD-EG-ALL01910	Reactor Vessel Integrity Program Implementation	Revision 2, 06/2019
BAW-1006A	Reactor Vessel Material Surveillance Program	Revision 3, 01/1975
BAW-1421	Analysis of Capsule OCI-F, Oconee Nuclear Station Unit 1 Reactor Vessel Material Surveillance Program	09/1975
BAW-1436	Analysis of Capsule OCI-E, Oconee Nuclear Station Unit 1 Reactor Vessel Material Surveillance Program	09/1977
BAW-1837	Analysis of Capsule OCI-A, Oconee Nuclear Station Unit 1 Reactor Vessel Material Surveillance Program	08/1984
BAW-2050	Analysis of Capsule OCI-C, Oconee Nuclear Station Unit 1 Reactor Vessel Material Surveillance Program	10/1988
BAW-1437	Analysis of Capsule OCII-C, Oconee Nuclear Station Unit 2 Reactor Vessel Material Surveillance Program	05/1977
BAW-1699	Analysis of Capsule OCII-A, Oconee Nuclear Station Unit 2 Reactor Vessel Material Surveillance Program	12/1981
BAW-2050	Analysis of Capsule OCII-E, Oconee Nuclear Station Unit 2 Reactor Vessel Material Surveillance Program	10/1988
BAW-1439	Analysis of Capsule OCIII-A, Oconee Nuclear Station Unit 3 Reactor Vessel Material Surveillance Program	07/1977
BAW-1697	Analysis of Capsule OCIII-B, Oconee Nuclear Station Unit 3 Reactor Vessel Material Surveillance Program	10/1981
BAW-2128	Analysis of Capsule OCIII-A, Oconee Nuclear Station Unit 3 Reactor Vessel Material Surveillance Program	Revision 1, 05/1992

During the audit, the staff verified the applicant's claim that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," "corrective actions," "confirmation process," and "administrative controls" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

During the audit, the staff observed that ONS AMP B2.1.19, "*Reactor Vessel Material Surveillance,"* is an existing and on-going program that is consistent with the ten elements of AMP XI.M31, "*Reactor Vessel Material Surveillance,"* specified in NUREG-2191 (GALL-SLR) with three exceptions.

The first exception (for ONS Unit 3) describes the design of the reactor vessel material surveillance program, which was developed in accordance with ASTM E185-66 and updated to meet the intent of ASTM E185-70. At the time, ASTM E185-66 required the reactor vessel test specimens be taken from the base metal with the highest transition temperature, any weld metal, and the associated heat affected zone metal. As a result, the weld metal included in the ONS Unit 3 plant-specific surveillance capsules was a Linde 80 weld, but not the controlling weld metal (same heat/flux lot as the beltline region controlling weld) for ONS Unit 3. With the later development of the master integrated reactor vessel program (MIRVP), test specimens representing the ONS Unit 3 controlling beltline weld were made available and incorporated into the program.

The second exception addresses the incorporation of a (formerly standby) capsule into the surveillance capsule withdrawal schedule. Based upon BAW-1543, Revision 4, Supplement 7-A, standby capsules that do not contain weld materials or are not expected to contribute significantly to the Linde 80-weld metal surveillance database, may be disposed. In accordance with 10 CFR Part 50, Appendix H, surveillance capsule specimens should be tested at neutron fluences between one and two times the peak reactor vessel wall neutron fluence of interest at the end of the subsequent period of operation. Surveillance data for Linde 80 weld wire heat 72442 have been tested at neutron fluences ranging from 6.09E+18 to 1.95E+19 n/cm2 (E > 1 MeV), which are slightly below the projected neutron fluence of the controlling ONS Unit 3 circumferential weld at 72 EFPY (2.01E+19 n/cm2, E > 1 MeV). In addition, for ONS Unit 3 weld WF-67 (heat 72442), there are nine tested surveillance capsules that are available containing Linde 80 weld metals with copper and nickel compositions similar to best-estimate copper and nickel compositions of Linde 80 weld wire heat 72442. The neutron fluences for these capsules range from 7.27E+17 to 3.04E+19 n/cm2 (E > 1 MeV), which exceed the projected neutron fluence for ONS Unit 3 72 EFPY.

The third exception addresses capsule specimens that are not expected to contribute significantly to the Linde 80-weld metal surveillance database and are not required to support SLR. Duke Energy stated that relevant capsule data has been obtained to support the reactor pressure vessel TLAA at neutron fluences between one and two times the peak reactor vessel wall neutron fluence of interest at the end of the subsequent period of operation (i.e., 72 EFPY), with exception of ONS Unit 3 heat 72442, which is addressed in the second exemption.

The staff also audited the description of the SLRA for the Reactor Vessel Material Surveillance Program provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the GALL-SLR Report.

The staff further noted that Table A6.0-1 of Attachment A to the Oconee SLRA lists subsequent license renewal commitments. The Reactor Vessel Material Surveillance Program is listed as commitment #19.

SLRA AMP B2.1.20, One-Time Inspection

Summary of Information in the Application. The SLRA states that AMP B2.1.20, "One-Time Inspection," is a new program that will be consistent with the program elements in GALL-SLR Report AMP XI.32, "One-Time Inspection." To verify this claim of consistency, the staff audited the SLRA 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. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M32	One-Time Inspection AMP Evaluation Report	Revision 1
AD-EG-ALL-1653	License Renewal One-Time Inspection Aging Management Program	Revision 0

During the audit, the staff verified the applicant's claim that the "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

In addition, the staff found that for the "scope of program," program element, sufficient information was not available to verify whether it was consistent with the corresponding program elements of the GALL-SLR Report AMP. The staff will consider issuing an RAI in order to obtain the information necessary to verify whether this program element is consistent with the corresponding program elements of the GALL-SLR Report AMP.

During the audit, the staff reviewed SLR-ONS-AMPR-XI.M32 and noted that the One-Time Inspection program also manages loss of coating integrity for the Condensate System powdex and slurry tanks.

The staff also reviewed the summary description of the program provided in SLRA Appendix A, "UFSAR Supplement," Section A2.20, "One-Time Inspection." The staff verified this description is consistent with the corresponding program description in GALL-SLR Report Table XI-01.

SLRA AMP B2.1.21, Selective Leaching

Summary of Information in the Application. The SLRA states that AMP B2.1.21, "Selective Leaching," is a new program that will be consistent with the program elements in GALL-SLR Report AMP XI.M33, "Selective Leaching." To verify this claim of consistency, the staff audited the SLRA 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. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M33	Selective Leaching AMP Evaluation Report	Revision 1
OSC-10475	License Renewal Cast Iron Selective Leaching	Revision 0
OSC-10396	Selective Leaching Corrosion Inspections – License Renewal	Revision 0
AR 02357223	Unexpected corrosion in malleable iron RCW [Recirculating Cooling Water] fittings	11/10/2020
AR 02354397	¾-inch RCW pipe break at 1D2 HDP [Heater Drain Pump]	10/21/2020

During the audit, the staff verified the applicant's claim that the "preventive actions," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR 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 verify whether they were consistent with the corresponding program elements of the GALL-SLR Report AMP. The staff will consider issuing RAIs in order to obtain the information necessary to verify whether these program elements are consistent with the corresponding program elements of the GALL-SLR Report AMP.

During the audit, the staff made the following observations:

- The staff reviewed SLR-ONS-AMPR-XI.M33 and noted the following: (a) the external surfaces of buried uncoated gray cast iron and ductile iron components are included within the scope of the ONS Selective Leaching program; (b) this includes components that were originally coated but for which subsequent inspections have identified coating degradation that would expose the external surfaces to direct contact with the soil environment such that loss of material due to selective leaching could occur; and (c) the

external surface of susceptible buried components are not generically excluded from the Selective Leaching program.

- The staff reviewed OSC-10396 and noted the following: (a) the fire protection piping was reviewed, and it appears that that piping is ductile iron; and (b) the buried pipe in the HPSW [High Pressure Service Water] and KSW [Keowee Service Water] systems was determined to be made of ductile iron.

- The staff reviewed AR 02357223 and noted the following: (a) nine fittings were sent off for analysis as part of extent of condition to determine their material composition; and (b) all nine fittings were found to be malleable iron.

- The staff reviewed AR 02354397 and noted the following: (a) although the RCW system is molybdate-treated, there was evidence of internal general corrosion, pitting, and graphitic corrosion; and (b) the attachment titled "Metallurgical Evaluation of Couplings" dated November 19, 2020, shows dark corrosion product layers (potentially indicative of graphitic corrosion) on the internal surfaces of malleable iron fittings.

The staff also audited the description of the SLRA Selective Leaching program provided in the UFSAR supplement. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR supplement was an adequate description of the SLRA Selective Leaching program. The staff will consider issuing an RAI in order to obtain the information necessary to verify the sufficiency of the UFSAR supplement program description.

SLRA AMP B2.1.22, ASME Code Class 1 Small-Bore Piping

Summary of Information in the Application. The SLRA states that AMP B2.1.22, "ASME Code Class 1 Small-Bore Piping," is a new program that is consistent with the program elements in GALL-SLR Report XI.M35, "ASME Code Class 1 Small-Bore Piping." To verify this claim of consistency, the staff audited the SLRA AMP.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. The staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M35	"ASME Code Class 1 Small-Bore Piping AMP Evaluation Report" This report serves as technical basis document.	Revision 1
1997- Metlab Report #2181-ONS 2&3 HPIMU Component	"ONS 2&3 HPI/MU [High Pressure Injection / Makeup] Nozzle Components Metallurgical Analysis Report."	06/30/1997

Document	Title	Revision / Date
2013-Metlab Report #5105-ONS 1B2 HPI Line Safe End to Pipe Weld	"ONS 1B2 HPI Line Safe End-to-Pipe Weld, Metallurgy File #5105" This report documents November 8, 2013 RCS [reactor coolant system] leakage at the safe end-to-pipe butt weld of Unit 1 located between the high pressure injection (HPI) line nozzle and valve.	12/03/2013
2015 Report 5319 - Final	As part of thermal fatigue extent of condition evaluation and in accordance with Materials Reliability Program (MRP)-146, an augmented ultrasonic testing (UT) was performed on the extrados of 1B2 1.5-inch stainless steel cold leg drain line of Unit 2 on November 13, 2014. The inspection identified rejectable indications. Metallurgical evaluation was performed as part of root cause analysis.	01/15/2015
OISI-0169.10-0050-AUG-ISI	Oconee Nuclear Station – Augmented Inservice Inspection NDE Plan – General Requirements and Units Detail Listing	6/10/2020

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

During the audit, the staff made the following observations:

- From review of the program basis document, the staff verified that this document provides supporting evidence that this program will employ volumetric or destructive examinations to augment the existing ASME Code, Section XI inservice inspections to manage the potential cracking of the Class 1 small-bore piping butt and socket welds due to the stress corrosion cracking (SCC), thermal fatigue, or vibratory fatigue.

- The staff reviewed the Oconee OpE and noted that an age-related cracking has been identified in the Class 1 small-bore piping butt welds. As a result, the applicant, within the scope of this program, will conduct periodic examinations of a sample of the Class 1 small-bore piping butt welds (i.e., 10 percent of the butt welds every 10 years, up to a maximum of 25 welds per unit).

- The staff's review of Oconee OpE revealed that no aged-related cracking has been identified in Class 1 small-bore piping socket welds. As a result, the applicant within the scope of this program will conduct a one-time examination of a sample of the Class 1 small-bore piping socket welds (i.e., 3 percent of the socket welds, up to a maximum of 10 welds per unit) within the 6-year period prior to the subsequent period of extended operation. However, if cracking is identified in the socket welds examined, the applicant within the scope of this program will conduct periodic examinations of a sample of the Class 1 small-bore piping socket welds (i.e., 10 percent of the socket welds, up to a maximum of 25 welds per unit).

The staff also audited the description of the SLRA ASME Code Class 1 Small-Bore Piping provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR.

SLRA AMP B2.1.23, External Surfaces Monitoring of Mechanical Components

Summary of Information in the Application. The SLRA states that AMP B2.1.23, "External Surfaces Monitoring of Mechanical Components," is a new program that will be consistent with the program elements in GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components." To verify this claim of consistency, the staff audited the SLRA 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 documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M36	External Surfaces Monitoring of Mechanical Components AMP Evaluation Report	Revision 001
AD-EG-ONS-1213	Oconee Subsequent License Renewal Walkdowns	Revision 0 Draft
AD-MN-ALL-0006	Fluid Leak Management	Revision 2
AR 01802612	LPSW line leak at TBB L-20	09/02/2009
AR 01847930	U-1 A BA compressor has leaking hydraulic hose	10/22/2012
AR 01851430	Keowee WL "Lake Water" Strainers and piping in need of paint	08/13/2013
1007933	EPRI Aging Assessment Field Guide	December 2003
OSS-0241.00-00-0004	Conventional Thermal Insulation	Revision 007
1009743	EPRI Aging Identification and Assessment Checklist	August 2004

During the audit, the staff verified the applicant's claim that the "preventive actions," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR 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 verify whether they were consistent with the corresponding program element of the GALL-SLR Report AMP. The staff will consider issuing RAIs in order to obtain the information necessary to verify whether

these program elements are consistent with the corresponding program elements of the GALL-SLR Report AMP.

During the audit, the staff noted that since plant OpE indicated stress corrosion cracking or loss of material in aluminum exposed to aqueous solutions and air environments, or to stainless steel components exposed to air environments, have not been found at the plant, the One-Time Inspection program will be used to verify that these aging effects are not applicable.

The staff also audited the description of the SLRA AMP "External Surfaces Monitoring of Mechanical Components" provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.24, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

Summary of Information in the Application. The SLRA states that AMP B2.1.24, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," is a new program that will be consistent with the program elements in GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components." To verify this claim of consistency, the staff audited the SLRA 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 documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP Evaluation Report	Revision 0
AR 01794564	Internal Sleeves for the two CCW Expansion Joints found damaged during 2EOC25	10/28/2010
AR 02203319	3RBC-AH0022D, RB [Reactor Building] Aux Fan Duct Crack	05/02/2018
AR 01784841	Strainer body for the Primary Instrument Air Compressor was found cracked during quarterly PM	09/30/2009
AR 01820275	3HPSW-37 has 30 dpm [drops per minute] leak	04/05/2012
AR 01831263	Leak at inlet piping of Retarding Chamber for 1HPSW [High Pressure Service Water] - 688	06/22/2012
AR 01938414	HPSW-479 Leaking	08/01/2015
AR 01827647	Water Leaking form HPSW header on Unit 3 Aux Bldg 1st floor	08/13/2011
AR 01909111	Piping leak upstream of HPS-WA-0856	09/02/2014

AR 01907303	2-inch pipe downstream of HPSW-769 has a small thru wall leak	01/29/2015

During the audit, the staff verified the applicant's claim that the "scope of program," "preventive actions," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

In addition, the staff found that for the "parameters monitored or inspected" program element, sufficient information was not available to verify whether it was consistent with the corresponding program element of the GALL-SLR Report AMP. The staff will consider issuing RAIs in order to obtain the information necessary to verify whether this program element is consistent with the corresponding program element of the GALL-SLR Report AMP.

The staff also audited the description of the SLRA Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.25, Lubricating Oil Analysis

Summary of Information in the Application. The SLRA states that AMP B2.1.25, "Lubricating Oil Analysis," is an existing program that is consistent with the program elements in GALL-SLR Report AMP XI.M39, "Lubricating Oil Analysis." To verify this claim of consistency, the staff audited the SLRA AMP.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.39	Oconee Nuclear Station Units 1, 2 and 3 Lubricating Oil Analysis AMP Evaluation Report GALL-SLR Program XI.M39	Revision 1
MD 6.3.13 Electronic Reference oAP0007E	Oconee Lubricating and Oil Analysis Program	Revision 000
Procedure No. MD/0/A/2000/075 Electronic Reference OAP009432	KHS Oil Sampling	Revision 007

During the audit, the staff verified Oconee's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

During the audit of the “operating experience” program element, the staff reviewed a search of results of the plant-specific database to identify any previously unknown or recurring aging effects. The staff will evaluate any identified plant-specific OpE in the SER.

The staff also audited the description of the SLRA AMP Lubricating Oil Analysis program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.26, Buried and Underground Piping and Tanks

Summary of Information in the Application. The SLRA states that AMP B2.1.26, “Buried and Underground Piping and Tanks,” is an existing program with enhancements and exceptions that will be consistent with the program elements in GALL-SLR Report AMP XI.M41, “Buried and Underground Piping and Tanks.” To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the exceptions and enhancements associated with this AMP. The staff will document its review of the exceptions to the GALL-SLR Report AMP and the enhancements in the SER. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this enhanced program, and the staff’s audit addressed only the program elements described in the applicant’s basis document. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant’s methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M41	Buried and Underground Piping and Tanks AMP Evaluation Report	Revision 1
EC 407469	Replace 6-inch, Class C, SSF [Standby Shutdown Facility] ASW [Auxiliary Service Water] Piping	10/16/2018
IP/0/B/0380/005 D	Standby Shutdown Facility Diesel Fuel Oil Storage Tank Cathodic Protection System	Revision 5
OSS-0009.00-00-0002	Backfill for QA Conditions 1,2,3,4 and Non-QA Structures, Appurtenances, and Buried Utilities	Revision 7
AD-EG-ALL-1613	Buried Piping Integrity Program Implementation	Revision 5
PT/0/A/0250/024	Fire Protection System Three Year Flow Test	Revision 35
PT/0/A2200/012	Keowee Hydro Station Fire Protection Pump and Mulsifyre Systems Wet Surveillance	Revision 39
AR 02079485	U1 SSF-ASW Piping In-Line Inspections Results	11/16/2016
AR 02077203	SSF-ASW Coating Inspection Results: Corrosion Pit Evaluation	11/9/2016

AR 01784715	Engineering Inspection of Unit 3 Exposed CCW Pipe	03/18/2009
OSC-11163	Low Frequency Electromagnetic Technique Inspection Report of the 2A9 CCW Pipe Line	Revision 0
OSC-11241	Low Frequency Electromagnetic Technique Inspection Report of the CCW Discharge Pipe (Manway 3B-9)	Revision 0
Drawing O-032-Y	Standby Shutdown Facility Outdoor Structures Conc. Reinf. & Misc. Steel Plan, Sections & Details	Revision 4
Drawing O-34	Standby Shutdown Facility Excavation Plans, Sections & Details	Revision 3
Drawing O-32-V	Yard Area – Tanks Standby Shutdown Facility Diesel Fuel Oil Storage Tank System FO	Revision 5
OM-347-0009-001	Oconee Nuclear Station SSF Diesel Fuel Tank Cathodic Protection System Manual	Revision 4

During the audit, the staff verified the applicant's claim that the "scope of program," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP, or will be consistent after implementation of the identified enhancements.

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-SLR Report AMP. The staff will consider issuing RAIs in order to obtain the information necessary to verify whether these program elements are consistent with the corresponding program elements of the GALL-SLR Report AMP.

During the audit, the staff reviewed SLR-ONS-AMPR-XI.M41 and noted the following: (a) the program uses the -850 millivolt (mV) relative to a copper/copper sulfate electrode (CSE) instant-off criterion for determination of cathodic protection system effectiveness; (b) the original design of buried piping systems at Oconee did not require coating of stainless steel piping; (c) a review of plant-specific OpE has not revealed any instances of through-wall leakage of buried stainless steel piping at Oconee; and (d) the coating system for the SSF diesel engine fuel oil tank consists of a prime coat of Amercoat 370 high build epoxy primer (4-6 DFT [dry film thickness]) and a finish coat of Amercoat 78HB high build coal tar epoxy (12-16 DFT).

The staff also audited the description of the SLRA Buried and Underground Piping and Tanks program provided in the UFSAR supplement. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR supplement was an adequate description of the SLRA Buried and Underground Piping and Tanks program. The staff will consider issuing an RAI in order to obtain the information necessary to verify the sufficiency of the UFSAR supplement program description.

SLRA AMP B2.1.27, Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks

Summary of Information in the Application. The SLRA states that AMP B2.1.27, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," is a new program with exceptions that will be consistent with the program elements in GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," as modified by SLR-ISG-2021-02-MECHANICAL,

"Updated Aging Management Criteria for Mechanical Portions of the Subsequent License Renewal Guidance."

To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the exceptions associated with this AMP. The staff will document its review of the exceptions to the GALL-SLR Report AMP in the SER. 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. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.M42	Internal Coatings/Linings for In-scope Piping, Piping Components, Heat Exchangers, and Tanks AMP Evaluation Report	Revision 1
PT/0/A/0250/024	Fire Protection System Three Year Flow Test	Revision 35
PT/0/A2200/012	Keowee Hydro Station Fire Protection Pump and Mulsifyre Systems Wet Surveillance	Revision 39
OSC-7380	CCW Intake and Discharge Piping Units 1, 2, and 3; 5 year Civil/Coating Inspection Report	Revision 15
OSC-7381	Borated Water Storage Tank 5 year Civil/Structural Inspection	Revision 9

During the audit, the staff verified the applicant's claim that the "scope of program," "preventive actions," "parameters monitored or inspected," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP, or will be consistent after implementation of the identified enhancements.

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 element of the GALL-SLR Report AMP. The staff will consider issuing an RAI in order to obtain the information necessary to verify whether this program element is consistent with the corresponding program element of the GALL-SLR Report AMP.

The staff also audited the description of the SLRA Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program provided in the UFSAR supplement. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR supplement was an adequate description of the SLRA Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks

program. The staff will consider issuing an RAI in order to obtain the information necessary to verify the sufficiency of the UFSAR supplement program description.

SLRA AMP B2.1.28, ASME Section XI, Subsection IWE

Summary of Information in the Application. The SLRA states that AMP B2.1.28, "ASME Section XI, Subsection IWE," is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.S1, "ASME Section XI, Subsection IWE." To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the enhancements associated with this AMP. The staff will document its review of the enhancements in the SER. The staff will address issues identified during the audit in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.S1	ASME Section XI, Subsection IWE AMP Evaluation Report, ONS Units 1, 2 and 3	Revision 2
MP/0/A/3005/010	Containment Structural Inspection	Revision 10
NDE-NE-ALL-7402	Visual Examination of IWE Components	Revision 1
O-ISI3-62-0001	Third Interval Containment Inservice Inspection Plan	Revision 6
CSD-ISI-ALL-1702.01	ASME Section XI Inservice Inspection Program Workplace Processes and Inspections	Revision 1
SLR-ONS-IPAR-S502	Subsequent License Renewal Integrated Plant Assessment of the Reactor Building	Revision 1
OSC-10898	Reactor Building Concrete Subject to Elevated Temperatures	Revision 0
N/A	OPEX Report – Long Description	Revision 1
SLR-ONS-OPEX-0100	Subsequent License Renewal Operating Experience Review Methodology and Results	Revision 4
AR 01850534	Potential Issue Related to ASME IWE Requirements for Containment Liner Inspection Ports	11/12/2013
AR 02203514	Liner Plate Wall Thickness Loss Identified	05/03/2018
AR 02325740	ISI Containment Moisture Barrier Visual Examination	04/16/2020
AR 02336986	License Renewal AMP Effectiveness Reviews	06/25/2020

During the audit, the staff verified the applicant's claim that the "scope of program," "parameters monitored or inspected," "monitoring and trending," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

In addition, the staff found that for the "preventive actions," "detection of aging effects," and "acceptance criteria" program elements, sufficient information was not available to verify whether it was consistent with the corresponding program element of the GALL-SLR Report AMP. The staff will consider issuing an RAI in order to obtain the information necessary to verify whether this program element is consistent with the corresponding program elements of the GALL-SLR Report AMP and/or the associated enhancements are adequate to manage aging effects.

During the audit, the staff made the following observations:

- The staff identified that additional information is needed to determine whether the IWE AMP and Appendix J AMP examination/testing methods will be sufficient to manage DM welds without additional appropriate examinations capable of detecting cracking due to SCC.

- The staff noted an inconsistency between SLRA Section 3.5.2.2.1.6 and SLRA Section B2.1.28 on the aging management of the DM welds and stainless steel components. The staff also noted an inconsistency between SLRA Section 3.5.2.2.1.6, SLRA Sections A2.28 and B2.1.28 related to identifying the specific pressure-retaining components that will be subject to surface or enhanced examinations to detect cracking.

- The staff also noted that the non-applicability claim for SLRA Table 3.5.1, item 3.5.1-027 did not appear to be adequately justified or the line item adequately addressed for cracking due to cyclic loading for steel, stainless steel and DM weld containment pressure-retaining boundary components subject to cyclic loading but with no CLB fatigue analyses.

- The staff noted that SLRA Section 3.5.2.2.1.3 does not provide information on how the moisture barrier degradation, at the junction on where the shell or liner becomes embedded, and the borated water spills and water ponding on the concrete floor are adequately managed.

The staff also audited the description of the SLRA ASME XI, Subsection IWE program provided in the UFSAR supplement. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR supplement was an adequate description of the SLRA ASME Section XI, Subsection IWE program. The staff will consider issuing an RAI in order to obtain the information necessary to verify the sufficiency of the UFSAR supplement program description.

SLRA AMP B2.1.29, ASME Section XI, Subsection IWL

Summary of Information in the Application. The SLRA states that AMP B2.1.29, "ASME Section XI, Subsection IWL," is an existing program with enhancements and an exception that will be consistent with the program elements in GALL-SLR Report AMP XI.S2, "ASME Section XI, Subsection IWL." To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the exception and enhancements associated with this AMP.

The staff will document its review of the exception to the GALL-SLR Report AMP and the enhancements in the SER. The staff will address issues identified during the audit in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.S2	ASME Section XI, Subsection IWL AMP Evaluation Report	Revision 2
CSD-ISI-ALL-1702.01	ASME Section XI Inservice Inspection Program Workplace Processes and Instructions	Revision 1
NDE-NE-ALL-7401	Visual Examination of IWL Components	Revision 1
O-ISIC3-62-0001	Third Interval Containment Inservice Inspection Plan Oconee Nuclear Station Units 1, 2, & 3	Revision 6
MP-0-A-1400-022	Tendon – Reactor Building – Surveillance	Revision 25
N/A	OPEX Report – long description	Version 1
AR 01817471	PIP Detail Report Serial No. O-12-03170	03/21/2012
AR 01828181	PIP Detail Report Serial No. O-12-05946	05/16/2021
AR 01315654	PMAD – Coat Unit 1 and 2 Exterior of RB Domes Every 2 Years	08/09/2012
AR 01905317	High Temperature in Main Steam Penetration and Leaking HVAC	12/13/2012
OSC-10898	Reactor Building Concrete Subject to Elevated Temperatures	Revision 0
N/A	Unit 1, Year 45 Tendon Surveillance Summary and Evaluation Report	9/7/2017

During the audit, the staff verified the applicant's claim that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

The staff also verified the applicant's claim that aspects of the "acceptance criteria" program element not associated with the exception identified in the SLRA are consistent with the corresponding program elements in the GALL-SLR Report AMP.

In addition, the staff found that for the "operating experience" program element, sufficient information was not available to verify whether it was consistent with the corresponding program element of the GALL-SLR Report AMP. The staff will consider issuing an RAI in order to obtain the information necessary to verify whether this program element is consistent with the corresponding program elements of the GALL-SLR Report AMP.

The staff also audited the description of the SLRA ASME Section XI, Subsection IWL program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.30, ASME Section XI, Subsection IWF

Summary of Information in the Application. The SLRA states that AMP B2.1.30, "ASME Section XI, Subsection IWF," is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.S3, "ASME Section XI, Subsection IWF. To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the enhancements associated with this AMP. The staff will document its review of the enhancements in the SER. The staff will address issues identified in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal. Furthermore, the staff conducted additional OpE searches on the applicant's CAP database.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-OPEX-0100	SLR Operating Experience Review Methodology and Results	Revision 4
N/A	OPEX Report Long Description	Version 1
AR 01850913	Spacer on pipe clamp missing (U1)	11/5/2012
AR 01908871	Discrepancy noted during ISI VT-3 inspections on pipe support S/R 3-53B-5-0-2436D-SR40 (pipe bears on support and gap above pipe is 1.625" vs 2.375" gap on sketch) ISI VT-3	04/22/2015
AR 01991117	Hanger discrepancies on 1-54A-439A-H23 (ISI VT-3)	01/14/2016
AR 02162875	Pipe clamp on rod hanger overtightened on support 2-51A-0-1444-H187 (VT-3)	11/3/2017
AR 01784615	Nut missing from pipe hanger(s) on Emergency Feedwater Line Unit 1	03/11/2009
AR01820572	Loose pipe support clamps (PSW pipe supports U2)	04/13/2012
AR01830957	Loose locknut on pipe support (U2 LPI pipe support/restraint)	09/5/2013
AR01849492 & AR01849507	Hanger 2-07B-0-1400A-H5 found with loose jam nut	03/13/2013
AR01874248	Cold load on spring can for pipe support 1-51A-1-0-444-H3 is out of tolerance	11/13/2014

AR01872782	On Pipe support 14-0-479A-H20D & 1-14-0-479A-H5 there is heavy pitting on items (#2, #6, #7 and associated welds)	11/9/2014
AR01936342	Cracked weld at welded attachment – ISI Class B pipe support 1-53B-435B-DE045	07/14/2015
AR02077443	ISI Discrepancies during VT-3 exam of hanger 1-14B-O-479A-H5	11/10/2016
AR02164916	Missing bolts (2) and degraded concrete on 2B S/G Lateral supports	11/12/2017
AR02185619	ASME Support Degraded Condition (Component support ID# 3-53B-5-0-2444-H94 was found to have loose clamp bolt nut)	2/19/2018
AR02203655	ISI examination of Hanger 3-01A-1-1-0-2401B-H41, loose jam nut on pipe clamp of the support	5/3/2018
AR02300024	Visual Examination (VT-3) of Component Support 2-14B-0-1439A-H34	10/30/2019
AR02300737	Potential corrosion of Support (spring hanger 2-51A-435B-DKB-1411) Anchor Plate and Bolting	11/5/2019
AR0232845	VT-3 Examination of the BWST Tank Supports (including before/after pictures of degraded support members)	04/17/2020
AR02325846	Degraded Coating and Bolting Corrosion found on U3 BWST anchors	04/17/2020
AR01862872	Corrosion and heavy rust on anchors (U3 BWST)	03/12/2014
O1R28 Inspection Reports	Visual Examination of Pipe Hanger, Support or Restraint (VT-3) Oconee Unit 1 ISI	Fall 2014
O1R29 Inspection Reports	Visual Examination of Pipe Hanger, Support or Restraint (VT-3) Oconee Unit 1 ISI	Fall 2016
O1R30 Inspection Reports	Visual Examination of Pipe Hanger, Support or Restraint (VT-3) Oconee Unit 1 ISI	Fall 2018
O1R31 Inspection Reports	Visual Examination of Pipe Hanger, Support or Restraint (VT-3) Oconee Unit 1 ISI	Fall 2020
O2R27 Inspection Reports	Visual Examination of Pipe Hanger, Support or Restraint (VT-3) Oconee Unit 2 ISI	Fall 2015
O2R28 Inspection Reports	Visual Examination of Pipe Hanger, Support or Restraint (VT-3) Oconee Unit 2 ISI	Fall 2017
O2R29 Inspection Reports	Visual Examination of Pipe Hanger, Support or Restraint (VT-3) Oconee Unit 2 ISI	Fall 2019
O3R28 Inspection Reports	Visual Examination of Pipe Hanger, Support or Restraint (VT-3) Oconee Unit 3 ISI	Spring 2016
O3R29 Inspection Reports	Visual Examination of Pipe Hanger, Support or Restraint (VT-3) Oconee Unit 3 ISI	Spring 2018
O3R30 Inspection Reports	Visual Examination of Pipe Hanger, Support or Restraint (VT-3) Oconee Unit 3 ISI	Spring 2020
[[XX]] (Proprietary), Appendix A	Irradiation Embrittlement of ONS RPV Supports for SLR, Appendix A – ONS RPV Support Skirt Visual Examination Reports [VT-12-1076 dated November 17, 2012, VT-13-1180 dated November 30, 2013 and VT-14-1233 dated May 10, 2014 for Units 1, 2 and 3, respectively]	Revision 1
N/A	ONS RPV Support Skirt Inspection Meeting Presentation	08/20/2021

SLR-ONS-AMPR-XI.S3	ASME Section XI, Subsection IWF AMP Evaluation Report, ONS Units 1, 2 and 3	Revision 2
OISI-0169.10-0050-ISI PLAN	Fifth Interval Inservice Inspection Plan, ONS Units 1, 2, & 3 and Keowee Hydro Station Units 1 & 2	Revision 0 & Revision 1 markup
OISI-0169.10-0050-BASIS DOC	ONS Units 1, 2 and 3 ASME Section XI Program Basis Document for the 5th Inservice Inspection Interval	Revision 0 (07/24/2014) & Revision 1 markup
O-ISIC3-62-0001	Third Interval Containment Inservice Inspection Plan Oconee Nuclear Station Units 1, 2 & 3	Revision 8
AD-EG-ALL-1701	ASME Section XI Plan Development (Fleet)	Revision 2
AD-EG-ALL-1702	ASME Section XI Inservice Inspection Program Administration (Fleet)	Revision 6
NDE-NE-ALL-7302	VT-3 Visual Examination of Component Supports	Revision 1 & markup
AD-NE-ALL-1101	Training, Qualification, and Certification of Nondestructive Examination Personnel	Revision 5
AD-NE-ALL-1107	Evaluation of Indications and Relevant Conditions	Revision 3
SDQA Plan “D”	Duke Energy Company Power Chemistry Materials Guide (PCMG) Program	Revision 31 & markup
AD-EN-ALL-0045	Nuclear Chemical Control	Revision 9
MP/0/A/3019/004	Hangers – QA Condition 1 and 4 – Removal, Installation, or Modification Procedure	Revision 076
ER-CHM-00005 (Excel spreadsheet)	Nuclear Chemical [Approved] List [includes Molykote BR-2, Molykote 3452, Molykote (R) Z Powder as approved lubricants)	N/A
Report DUKE-003-003	Assessment of the Oconee Nuclear Station Unit 1 Inservice Inspection Program, Prepared by Inservice Engineering	Revision 0 (08/21/2009)
Report DUKE-004-001	Assessment of the Oconee Nuclear Station Unit 2 Inservice Inspection Program, Prepared by Inservice Engineering	Revision 0 (08/27/2009)
Report DUKE-002-002	Assessment of the Oconee Nuclear Station Unit 3 Inservice Inspection Program, Prepared by Inservice Engineering	Revision 0 (08/28/2009)

During the audit, the staff verified the applicant’s claim that the “parameters monitored or inspected,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP, or will be consistent after implementation of the identified enhancements.

In addition, the staff found that for the “scope of program,” “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-SLR Report AMP. The staff will consider issuing RAIs, RCIs or use a voluntary supplement to obtain the information necessary to verify whether these program elements are consistent with the corresponding program elements of the GALL-SLR Report AMP.

During the audit, the staff made the following observations:

- The staff noted that Section 3.2.a of the AMP evaluation report SLR-ONS-AMPR-XI.S3 states that ONS does not contain any [Class] MC component supports; therefore, there are no Class MC component supports in the scope of the B2.1.30 AMP.

- The staff noted from Section 4.1 of the AMP evaluation report, SLR-ONS-AMPR-XI.S3, that the supports within the scope of the ASME Section XI, IWF AMP do not have elastomeric vibration isolation elements at ONS.

- The staff noted that there was a lack of clarity on consistency of the proposed enhancement to the "detection of aging effects" program element for volumetric examination of high strength bolting regarding sampling criteria and bases, and how the sample is sufficiently representative to provide reasonable assurance that SCC is not occurring on the entire population of high strength bolting.

- The staff noted from Section 4.4.d of the AMP evaluation report, SLR-ONS-AMPR-XI.S3, that plant specific OpE has not identified cracking due to SCC for high strength bolts within the scope of the IWF AMP.

- The staff noted that the SLRA and the "preventive actions" program element in the AMP evaluation report did not appear to have sufficiently addressed the use at ONS of molybdenum disulfide and other lubricants using sulfur which are identified in the GALL-SLR Report as potential contributors to stress corrosion cracking (SCC) in high strength bolting. The staff noted that ER-CHM-00005 "Nuclear Chemical [Approved] List" includes Molykote BR-2, Molykote 3452, Molykote (R) Z Powder as approved lubricants at ONS, which contain molybdenum disulfide as an ingredient. The staff also noted that it was not clear that the timing of implementation of proposed enhancement 5 volumetric examinations on high strength bolting would assure adequate aging management of SCC prior to loss of intended function.

- The staff noted that examples of OpE described in the SLRA for IWF component supports were related to non-conforming conditions to construction drawings and specifications and did not appear to reflect examples of OE that provided objective evidence of effectively addressing aging effects such as due to corrosion, boric acid wastage, SCC, etc. However, the staff also noted from audit review of AR0232845 and AR0232846 of BWST supports degradation, ONS RPV Support Skirt Visual Examination Reports VT-12-1076 dated November 1, 2012, VT-13-1180 dated November 30, 2013 and VT-14-1233 dated May 10, 2014, and related ONS RPV Support Skirt Inspection Meeting Presentation dated August 8, 20/21, that these documents provided examples of OE involving aging effects.

- The staff noted that the "Discussion" column for SLRA Table 3.5.1, item 3.5.1-86 stated the item is not applicable on the basis that ONS has no in-scope "stainless steel" structural bolting exposed to air-outdoor environment. Contrary to the above SLRA statement, the staff noted that GALL-SLR AMR line items that correspond to SRP-SLR Table 3.5-1 item 086 is for "steel; galvanized steel" material and not "stainless steel" material, and therefore the non-applicability claim was not justified.

- The staff noted from audit review of Section 4.4.d of SLR-ONS-AMPR-XI.S3 (on page 16 of 41) and response to audit question 4 on the ePortal that the only high strength bolting greater than 1-inch diameter at ONS are the anchor bolts for reactor pressure vessel, replacement once through SG, pressurizer and reactor coolant pumps, which are all part of Nuclear Steam Supply System (NSSS) component supports.

The staff also audited the description of the SLRA ASME Section XI, Subsection IWF AMP provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.31, 10 CFR Part 50, Appendix J

Summary of Information in the Application. The SLRA states that AMP B2.1.31, "10 CFR Part 50, Appendix J," is an existing program that is consistent with the program elements in GALL-SLR Report AMP XI.S4, "10 CFR Part 50, Appendix J." To verify this claim of consistency, the staff audited the SLRA AMP. The staff will address issues identified during the audit in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.S4	10 CFR Part 50, Appendix J AMP Evaluation Report	Revision 1
OSS-0254.00-00-4001	Design Basis Spec for Reactor Building Containment Isolation	Revision 44
AD-EG-ALL-1705	Containment Leak Test (Appendix J) Program Implementation	Revision 2
SLR-ONS-AMPR-XI.S1	ASME Section XI. Subsection IWE AMP Evaluation Report	Revision 2
SLR-ONS-OPEX-0100	Subsequent License Renewal Operating Experience Review Methodology and Results	Revision 4
AR 02331259	Maintenance Rule (a)(1) evaluation for RBI+ Super System	5/21/2020
AR 02324112	Electrical Penetration WD-7 Failed Leak Rate Test	4/20/2020
AR 01848980	PIP O-13-14288	2/17/2014
AR 01873871	3SF-97 Failed Leak Rate Test	5/9/2014
N/A	OPEX Report – Long Description	Revision 1
N/A	10 CFR Part 50, Appendix J, Program Functional Area Manual	Revision 0

During the audit, the staff verified the applicant's claim that the "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

In addition, the staff found that for the "scope of program" program element, sufficient information was not available to verify whether it was consistent with the corresponding program element of the GALL-SLR Report AMP. The staff will consider issuing an RAI in order to obtain

the information necessary to verify whether this program element is consistent with the corresponding program elements of the GALL-SLR Report AMP.

The staff also audited the description of the SLRA 10 CFR Part 50, Appendix J provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.32, Masonry Walls

Summary of Information in the Application. The SLRA states that AMP B2.1.32, "Masonry Walls," is an existing program with enhancement that will be consistent with the program elements in GALL-SLR Report AMP XI.S5, "Masonry Walls." To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff reviewed the enhancement associated with this AMP. The staff will document its review of the enhancement in the SER. The staff will address issues identified during the audit in the SER.

Audit Activities. Over the course of the audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

On August 30 – September 2, 2021, two members of the staff participated in an on-site audit at ONS in Seneca, South Carolina to better understand the plant-specific design of masonry walls using fiber reinforced polymers and observe that there are no masonry walls exposed to an outdoor environment, as noted in the SLRA. While onsite, the staff engaged with the applicant staff, conducted walkdowns, and reviewed additional documentation provided by the applicant.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.S5	Masonry Walls AMP Evaluation Report	Revision 1
SLR-ONS-AMPR-XI.S6	Structures Monitoring AMP Evaluation Report	Revision 1
AD-EG-ALL-1214	Condition Monitoring of Structures	Revision 1
AD-EG-ONS-1214	Condition Monitoring of Structures	Revision 2
SLR-ONS-OPEX-0100	Subsequent License Renewal Operating Experience Review Methodology and Results	Revision 4
N/A	OPEX Report - Long Description	Revision 1
AR 01793066	Top Mortar Joint for the Masonry Block Walls on the West Side	05/26/2011
AR 01830000	5 Year Civil/Structural Inspection of the Auxiliary Building	03/08/2013
AR 01836401	The 5yr Civil/Structural Inspection of the Turbine Building (TB) Mezzanine and operating floors	07/21/2013
AR 01846188	Misc. Issues Identified During the NTTF 2.3 Seismic Walkdowns	01/30/2020
AR 01854319	Protected Service Water (PSW) Related: During Work Associated with WO 02135161-48 (a Crack in the Cinder Block)	12/17/2014

OSC-77196	5-Year Civil/Structural Inspection of Plant Grounds and Miscellaneous Structures	Revision 3
ML11164A257	Oconee Nuclear Station, Units 1, 2, And 3, Issuance of Amendments Regarding Authorizing a Change to the Updated Final Safety Analysis Report Allowing the Use of Fiber Reinforced Polymer on Masonry Brick Walls for the Mitigation of Differential Pressure Created by High Winds	06/27/2011

During the audit, the staff verified the applicant's claim that the "scope of program," "preventive actions," "parameters monitored or inspected," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

In addition, the staff found that for the "detection of aging effects" program element, sufficient information was not available to verify whether it was consistent with the corresponding program element of the GALL-SLR Report AMP. The staff will consider issuing an RAI in order to obtain the information necessary to verify whether this program element is consistent with the corresponding program elements of the GALL-SLR Report AMP and/or the associated enhancements are adequate to manage aging effects.

During the audit, the staff observed that the SLRA claims that no masonry walls in an outdoor environment are in the scope of SLR. The staff found that most of perimeter masonry walls was covered with metal siding, and the metal siding can protect the masonry walls from rain. However, these perimeter masonry walls are exposed to the wind (a part of outdoor environment) even though the exterior side of the masonry walls covered by metal siding is normally inaccessible for direct visual inspection.

During the walkdown of structures from the outside, the staff noted that most of the structure's envelope was covered with metal siding, therefore making the exterior side of the masonry walls normally inaccessible for direct visual inspection. The staff also noted that AMP or existing procedures do not clearly identify how an evaluation of the acceptability of the inaccessible areas for masonry walls covered by metal siding should be conducted whenever conditions are detected in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas or during the replacement/repair of metal siding.

The staff also audited the description of the SLRA Masonry Walls program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.33, Structures Monitoring

Summary of Information in the Application. The SLRA states that AMP B2.1.33, "Structures Monitoring," is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.S6, "Structures Monitoring." To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the enhancements associated with this AMP. The staff will document its review of the enhancements in the SER. At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this enhanced program, and the staff's audit addressed only describe extent of audit. The staff will address issues identified during the audit in the SER.

Audit Activities. Over the course of the audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

On August 30 – September 2, 2021, two members of the staff participated in an on-site audit at ONS in Seneca, South Carolina to gain a general overview of current conditions of the structures as it compares to the provided OpE and an understanding on the alkali silica reaction expansion in Keowee spillway wing walls managed by the Federal Energy Regulatory Commission (FERC) inspections of the Keowee Hydro Station Program. While onsite, the staff engaged with the applicant staff, conducted walkdowns, and reviewed additional documentation provided by the applicant.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.S6	Structures Monitoring AMP Evaluation Report	Revision 1
AD-EG-ALL-1214	Condition Monitoring of Structures	Revision 1
AD-EG-ONS-1214	Condition Monitoring of Structures	Revision 2
MP/0/A/18000/055	Torque – Miscellaneous Fasteners	Revision 27
SCDP-402	Material Management (Storage, Issue and Maintenance)	Revision 16
UFSAR	Oconee Nuclear Station Updated Final Safety Analysis Report (UFSAR)	Revision 28
OSC-7586	Reactor Building Internal, Structures 5 Year Civil inspection	Revision 5
OSC-6914	Auxiliary Building Units 1,2,3, Five Year Civil/Structural inspection	Revision 9
OSC-7006	Turbine Building units 1, 2 & 3 [including unit 1-2 Switchgear Enclosure (Blockhouse), Unit 3 Switchgear Enclosure (Blockhouse), and 6900 Volt Switchgear Enclosure (Unit 3)]	Revision 4
OSC-7143	230KV and 525KV Switchyards, 115 KV Switching Stations, and Transformer Yard, with associated and miscellaneous Cable Trenches 5-Year Civil/Structural Inspection	Revision 4
OSC-6993	Standby Shutdown Facility 5 Year Civil/Structural Inspection	Revision 5
OSC-7019	Condense Circulating Water (CCW) Intake and Discharge Structures 5 Year Civil/Structural inspection	Revision 9
OSC-7196	5-Year Civil/Structural Inspection of Plant Grounds and Miscellaneous Structures	Revision 3
OSC-8692	Keowee Civil Inspection	Revision 10
OSC-7382	Elevated Water Storage Tank 5 Year Civil / Coating Inspection	Revision 3
OSC-10773	Fiber Reinforced Polymer (FRP) Inspection Unit 1,2, and 3	Revision 3
J18030364 (Order Number)	Order Summary Report: Oconee – GW CTP (Groundwater Testing 2018)	04/20/2018
J19030638 (Order Number)	Order Summary Report: Oconee – GW CTP (Groundwater Testing 2019)	04/18/2019

J20100010 (Order Number)	Order Summary Report: ONS Groundwater 5 Year Event (Groundwater Testing 2020)	10/22/2020
PCMG	Duke Energy Company Power Chemistry Material Guide Program, SDQA Plan "D"	Revision 31
N/A	OPEX Report – Long Description	Revision 1
AR 02325846	Degraded Coating and Bolt Corrosion on U3 BWST Anchors	04/17/2020
AR 01850661	As Part of 10-yr ISI Inspection, Discovered the Base of U1 BWST tank and Bolts are Corroded	10/31/2012
AR 01899643	IN 11-20 Concrete Degradation by Alkali-Silica Reaction	12/05/2011
AR 02145743	Standby Shutdown Facility (SSF) Diesel Exhaust Chimney and Roof Inspection	03/23/2017
WO 20353930	Inspect Protected Service Water (PSW) Underground Cable Bank Drainage System	12/17/2020

During the audit, the staff verified the applicant's claim that the "preventive actions," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

In addition, the staff found that for the "scope of program," "parameters monitored or inspected," "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 of the GALL-SLR Report AMP. The staff will consider issuing RAIs in order to obtain the information necessary to verify whether these program elements are consistent with the corresponding program elements of the GALL-SLR Report AMP.

During the audit, the staff made the following observations:

- For the "Scope of Program" program element, the staff noted that several structures and components identified in the SLRA as within the scope of the AMP were not clearly identified in the scope of current procedures or as an enhancement.

- For the "Parameters Monitored or Inspected" program element, the staff noted that existing procedures were not clear on the specific parameters to be monitored or inspected for masonry walls, concrete degradation associated with anchors, and loss of preload in bolting.

- The staff noted that Section 5.1.2 of the site's procedure (i.e., AD-EG-ONS-1214) includes a provision that allows the site to increase the inspection frequency of the AMP up to a 10 year inspection interval. However, the SLRA does not address this as an exemption to the GALL--SLR Report inspection interval criteria of not exceeding 5 years.

- The staff noted some inconsistency between the SLRA enhancements and GALL-SLR Report recommendations to ensure that inaccessible areas are adequately managed by the program. The staff also noted that existing procedures and SLRA enhancements particularly focus on management of areas considered to be inaccessible due to being underground or for having limited access due to radiological concerns. However, the AMP does not clearly identify how above ground inaccessible areas (e.g.,

structural areas covered by siding) will be adequately managed for degradation during the subsequent period of extended operations.

- The staff also noted that clear acceptance criterion for the inspections of some structural steel elements were not identified in the site's procedure (i.e., AD-EG-ONS-1214) to ensure that the need for corrective actions is identified before loss of intended functions.

The staff made the following observations during walkdowns:

- During the walkdown of structures from the outside, the staff noted that most of the structure's envelope was covered with metal siding, therefore making the exterior side of the structural elements (e.g., wall, column, masonry wall) normally inaccessible for direct visual inspection.

- During the walkdown of the borated water storage tanks, the staff noted that the tanks and anchorages were covered with metal siding, therefore making the exterior of the tanks, including its anchorage, normally inaccessible for direct visual inspection.

- During the walkdown of the structures and components within the scope of subsequent license renewal, the staff noted the degradations observed during the walkdowns were found to be consistent with the OpE for which the GALL-SLR Report program was evaluated.

The staff also audited the description of the SLRA Structures Monitoring program provided in the UFSAR supplement. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR supplement was an adequate description of the SLRA Structures Monitoring program. The staff will consider issuing an RAI in order to obtain the information necessary to verify the sufficiency of the UFSAR supplement program description.

SLRA AMP B2.1.34, Inspection of Water-Control Structures Associated With Nuclear Power Plants

Summary of Information in the Application. The SLRA states that AMP B2.1.34, "Inspection of Water-Control Structures Associated with Nuclear Power Plants," is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants." To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the enhancements associated with this AMP. The staff will document its review of the enhancements in the SER. The staff will address issues identified during the audit in the SER.

Audit Activities. Over the course of the audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

On August 30 – September 2, 2021, two members of the staff participated in an on-site audit at ONS in Seneca, South Carolina to gain a general overview of current conditions of the structures and issues related to water infiltration. The staff also sought to understand the structures and components that are under review by this AMP, and those under review by the FERC. While onsite, the staff engaged with the applicant staff, conducted walkdowns, and reviewed additional documentation provided by the applicant.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.S7	Inspection of Water-Control Structures Associated with Nuclear Power Plant AMP Evaluation Report	Revision 1
OSC-10322	License Renewal Documentation Calculation - Federal Energy Regulatory Commission (FERC) 5-Year Inspection (Commitment 4.17) - Program	Revision 0
OSC-10333	License Renewal Documentation Calculation - DP 5 - Year Underwater Inspection Hydroelectric Dams and Appurtenances (Commitment 4.13) - Program	Revision 0 3/23/2012
N/A	Manual of Inspection for Civil Works and Structures at Hydroelectric Stations	Revision 4
FERC Project No. 2503	Ninth FERC Part 12 D Safety Inspection Report	12/9/2016
FHG-SLA-NA-0014	Service Level Agreement (SLA) Between Fossil Hydro Operations Hydro Fleet and Oconee Nuclear Station for Dam Safety Related Services	09/13/2017
OSC-10401	License Renewal Documentation Calculation – Penstock Inspection (Commitment 4.30) - Program	Revision 0
N/A	OPEX Report – Long Description	Revision 1
AD-EG-ALL-1214	Condition Monitoring of Structures	Revision 1
AD-EG-ONS-1214	Condition Monitoring of Structures	Revision 2
OSC-7019	Condense Circulating Water (CCW) Intake and Discharge Structures 5 Year Civil/Structural Inspection	Revision 8
OSC-8692	Keowee Civil Inspections	Revision 9
SLR-ONS-IPAR-S504	Subsequent License Renewal Integrated Assessment of Keowee Hydro Station	Revision 1
SLR-ONS-IPAR-S506	Subsequent License Renewal Integrated Plant Assessment of the Earthen Embankments	Revision 1
SLR-ONS-FERR-0100	Subsequent License Renewal Further Evaluation Required Report	Revision 1
AR 02321780	License Renewal Aging Management Program Assessment	03/23/2020
AR 02193693	Condition Monitoring of Structures Inspections	03/23/2018
WO 98035368	Repair Spalled Concrete at Condense Circulating Water (CCW) Intake Structure	08/07/2008
OSC-0012	Oconee Intake Structure	Revision 12
AR 02311470	Update OSC-8692 to document concrete inspection	1/18/2020
AR 02336986	License Renewal AMP Effectiveness Reviews	6/25/2020
WO 01930591	Perform 5 Year Dam Inspection	11/13/2011
WO 20091459	Perform 5 Year Site/Structural Inspection	07/01/2018

During the audit, the staff verified the applicant's claim that the "parameters monitored or inspected," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

In addition, the staff found that for the "scope of program," "preventive actions," "detection of aging effects," and "acceptance criteria" program elements, sufficient information was not available to verify whether it was consistent with the corresponding program elements of the GALL-SLR Report AMP. The staff will consider issuing RAIs in order to obtain the information necessary to verify whether these program elements are consistent with the corresponding program elements of the GALL-SLR Report AMP and/or the associated enhancements are adequate to manage aging effects.

During the audit, the staff made the following observations:

- The staff noted that enhancements 1, 2, and 3 of the Inspection of Water-Control Structures Associated with Nuclear Power Plants program include preventive actions to ensure structural bolting integrity. However, it does not appear that the AMP has an enhancement for preventative actions for the coating material selection discussed in Section 2 of Research Council for Structural Connections.

- The staff noted that enhancement 5 of the Inspection of Water-Control Structures Associated with Nuclear Power Plants program is related to sliding surfaces for Element 3. However, enhancement 5 also establishes acceptance criteria for sliding surfaces (Element 5).

- The staff noted that enhancement 14 of the Inspection of Water-Control Structures Associated with Nuclear Power Plants program relates to both piles and sheeting. The staff found that the sheet piles are included as an AMR line item in SLRA Table 3.5.2-23, but the staff could not locate an AMR line item for sheeting.

- For the Penstock, Power Tunnels, Spillway, and Intake structures, the staff noted that aging effects of bolting, concrete, and steel are managed by both the FERC Inspection programs for the Keowee Hydro Station and the Inspection of Water-Control Structures Associated with Nuclear Power Plants program. The staff needs additional clarification of the rationale and difference in aging management scope of these two AMPs for the Penstock, Power Tunnels, Spillway, and Intake structures.

The staff made the following observations during walkdowns:

- During the walkdown of the Keowee powerhouse structure, the staff noted that the structure's envelope was covered with metal siding, therefore making the exterior side of the structural elements (e.g., wall, column, masonry wall) normally inaccessible for direct visual inspection. The staff also noted that metal siding appears not to be part of the AMR review in SLRA Tables 2.4.4-1 and 3.5.2-4.

- During the walkdown of the breaker vault located inside of the Keowee powerhouse structure, the staff noted that the inside of the breaker vault (e.g., interior concrete, ceiling) and equipment supports are not being inspected for aging management.

- During the walkdown of the Keowee Hydro Station within the scope of subsequent license renewal, the staff noted the degradations observed during the walkdowns were found to be consistent with the OpE for which the GALL-SLR Report program was evaluated.

The staff also audited the description of the SLRA Inspection of Water-Control Structures Associated with Nuclear Power Plants program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.35, Protective Coating Monitoring and Maintenance

Summary of Information in the Application. The SLRA states that AMP B2.1.35, "Protective Coating Monitoring and Maintenance," is an existing program that, with enhancements, will be consistent with NUREG-2191, Section XI.S8, Protective Coating Monitoring and Maintenance as modified by SLR-ISG-2021-03-STRUCTURES, "Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance" (ADAMS Accession No. ML20181A381). To verify this claim of consistency, the staff audited the SLRA AMP.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
NCR 02242165	ONS 1 RX Bld Coating Cond Assmt	11/08/2018
NCR 02305906	ONS 2 RX Bld Coating Cond Assmt	12/05/2019
NCR 02328243	ONS 3 RX Bld Coating Cond Assmt	05/02/2020
NCR 2232618	Checklist Summary Report	09/24/2018
NCR 02228068	NOS Audit: Degraded Coatings Calc not maintained	08/30/2018
NCR 02226162	NOS Audit: U1 Rx Bldg Coating Insp Documentation Issues	08/22/2018
AD-EG-ALL-1640	Nuclear Coatings Program Implementation	Revision 4
AD-EG-ALL-1641	Primary Containment Coatings Condition Assessment	Revision 1
PD-EG-ALL-1640-Final Version	Nuclear Coatings Program	Revision 0
MWO 01492938	PMLP Technical Basis Report (Unit 1)	07/12/2021

Document	Title	Revision / Date
MWO 01492842	PMLP Technical Basis Report (Unit 2)	07/12/2021
MWO 01492944	PMLP Technical Basis Report (Unit 3)	07/12/2021
AD-EG-ALL-1650	License Renewal Aging Management	Revision 3

During the audit, the staff verified Duke Energy's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP. During the audit of the "operating experience" program element, the staff reviewed a search of results of the plant-specific database to identify any previously unknown or recurring aging effects. The staff will evaluate any identified plant-specific OpE in the SER.

The staff also audited the description of the SLRA AMP Protective Coating Monitoring and Maintenance program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.36, Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Summary of Information in the Application. The SLRA states that AMP B2.1.36, "Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," is an existing program with enhancements, that will be consistent with the program elements in GALL-SLR Report AMP XI.E1, "Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." To verify this claim of consistency, the staff audited the SLRA AMP. At the time of the audit, ONS had not yet fully developed all the documents necessary to implement this program, and the staff's audit addressed the program elements described in the applicant's basis document as well as the available current relevant maintenance procedures.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.E1	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP Evaluation Report	Revision 1
IP-0-A-2000-001	Power and Control Cable Inspection and Testing	Revision 16
SLR-ONS-IPAR-EE01	Oconee Subsequent License Renewal Electrical and I&C Component Independent Plant Assessment	Revision 1

MP-0-B-2002-001	Inspection of Keowee Underground Cable Trench Drainage System	Revision 4
AD-PI-ALL-0300	Self-Assessment and Benchmark Progress	Revision 4
OSS-0274.00-00-0006 LR AMR Electrical	Oconee Electrical Component Aging Management Review for License Renewal	06/30/2003
	Responses To NRC Audit Questions	08/04/2021
ONS Engineering Support Document	ONS Cable Aging Management In Support Of License Renewal	02/19/2014

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

During the audit of the "operating experience" program element, the staff reviewed OpE corrective actions program examples provided by ONS to identify any previously unknown or recurring aging effects. The staff will evaluate the identified plant-specific OpE in the SER.

The staff also audited the description of the SLRA AMP A2.36, "Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements" program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.37, Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits

Summary of Information in the Application. The SLRA states that AMP B2.1.37, "Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits" is a new program and will be consistent with the program elements from GALL-SLR Report AMP XI.E2, "Electrical Insulation 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 SLRA AMP. At the time of the audit, ONS had not yet developed all the documents necessary to implement this program and the staff's audit addressed the program elements described in the applicant's basis document as well as the available supporting documents.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. The staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.E2	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits	Revision 1
OSS-0254.00-00-2002	Reactor Protective System Design Basis Specification	Revision 22
OSS-0254.00-00-2023	Design Basis Specification for the Area Radiation Monitoring System	Revision 10
AD-EG-ALL-1615	Cable Aging Management Program - Implementation	Revision 3
SLR-ONS-AMPR-XI.E1	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Revision 0
SLR-ONS-SCOP-0001	Subsequent License Renewal Scoping for 10CFR54.4(a)(1) Safety Related Criteria	Revision 0

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

The staff also audited the description of the SLRA A2.37, "Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits" program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.38, Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Summary of Information in the Application. The SLRA states that AMP B2.1.38, "Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.E3A, "Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," as modified by SLR-ISG-2021-04-ELECTRICAL, Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance specified in NUREG-2191 (GALL-SLR). To verify this claim of consistency, the staff audited the SLRA AMP. At the time of the audit, the applicant had not yet fully developed all the documents necessary to implement this program, and the staff's audit addressed the program elements described in the applicant's basis document.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.E3A	Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP Evaluation Report	Revision 1
IP-0-A-2000-001	ONS Cable Testing Procedure	Revision 16
RP-0-A-1000-035	Severe Weather Preparations	Revision 5
MP-0-B-2002-001	Inspection of Keowee Underground Cable Trench Drainage System	Revision 4
AD-PI-ALL-0300	Self-Assessment and Benchmark Progress	Revision 4
AR01806540	During cable walk downs in supporting cable aging management for license renewal several cable issues have been identified that need to be corrected	04/12/2011
AR01179772	Need a quarterly PM to pump water from intake and CT-5 cable trenches	07/30/2009
AR01906082	2014 NRC inspection identified the need for increased monitoring and testing of cables in Trench 3	05/05/2014

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

The staff also audited the description of the SLRA A2.38, "Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements" program provided in the FSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

During the audit, the staff reviewed the periodic action taken by the applicant such as inspecting for water accumulation in cable manholes, vaults, conduits, and removing water as needed for inaccessible medium-voltage power cables. However, periodic actions taken may not be sufficient due to the inability to remove accumulated water trapped in the raceways. During the audit, the staff requested the applicant to clarify if the applicant was taking additional actions to prevent water accumulation in the raceway due to settling or cracking due to soil settling over a long period of time, manholes and cable trench covers not being watertight, and potentially wetting or submergence even when duct banks are sloped with the intention to minimize water accumulation. In response to the staff request, the applicant responded in its ePortal that ONS doesn't need to take additional preventive actions beyond those recommended in NUREG-2191 (GALL-SLR) AMP XI.E3A – Preventive Actions, which does not include recommendations for additional periodic and event-driven actions beyond "inspecting conduit ends and cable manholes/vaults for water accumulation, and removing the water, as needed." Accordingly, the ONS SLR B2.1.38 includes "…water collection in accessible trenches (e.g., low points) and conduit manholes containing in-scope medium-voltage cables and conduit ends is monitored via documented inspection, and the water removed as needed." The NUREG-2191 AMP XI.E3A Program Description includes the above concern that the periodic actions may not be sufficient to verify that the water is not trapped elsewhere in the raceways, as well as the question's list of potential causes of raceway water accumulation. The NUREG-2191 AMP XI.E3A program description also provides information to address this concern by stating "therefore, in addition to the above periodic actions, in-scope inaccessible medium-voltage cables exposed to significant moisture are tested to determine the conditions of the electrical insulation." ONS SLRA B2.1.38 already includes this solution, the periodic condition monitoring of exposed in-scope cable in the form of the insulation electrical testing portion of the program. The staff finds the applicant's

response acceptable because in addition to periodic actions taken to remove water in the manholes/vaults and conduit ends, inaccessible medium-voltage power cables exposed to significant moisture are tested to determine the conditions of the electrical insulation. The staff concern about additional actions to prevent water accumulation in the raceways is resolved.

SLRA AMP B2.1.39, Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Summary of Information in the Application. The SLRA states that AMP B2.1.39, "Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," is a new program that will be consistent with the program elements in GALL-SLR Report AMP XI.E3B, "Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," as modified by SLR-ISG-2021-04-ELECTRICAL, Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance specified in NUREG-2191 (GALL-SLR). To verify this claim of consistency, the staff audited the SLRA AMP. At the time of the audit, the applicant had not yet fully developed all the documents necessary to implement this program, and the staff's audit addressed the program elements described in the applicant's basis document.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.E3B	Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP Evaluation Report	Revision 1
IP-0-A-2000-001	Power and Control Cable Inspection and Testing	Revision 16
RP-0-A-1000-035	Severe Weather Preparations	Revision 5
MP-0-B-2002-001	Inspection of Keowee Underground Cable Trench Drainage System	Revision 4
AD-PI-ALL-0300	Self-Assessment and Benchmark Progress	Revision 4
AR01806540	During cable walk downs in supporting cable aging management for license renewal several cable issues have been identified that need to be corrected	04/12/2011
AR01179772	Need a quarterly PM to pump water from intake and CT-5 cable trenches	07/30/2009
AR01906082	2014 NRC inspection identified the need for increased monitoring and testing of cables in Trench 3	05/05/2014
AR01844740	During a walk down in preparing to move underground cables to construct new maintenance building concrete, manhole CMH-C5 was observed with water covering the cables	09/24/2012

During the audit, the staff verified the applicant's claim 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 SLRA AMP

are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

The staff also audited the description of the SLRA A2.39, "Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements" program provided in the FSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

During the audit, the staff reviewed the periodic action taken by the applicant such as inspecting for water accumulation in cable manholes, vaults, conduits, and removing water as needed for inaccessible instrument and control cables. However, periodic actions taken may not be sufficient due to the inability to remove accumulated water trapped in the raceways. During the audit, the staff requested the applicant to clarify if the applicant is taking additional actions to prevent water accumulation in the raceway due to settling or cracking due to soil settling over a long period of time, manholes and cable trench covers not being watertight, and potentially wetting or submergence even when duct banks are sloped with the intention to minimize water accumulation. In response to the staff request, the applicant responded in its ePortal that ONS doesn't need to take additional preventive actions beyond those recommended in NUREG-2191 (GALL-SLR) AMP XI.E3B. Element 2 of that GALL-SLR AMP XI.E3B – Preventive Actions, does not include a recommendation for additional periodic and event-driven actions beyond "inspecting in-scope accessible cable conduit ends, manholes, and trenches (e.g., low points) containing in-scope instrument and control cables will be periodically monitored via documented inspections, and the water removed as needed." The NUREG-2191 AMP XI.E3B Program Description includes the above concern that "these periodic actions may not be sufficient due to the inability to remove accumulated water trapped in the raceways," as well as the question's list of potential causes of raceway water accumulation. The NUREG-2191 AMP XI.E3B Program Description also provides information to address this concern by stating "therefore, in addition to the above periodic actions, in-scope inaccessible and underground instrumentation and control cables subject to significant moisture are evaluated to determine whether testing is required." ONS SLRA B2.1.39 already includes this solution, i.e., the evaluation for potential one-time electrical testing of exposed cables. The staff finds the applicant's response acceptable because in addition to periodic actions taken to remove water in the manholes/vaults and conduit ends, inaccessible instrument and control cables exposed to significant moisture are evaluated to determine whether one-time testing is required. The staff concern about additional actions to prevent water accumulation in the raceways is resolved.

SLRA AMP B2.1.40, Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Summary of Information in the Application. The SLRA states that AMP B2.1.40, "Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," is a new program that will be consistent with the program elements in GALL-SLR Report AMP XI.E3C, "Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," as modified by SLR-ISG-2021-04-ELECTRICAL, Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance specified in NUREG-2191 (GALL-SLR). To verify this claim of consistency, the staff audited the SLRA AMP. At the time of the audit, the applicant had not yet fully developed all the documents necessary to implement this program, and the staff's audit addressed the program elements described in the applicant's basis document.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.E3C	Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP Evaluation Report	Revision 1
IP-0-A-2000-001	Power and Control Cable Inspection and Testing	Revision 16
RP-0-A-1000-035	Severe Weather Preparations	Revision 5
MP-0-B-2002-001	Inspection of Keowee Underground Cable Trench Drainage System	Revision 4
AD-PI-ALL-0300	Self-Assessment and Benchmark Progress	Revision 4
AR01806540	During cable walk downs in supporting cable aging management for license renewal several cable issues have been identified that need to be corrected	04/12/2011
AR01179772	Need a quarterly PM to pump water from intake and CT-5 cable trenches	07/30/2009
AR01906082	2014 NRC inspection identified the need for increased monitoring and testing of cables in Trench 3	05/05/2014
AR01844740	During a walk down in preparing to move underground cables to construct new maintenance building concrete, manhole CMH-C5 was observed with water covering the cables	09/24/2012
AR01835744	Documentation of focused self-assessment 0-SAG-SA-12-09 Report, License Renewal Phase 2 readiness assessment	07/23/2012

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

The staff also audited the description of the SLRA A2.40, "Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements" program provided in the FSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.41, Metal Enclosed Bus

Summary of Information in the Application. The SLRA states that AMP B2.1.41, "Metal Enclosed Bus," is a new program that will be consistent with the program elements in GALL-SLR Report AMP XI.E4, "Metal Enclosed Bus." To verify this claim of consistency, the staff audited the SLRA AMP. At the time of the audit, the applicant had not yet fully developed all the documents necessary to implement this program, and the staff's audit addressed the program elements described in the applicant's basis document.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.E4	Metal Enclosed Bus AMP Evaluation Report	Revision 1
IP/0/A/2001/0031	Inspection and Maintenance of 4.16kV Bus, 6.9kV Bus, Generator Bus, Isophase Bus, and Main Feeder Bus	Revision 8
AR01861189	Localized hot spot identified on the K2 isolated phase bus duct	02/26/2014
AR02306205	Automatic reactor scram due to generator trip from ground rdtn1elay	12/16/2019
AR01548419	SER 5-09, 6.9 kV nonsegregated bus failure and complicated scram	11/05/2009

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

The staff also audited the description of the SLRA A2.41, "Metal Enclosed Bus" program provided in the FSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.42, Fuse Holders

Summary of Information in the Application. The SLRA states that AMP B2.1.42, "Fuse Holder," is a new program that will be consistent with the program elements in GALL-SLR Report AMP XI.E5, "Fuse Holder." To verify this claim of consistency, the staff audited the SLRA AMP. At the time of the audit, the applicant had not yet fully developed all the documents necessary to implement this program, and the staff's audit addressed the program elements described in the applicant's basis document.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.E5	Fuse Holder AMP Evaluation Report	Revision 1
AR01999676	While in the process of restoring the CX transformer to service, Keowee Operator discover a loose fuse holder in 1A compartment on load center 1X	02/09/2016
AR01978476	While performing phase rotation check on load side of K0ELK-TF-CX per WO task 20000869-35, members of main team 418 discovered that the Y phase fuse holder appear to have loose connection in the fuse holder	11/25/2015
AR01970686	During performance of TT/2/A/0600/024 A at step 5.8 for removal of fuse SFU-1, the left TANG of the top fuse holder (mounted to control power transformer) fell off.	11/01/2015

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

The staff also audited the description of the SLRA A2.42, "Fuse Holder" program provided in the FSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B2.1.43, Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Summary of Information in the Application. The SLRA states that AMP B2.1.43, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," is a new program that will be consistent with the program elements in GALL-SLR Report AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." To verify this claim of consistency, the staff audited the SLRA AMP. At the time of the audit, the applicant had not yet fully developed all the documents necessary to implement this program, and the staff's audit addressed the program elements described in the applicant's basis document.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP Evaluation Report	Revision 1
SLR-ONS-SAMP-XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Aging Management Program Sample Basis Document	Revision 0

AR01851039	Valve 1CS-46 has a light film of dry white boron on the air operator with rust color as some of the operator bolting from boric acid leakage	03/25/2013
AR01851627	Information provided in work order completion comments indicate that O-rings are not installed on all of cable connections associated with 3NI-5 in the Unit 3 Control Room	08/17/2013
AR1808563	The left incoming lead on top side of Breaker 8-22 was indicating 300 degree Fahrenheit during thermography on 09/30/2011	09/30/2011

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP or will be consistent after implementation of the identified enhancements.

The staff also audited the description of the SLRA A2.43, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements" program provided in the FSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B3.1, Fatigue Monitoring Program

Summary of Information in the Application. The SLRA states that AMP B3.1, "Fatigue Monitoring," is an existing program with enhancements that is consistent with the program elements in GALL-SLR Report AMP X.M1, "Fatigue Monitoring." To verify this claim of consistency, the staff audited the SLRA AMP. Issues identified but not resolved in this report will be addressed in the SER. During the audit, the staff also reviewed the enhancements associated with this AMP. The staff will document its review of the enhancements in the SER.

At the time of the audit, the applicant had not yet fully developed the documents necessary to implement this enhanced program, and the staff's audit addressed only describe extent of audit (e.g., the program elements described in the applicant's basis document). The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal. Furthermore, the staff conducted additional OpE searches on the applicant's CAP database.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-OPEX-0100	Subsequent License Renewal Operating Experience Review Methodology and Results	Revision 4
SLR-ONS-AMPR-X.M1	Fatigue Monitoring AMP Evaluation Report	Revision 1

Document	Title	Revision / Date
AD-EG-ALL-1632	Integrated Fatigue Management	Revision 2
PIP-8-1218	NRC Regulatory Issue Summary 2008-30 Fatigue Analysis	12/22/2008
AR 1543791	NRC Regulatory Issue Summary 2008-30	12/22/2008
AR 1908115	ASME Code Section III Fatigue Analysis on Steam Generator Tube-to-Tubesheet Welds	3/26/2015
MRP-148	Integrated Fatigue Management Guideline	Revision 1
MRP-149	Fatigue Licensing Basis Monitoring Guideline	Revision 1
MRP-192	Assessment of Residual Heat Removal Mixing Tee Thermal Fatigue in PWR Plants	Revision 3

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP, or will be consistent after implementation of the identified enhancements.

The staff found that, for the "corrective actions" program elements, sufficient information was not available to verify whether they were consistent with the corresponding program elements of the GALL-SLR Report AMP. The staff will consider issuing an RAI in order to obtain the information necessary to verify whether this/these program elements are consistent with the corresponding program elements of the GALL-SLR Report AMP.

During the audit, the staff observed that in relation to the "corrective actions" program element, Enhancement 3 of the program states that the program will be enhanced to expand existing corrective action guidance associated with exceeding a cycle counting surveillance limit. The SLRA does not clearly discuss the meaning of the cycle surveillance limit. Specifically, the SLRA does not address whether the cycle counting surveillance limit includes the cycle limits associated with the analytical flaw evaluations (SLRA Section 4.3.5), weld overlay fatigue analyses (SLRA Section 4.3.6), cumulative usage factors and environmental cumulative usage factors as well as the design cycles.

In addition, the applicant's evaluation of the OpE does not clearly address an evaluation regarding RIS 2011-14, "Metal Fatigue Analysis Performed by Computer Software." RIS 2011-14, in part, identifies the concern that the fatigue calculations of the WESTEMS software package may involve the algebraic summation of three orthogonal moment vectors, which is not consistent with the provisions of ASME Code, Section III, Subsection NB, Subarticle NB-3650. In addition, it was not clear to the staff how the applicant's Quality Assurance Program addressed the concerns in RIS 2011-14 regarding the implementation of fatigue monitoring activities. The staff will consider issuing an RAI in order to obtain the information necessary to verify whether the "operating experience" program element is consistent with the corresponding program element of the GALL-SLR Report AMP in terms of the OpE evaluation regarding RIS 2011-14.

The staff also audited the description of the SLRA Fatigue Monitoring program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B3.2, Neutron Fluence Monitoring Program

Summary of Information in the Application. The SLRA states that AMP B3.2, "Neutron Fluence Monitoring," is an existing program that will be consistent with the program elements in GALL-SLR Report AMP X.M2, "Neutron Fluence Monitoring," as modified by SLR-ISG-MECHANICAL-2021-02, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance" (ADAMS Accession No. ML20181A434). To verify this claim of consistency, the staff audited the SLRA AMP.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
AD-EG-ALL01910	Reactor Vessel Integrity Program Implementation	Revision 2, 06/2019
MP/0/B/1800/087	Reactor Vessel – Cavity Dosimetry – Removal and Replacement	Revision 12

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

The staff observed that because ONS Units 1, 2 and 3 do not currently have in-vessel surveillance capsules, ex-vessel cavity dosimetry is used to monitor neutron fluence. The ONS Unit 2 reactor vessel has installed cavity dosimetry. The neutron fluence uncertainty for ONS Units 1 and Unit 3 are based on ONS Unit 2 cavity dosimetry results because the units have similar design, fabrication, operation, and fuel loading patterns. This approach has prior NRC approval (by letter to Duke Power Company dated December 5, 1988 [Reference D. B. Matthews (NRC) letter dated December 5, 1988 to H. B. Tucker (Duke), Subject: "Cavity Dosimetry Program", Oconee Nuclear Station Units 1, 2, and 3).

The staff also audited the description of the SLRA B3.2, Neutron Fluence Monitoring provided in the UFSAR supplement. The staff verified that this description is consistent with the description provided in the GALL-SLR Report.

The staff further noted that Table A6.0-1 of Attachment A to the Oconee SLRA lists subsequent license renewal commitments. The Neutron Fluence Monitoring Program is listed as commitment #45.

SLRA AMP B3.3, Environmental Qualification (EQ) of Electric Equipment

Summary of Information in the Application. The SLRA notes that the AMP B3.3, "Environmental Qualification of Electric Equipment," is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report X.E1, "Environmental Qualification of Electric Equipment." To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the enhancements associated with this AMP. The staff will document its review of the enhancements in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
WO Number 01985140	1RX PN WA10, Replace Damaged Terminal Blacks in 1WA10	02/04/2021
AR01812645	Phenolic barrier cracked/broken	06/22/2011
AR01909022	Information in the Cable Entrance Sealing Sections of EQMM-1	03/31/2015
AR02095407	2017 NRC EQ Program Inspection Item on EQ NAMCO Limit Switch	09/21/2017
AR01839062	3LWD-1 Exceeded EQ Replacement Interval	07/2/2013
AR01905579	Elevated Radiation Levels Along North Wall	08/26/2020
AR02210548-05/AD-PI-ALL-0300	Self-Assessment Report	Revision 4
AR-2210548	2018 ONS EQ Program Readiness Assessment (EQ DBA Inspection)	01/13/2020
EQMM-1393.01	Environmental Qualification Maintenance Manual Introduction	Revision 40
AD-EG-ALL-1117	Design Analyses and Calculations	Revision 7
NEI 14-12	Aging Management Program Effectiveness	Revision 0

Document	Title	Revision / Date
OSS-0274.00-00-0008	Time-Limited Aging Analysis of Electrical Components for License Renewal	Revision 1
O-EQCM	Environmental Qualification Criteria Manual (EQCM)	Revision 4
EQMM-1393.01-N03-01	Environmental Qualification Maintenance Manual Equipment Type: Limit Switch Manufacturer: NAMCO Model/Series: EA-180, Revision H or Later	Revision 13
DPC-1381.05-00-0008	NAMCO Limit Switches – Qualified Life – All Models	Revision 3
DPM-1393.01-0021.001	NGO Test Summary for NAMCO Limit Switch Model EA180, TR-155	Revision 3
EQMM-1393.01-P02-05	Environmental Qualification Maintenance Manual – Equipment Type: Pressure Transmitter – Manufacturer: Rosemount – Model/Series: 3154N Series	Revision 5
OSC-7622	Penetration Room Rosemount Transmitter Qualified Life Analysis	Revision 3
DPM-1393.01-0034.001	Environmental Qualification Test Report Summary for Rosemount 3150N-Series Pressure Transmitters	Revision 2
EQMM-1393.01-A02-00	Environmental Qualification Maintenance Manual Equipment Type: Actuator – Manufacturer: Limitorque – Model/Series: SMB/SBD/SB Inside & Outside Containment	Revision 18
OSC-7167	Qualified Life Analysis for Limitorque Motor Operated Valves	Revision 6
OM-245.0979.001	Limitorque Valve Actuator Qualification for Nuclear Power Station Service Report B0058	Revision 6
EQMM-1393.01-N07-00	Environmental Qualification Maintenance Manual Equipment Type: Pressure Switch – Manufacturer: Automatic Switch Company (ASCO) Model/Series: SB11AR/TG10A32R, SB11AR/TG10A42R, SA21AR/TD20A32R, SA31AR/TD30A32R, SA21AR/TD20A42R & SA31AR/TD30A42R	Revision 6
OSC-7403	ASCO Pressure Switch Qualified Life Analysis	Revision 0
OM-267.A—0050.001	NIB-ASCO Pressure Switch Qualification Test Reports	Revision 3
N/A	2021 NRC SLR Audit	08/11/2021
SLR-ONS-IPAR-E001	Oconee Subsequent License Renewal Electrical and I&C Component Integrated Plant Assessment	Revision 1
Duke Nuclear Condition Report (NCR) 02397996	EPRI Document NP-1558 R1 May Potentially Impact EQ	09/16/2021

During the audit, the staff verified the applicant's claim 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 SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP, or will be consistent after implementation of the identified enhancements.

The staff notes that the applicant generated Nuclear Condition Report 02397996 during the audit to evaluate whether the recent revision to the EPRI Report NP-1558 has any adverse effects on the qualification of electric equipment at ONS (specifically related to the activation energy used to determine the qualification of components).

The staff also audited the description of the SLRA Appendix A3.3, "Environmental Qualification of Electric Equipment," provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR Report.

SLRA AMP B3.4, Concrete Containment Unbonded Tendon Prestress

Summary of Information in the Application. The SLRA states that AMP B3.4, "Concrete Containment Unbonded Tendon Prestress," is an existing program with exceptions that will be consistent with the program elements in GALL-SLR Report AMP X.S1, "Concrete Containment Unbonded Tendon Prestress." To verify this claim of consistency, the staff audited the SLRA AMP. During the audit, the staff also reviewed the exceptions associated with this AMP. The staff will document its review of the exceptions to the GALL-SLR Report AMP in the SER. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-AMPR-X.S1	Concrete Containment Unbonded Tendon Prestress AMP Evaluation Report	Revision 1
SLR-ONS-TLAA-0303	Concrete Containment Unbonded Tendon Prestress Time-Limited Aging Analysis Evaluation for Oconee Subsequent License Renewal	Revision 1
O-ISIC3-62-0001	Third Interval Containment Inservice Inspection Plan Oconee Nuclear Station Units 1, 2, & 3	Revision 6
	Unit 2, Year 45 Tendon Surveillance Summary Report	03/09/2020
3EOC21	Oconee Nuclear Station, Unit 3, IWL Year 30 Tendon Surveillance Summary and Evaluation Report	03/06/2012
3EOC24	Oconee Nuclear Station, Unit 3 EOC24, IWL Year 35 Tendon Surveillance Summary and Evaluation Report	
3EOC26	Oconee Nuclear Station Unit 3 EOC26 IWL Year 40 Tendon Surveillance Summary and Evaluation Report	07/31/2017
MP-0-A-1400-022	Tendon – Reactor Building – Surveillance	Revision 25

OSC-10410	License Renewal Documentation Calculation – Containment Post-Tensioning System (Commitment 4.9) – Time Limited Aging Analysis (TLAA)	Revision 0
O-ISIC3-62-0001	Third Interval Containment Inservice Inspection Plan Oconee Nuclear Station Units 1, 2, and 3	Revision 8

During the audit, the staff verified the applicant's claim that the "scope of program," "preventive actions," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements of the SLRA AMP are consistent with the corresponding elements of the GALL-SLR Report AMP.

The staff also verified the applicant's claim that aspects of the "parameters monitored or inspected," and "monitoring and trending" program elements not associated with the exceptions identified in the SLRA are consistent with the corresponding program elements in the GALL-SLR Report AMP.

The staff also audited the description of the SLRA Concrete Containment Unbonded Tendon Prestress Program provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the GALL-SLR Report.

SLRA AMP B4.1, Secondary Shield Wall Tendon Surveillance

Summary of Information in the Application. The SLRA states that AMP B4.1, "Secondary Shield Wall Tendon Surveillance," is an existing plant-specific AMP. The staff audited the SLRA AMP to determine consistency with SRP-SLR Section A.1.2.3, "Aging Management Program Elements." The staff will address issues identified during the audit in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
OPEX Report	Long description of OEs	N/A
WO 20226325	Inspection of SSW 46, 1 and 5. SSW 5 bushing was deemed unacceptable. But per engineering review found to be acceptable as-is	10/11/2018
AR 01905125	Acceptance criteria of SSW tendon lift-off force is specified in Section 7.9.2 of OSS-0011F.00-00-0001 requiring lift-off force (tendon forces range from 390 kips to 560 kips) from is greater than the minimum, and less than the minimum required force plus 50 kips. Three tendons on Unit 1 and one on Unit 3 did not meet the 50 kips margin. Three actions were recommended.	05/09/2012

AR 02240939	During WO#20226325-01 indications were identified on the stressing washer and bushing on SW5. Engineering evaluation concluded that the indications were acceptable, and no repairs were required.	11/02/2018
AR 02336986	License Renewal AMP effectiveness review. UFSAR 18.3.23	10/01/2020
SLR-ONS-AMPR-PS-1	SSW Tendon Surveillance AMP Evaluation Report	Revision 1
MP/0/A1400/022 A	Tendon – Hydraulic Ram - Calibration	Revision 7
MP/0/A1400/0221	Tendon – SSW - Surveillance	Revision 17
OSS-0011F.00-00-0001	Specification for Reactor Building SSW Post-Tension Tendon Surveillance	Revision 7
SLR-ONS-AMPR-PS-1	SSW Tendon Surveillance AMP Evaluation Report	Revision 1
MP/0/A1400/022 A	Tendon – Hydraulic Ram - Calibration	Revision 7
MP/0/A1400/0221	Tendon – SSW - Surveillance	Revision 17
OSC-1855	SSW Tendon Evaluation	Revision 18
SLR-ONS-AMPR-PS-1	SSW Tendon Surveillance AMP Evaluation Report	Revision 1
ONS UFSAR	Section 18.3.23 Tendon – SSW – Surveillance Program	Revision 27
DRW. 128668E	Reactor Building Functional Requirements	Revision D7
DRW. O-70A	Reactor Building SSWs North Elevation Uni 1 and South Elevation Units 2 and 3	Revision 14
DRW. O-70E	Reactor Building SSW North Elevation Removable Sections, Concrete & Reinforcement	Revision 3
DRW. O-70D	Reactor Building SSW North Elevation Removable Sections, Concrete & Reinforcement	Revision 2
DRW. O-70B	Reactor Building SSW North Elevation Removable Sections, Concrete & Reinforcement	Revision 4
DWR. OM100-467	Vertical Tendon Profiles Units 1, 2 & 3	Revision 3
Document	**Title**	**Revision / Date**
DRW. OM-100-501	Horizontal Wall Tendon Between Elevations 797’-6” & 861’-6”, Units 1, 2 & 3	Revision 4
DRW. O-69R	Reactor Building SSW Elevations 797’-6” to 816’-6” Details at Tendons	Revision 4
DRW. O-69F	Reactor Building SSW Plans Elevations 818’-6” & 843’-6” Reinforcing	Revision 5
DRW. O-69B	Reactor Building Primary & SSW Concrete Plans Elevations 818’-6” & 844’-6”	Revision 17
DRW. O-69H	Reactor Building SSWs Sections and Details Reinforcing	Revision 5
DRW. O-69E	Reactor Building SSWs form Elevation 775’-5” to Elevation 802’-6” Reinforcing	Revision 5

During the audit, the staff verified that the applicant addressed the guidance in SRP-SLR Section A.1.2.3 for the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “acceptance criteria,” and “corrective actions” program elements of the SLRA AMP. In addition, the staff found that additional information may be needed to verify the applicant

addressed the SRP-SLR guidance for the “detection of aging effects,” and “monitoring and trending,” program elements and will consider issuing RAIs.

Additionally, the staff reviewed the current licensing basis, including the staff SER associated with the initial license renewal, and noted that no analysis exists that predicts the secondary shield wall (SSW) tendon losses for the current license term. Therefore, no TLAA is necessary for the SSW tendons.

The staff also audited the description of the SLRA “Secondary Shield Wall Tendon Surveillance AMP,” provided in the UFSAR supplement. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR supplement was an adequate description of the SLRA Secondary Shield Wall Tendon Surveillance AMP. The staff will consider issuing RAIs in order to obtain the information necessary to verify the sufficiency of the UFSAR supplement program description.

SLRA TLAA Section 4.1, Identification of Time-Limited Aging Analyses

Summary of Information in the Application. SLRA Section 4.1, “Identification and Evaluation of Time-Limited Aging Analyses,” provides a discussion of the methodology the applicant used to search for analyses, calculations, evaluations, or assessments that may qualify as TLAAs and need to be included and evaluated in the SLRA. SLRA Section 4.1 also discusses the results of the applicant’s search to identify any regulatory exemptions that were granted by Commission in accordance with the requirements 10 CFR 50.12 that were: (1) based on the analysis in a TLAA, and (2) remain in effect for the CLB.

Regulatory Basis for Conducting Audit Activities on SLRA Section 4.1

TLAA Identification and Evaluation Requirements. The Commission’s regulation in 10 CFR 54.3(a) defines six (6) criteria for TLAAs, all of which must be met to qualify an analysis, calculation, evaluation, or assessment (henceforth analysis) as a TLAA:

1) the analysis must involve systems, structures, or components (SCCs) within the scope of license renewal, as delineated in 10 CFR 54.4(a)

2) the analysis must consider the effects of aging

3) the analysis must involve time-limited assumptions defined by the current operating period (for example 40-years)

4) the analysis must be determined to be relevant by the licensee in making a safety determination

5) the analysis must involve conclusions related to the capability of the SCC to perform its intended function, as delineated in 10 CFR 54.4(b)

6) the analysis must be contained or incorporated by reference in the CLB

For each analysis that is determined to meet the definition of a TLAA in 10 CFR 54.3(a), the regulation in 10 CFR 54.21(c)(1) requires the applicant to evaluate the TLAA in the SLRA and to demonstrate that either:

(i) the analysis will remain valid for period of extended operation, or

(ii) the analysis has been projected to the end of the period of extended operation, or

(iii) the effects of aging on the intended function(s) of the component(s) assessed in the TLAA will be adequately managed during the period of extended operation.

Regulatory Exemption Identification and Evaluation Requirements. The Commission's regulation in 10 CFR 54.21(c)(2) requires the applicant to include a list of all plant-specific regulatory exemptions that were: (1) granted in accordance with 10 CFR 50.12 and remain in effect for the CLB, and (2) are based on a TLAA. For each regulatory exemption that meets and is based on these criteria, the regulation in 10 CFR 54.21(c)(2) requires the applicant to provide an evaluation of the exemption in the SLRA that justifies its continuation during the period of extended operation.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

Audit of the Applicant's Methodology for Identifying TLAAs and TLAA Search Results. The staff audited the applicant's methodology for identifying TLAAs in the CLB and the results of the applicant's CLB search for relevant documents or records that may be or include TLAAs. As part of its audit, the staff searched for any analysis that, contrary to the applicant's determination in the SLRA, might conform to the six criteria for TLAAs in 10 CFR 54.3(a), but was not included within the scope of the analyses that were identified and evaluated as TLAAs in the SLRA.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The staff relied on the keyword search that the applicant performed to search for TLAAs using following keywords: (1) age or aging, (2) brittle, (3) corrosion allowance, (4) cycle, cyclic, or cycling, (5) environmental qualification or EQ, (6) fatigue, (7) flaw, (8) fluence, (9) sixty or 60, (10) full power year or EFPY, (11) life (design, plant, qualified, or service), (12) operating period, or (13) usage factor or CUF.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
ONS Calculation No. OSC-2077-03-SLR-0500 (Record includes the keywords that the applicant used to search for TLAAs that are required to be identified and evaluated in the SLRA per 10 CFR 54.21(c)(1))	Time-Limited Aging Analysis Identification for Subsequent License Renewal	Revision 1
ONS Report No. SLR-ONS-TLAA-0301	Time-Limited Aging Analysis Evaluations and Dispositions for Oconee Subsequent License Renewal	Revision 1

Document	Title	Revision / Date
Framatome Proprietary Technical Report No. ANP 3899P	Framatome Reactor Vessel Internals Input to the ONS SLRA	Revision 0 (ADAMS Accession No. ML21158A201 contains the proprietary, non-publicly available report; a publicly available, redacted version of the report [ANP-3899NP, Revision 0] is available at ADAMS Accession No. ML21158A200)
UFSAR Section 3.5	Missile Protection	Dec. 31, 2019
UFSAR Section 3.6	Protection Against Dynamic Effects Associated with Postulated Rupture of Piping	Dec. 31, 2019
UFSAR Section 5.2	Seismic Loads and Loss-of-Coolant Loads	Dec. 31, 2019
UFSAR Section 5.4.8.6.1	Replacement Steam Generator LOCA Analysis	Dec. 31, 2019
SLRA Section 4.1.1	Time-Limited Aging Analyses Identification Process	Revision 0
SLRA Section 4.1.2	Evaluation of Time-Limited Aging Analyses	Revision 0
SLRA Table 4.1.4-1	Oconee Time-Limited Aging Analyses Categories and Dispositions	Revision 0
SLRA Table 4.1.4-2	Review of Time-Limited Aging Analyses Listed in NUREG-2192, Table 4.1-2	Revision 0
SLRA Table 4.1.4-3	Review of Time-Limited Aging Analyses Listed in NUREG-2192, Table 4.7-1	Revision 0
NRC NUREG-2192	Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants	July 2017
Nuclear Energy Institute Report No. NEI 17-01	Industry Guidance for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal Applications	December 2017
NRC NUREG-1723	Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2 and 3	ADAMS Accession No. ML0023695154
Duke Energy Serial Letter No. RA-19-0253	Duke Energy Carolinas, LLC, Oconee Nuclear Station, Renewed Facility Operating License Numbers DPR-38, DPR-47, and DPR-55, Proposed License Amendment Request to Revise Oconee Nuclear Station Current Licensing Basis for High Energy Line Breaks Outside of Containment	August 28, 2019 (ADAMS Accession No. ML19240A814)
NRC Correspondence Letter and License Amendment to Duke Energy Carolinas, LCC	Oconee Nuclear Station, Units 1, 2, and 3 – Issuance of Amendment Nos. 421, 423, and 422 RE: Revision of Licensing Basis for High Energy Line Breaks Outside of Containment	March 15, 2021 (ADAMS Accession No. ML21006A098)
Duke Power Company Letter to the NRC Document Control Desk	Oconee Nuclear Site, Docket Nos. 50-269, 50-270, and 50-287,	February 26, 1998

Document	Title	Revision / Date
	Response to NRC Bulletin 88-08, Supplement 1	(ADAMS Accession No. ML20203J930)
NRC Correspondence Letter to Mr. M. S. Tuckman, Executive Vice President, Duke Energy Company	Oconee Nuclear Station, Units 1, 2, and 3 RE: Supplement 1 to the Duke Energy Corporation Response to NRC Bulletin 88-08 (TAC NOS. MA1059, MA1060, and MA1061)	August 11, 2000 (ADAMS Accession No. ML003740377)

The staff made the following observations in relation to the applicant's TLAA identification methodology and results:

- The staff observed that ONS Calculation No. OSC-2077-03-SLR-0500 provides a comprehensive summary of the applicant methodology that it used to search for applicable TLAAs that would require identification and evaluation in the SLRA, as required in accordance 10 CFR 54.21(c)(1). The staff observed that the referenced ONS calculation clearly identifies that the applicant searches involved the following sources for relevant TLAAs: (1) Updated Final Safety Analysis Report (UFSAR), (2) ONS Facility Operating Licenses (DPR- for Unit 1, DPR for Unit 2 and DPR for Unit 3), (3) ONS Quality Assurance Program, (4) ONS inservice inspection (ISI) and inservice testing (IST) program documents, (5) ONS Offsite Dose Calculation Manual, (6) ONS Selected Commitments, (7) ONS Technical Specifications (TS) and TS bases, (8) ONS Electronic Licensing Library, ONS Design Calculations and Reports, (9) ONS Design Specification for Fire Protection, (10) ONS Regulatory Exemptions granted by the NRC in accordance with 10 CFR 50.12, (11) NRC NUREG-2192, (12) a past sampling of past license renewal applications (LRAs) or LRA Safety Evaluation Reports for Babcock and Wilcox (B&W)-PWRs or other vendor-designed PWRs, and (13) the staff's NUREG-1723 safety evaluation report for the past ONS LRA.

- The staff observed that the keywords (as identified on the previous page) used by the applicant to search its records and databases for applicant TLAAs are given in page 19 of ONS Calculation No. OSC-2077-03-SLR-0500. The staff observed that the applicant search resulted in over 200 records that the applicant reviewed for sources of relevant TLAAs, as reported in Section 2.0, "References" of the applicant's OSC-2077-03-SLR-0500 calculation.

- The staff observed that, with possibly the exception of the latest high energy line break analysis used in the CLB for ONS Units 1, 2, and 3, the applicant appears to have identified all analyses required to be identified as TLAAs in accordance with the TLAA definition criteria in 10 CFR 54.3(a) and has evaluated those TLAAs in either SLRA Section 4.2, 4.3, 4.4, 4.5, 4.6, or 4.7, or in one of their subsections. The staff will evaluate these TLAAs in either SER Section 4.2, 4.3, 4.4, 4.5, 4.6, or 4.7, or in one of their subsections.

- In SLRA Table 4.1.4-2, the applicant states that the high energy line break (HELB) analyses for ONS Units 1, 2 and 3 are not TLAAs because they do not involve time-dependent assumptions defined by the current operation term. The staff reviewed the relevant missile protection information in UFSAR Section 3.5, HELB information in UFSAR Section 3.6 and loss-of-coolant accident (LOCA) information in UFSAR Sections 5.2 and 5.4. The staff observed that, unlike the current licensing basis for other non-ONS PWRs, the HELB basis for ONS does not included any HELB bases that may link

the HELB bases for intermediate non-Class 1 pipe locations (i.e., those between terminal ends) to the applicant's "Non-Class 1 Piping Fatigue Analyses" TLAA as summarized, evaluated, and dispositioned for non-Class 1 piping components in SLRA Section 4.3.3.

On August 28, 2019 (ADAMS Accession No. ML19240A814), the applicant submitted a license amendment request (LAR) to update the HELB analysis for pipe breaks outside of containment. The LAR was approved on March 15, 2021 (ADAMS Accession No. ML21005A006). Based on the license amendment issued March 15, 2021, the staff noted that the updated HELB analysis would need to be identified as a TLAA because it is based on the same time-dependent S_a or S_h stress parameters for intermediate non-Class 1 piping locations that are evaluated in the applicant's "Non-Class 1 Piping Fatigue Analyses" TLAA, as summarized, evaluated, and dispositioned in SLRA Section 4.3.3. The staff discussed this matter with the applicant on October 6, 2021 and will consider issuing an RAI.

- The staff observed that, in SLRA Table 4.1.4-3, the applicant identifies that there are no time-dependent analyses associated with its NRC Bulletin 88-08 response that qualify as TLAAs for SLRA. The staff also observed that the applicant includes and evaluates its environmentally-assisted fatigue TLAA for Class 1 components in SLRA Section 4.3.4, "Environmentally Assisted Fatigue." The staff will evaluate the inter-relationships between the applicant's NRC Bulletin 88-08 response basis and its environmentally-assisted fatigue evaluations in Section 4.1 of the SER for the SLRA.

Audit of Regulatory Exemptions. For this aspect of the staff's audit, the staff searched ADAMS to locate those regulatory exemptions that were previously granted in accordance with the exemption approval and authorization requirements of 10 CFR 50.12 and included in the Dockets for the ONS reactor units (i.e., Docket No. 50-269 for Unit 1, 50-270 for Unit 2, and 50-287 for Unit 3). For those exemptions that were granted in accordance with 10 CFR 50.12, the staff audited the past staff performed regulatory exemption evaluations that were included and issued as part of authorization letters for the exemptions to ascertain whether the exemptions were based on a time-dependency associated with a TLAA assessment. The staff also searched ADAMS for any applicable records that might indicate that a specific 10 CFR 50.12-based regulatory exemption had been formally and legally withdrawn from the scope of the CLB by the applicant.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document [1,2]	Title	Revision/Date
SLRA, Section 4.1.3	"Identification and Evaluation of Exemptions"	Revision 0
ONS Calculation No. OSC-2077-03-SLR-0500 (Record includes the keywords that the applicant used to search for Regulatory Exemptions that are required to be identified and evaluated in the SLRA per 10 CFR 54.21(c)(2) and the applicant's determinations as to whether the exemptions require evaluation in the SLRA per the criteria in 10 CFR 54.21(c)(2))	Calculation Cover Sheet, Time-Limited Aging Analysis Identification for Sequent License Renewal	Revision 0
AEC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR 50.10(b)	08/02/1967
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR Part 50, Appendix H, Section II.C.2 Requirements – for ONS Unit 1) [3]	03/26/1976 (ADAMS Accession No. ML011970239)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR Part 50, Appendix H, Section II.C.2 Requirements – for ONS Unit 3) [3]	04/16/1976 (ADAMS Accession No. ML012200100)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR Part 50, Appendix H, Section II.C.2 Requirements – for ONS Unit 2) [3]	06/25/1976 (ADAMS Accession No.ML011990281)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR Part 50, Appendix H, Section II.C.2 Requirements – for ONS Unit 3) [3]	10/23/1976 (ADAMS Accession No. ML011970187)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR Part 50, Appendix H – for ONS Units 1, 2, and 3) [3]	07/14/1977 (ADAMS Accession No. ML012080013)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR 50.46 and 10 CFR Part 50, Appendix K Requirements – for ONS Unit 3)	07/06/1978 (ADAMS Accession No. ML19312C339)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR Part 50, Appendix R, Section III.G.3 Requirements – for ONS Units 1, 2, and 3)	02/02/1982 (ADAMS Accession No. ML15113A057)
Duke Energy Specification No. OSS-0254-00-00-4008 (Document provides the basis for transfer of fire protection requirements to NFPA-805)	Design Specification for Fire Protection	Revision 47

Document [1,2]	Title	Revision/Date
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR Part 50, Appendix H – for ONS Units, 1, 2 and 3) [3]	06/6/1982 (ADAMS Accession No. ML15112B061)
Duke Power Serial Letter to the NRC Document Control Desk	No Document Title – But the Official Record is a Formal Exemption Document for Specified Exemptions No Longer in Effect	06/15/1995 (ADAMS Accession No. ML15238A095)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR Part 50, Appendix R, Section III.L.2 Requirements – for ONS Units 1, 2, and 3)	August 31, 1983 (ADAMS Accession No. ML091310038)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR Part 50, Appendix E – for ONS Units 1, 2, and 3) [3]	01/06/1984 (ADAMS Accession No. ML15113A075)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR 50.55a, Paragraph (g)(4) – for ONS Units 1, 2, and 3) [3]	11/07/1984 (ADAMS Accession No. ML15113A124)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR Part 50, Appendix R, Paragraph III.J – for ONS Units 1, 2, and 3)	12/27/1984 (ADAMS Accession No. ML15113A137)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR Part 50, Appendix J, Paragraph III.A.3 – for ONS Units 1, 2, and 3) [3]	02/24/1987 (ADAMS Accession No. ML011990434)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR Part 50, Appendix R, Paragraph III.G – for ONS Units 1, 2, and 3)	08/21/1989 (ADAMS Accession No. ML012000058)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR 50.46 – for ONS Units 1, 2, and 3)	11/16/1998 (ADAMS Accession No. ML012050440)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR 50.60 and 10 CFR Part 50, Appendix G – for ONS Units 1, 2, and 3)	03/29/1999 (ADAMS Accession No. ML012050426)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR 50.60 and 10 CFR Part 50, Appendix G – for ONS Units 1, 2, and 3)	07/29/1999 (ADAMS Accession No. ML012050083)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR Part 50, Appendix J, Paragraph III.D.2(b)(ii) – for ONS Units 1, 2, and 3)	12/23/1999 (ADAMS Accession No. ML003670061)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR 50.44, 10 CFR 50.46, and 10 CFR Part 50, Appendix K – for ONS Units 1, 2, and 3)	03/23/2000 (ADAMS Accession No. ML003694794)
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR 50.44; 10 CFR Part 50, Appendix A, General Design Criterion 41; and 10 CFR Part 50, Appendix E, Section VI – for ONS Units 1, 2, and 3)	07/17/2001 (ADAMS Accession No. ML011710267)

Document [1,2]	Title	Revision/Date
NRC Exemption Evaluation and Authorization of Exemption to Duke Energy Company	Exemption (From Requirements of 10 CFR 50.61 and 10 CFR Part 50, Appendix G – for ONS Units 1, 2, and 3)	04/26/2012 (ADAMS Accession No. ML120580196)

Table Notes:

1. The list of Exemption-related documents in this table does not include exemption from the requirements in 10 CFR 50.54(w)(i) that was issued on October 7, 1988 (ADAMS Accession No. ML012000064), and granted permission to deviate from financial requirements in 10 CFR Part 50, as this exemption not based on TLAAs and would not need to be evaluated in the SLRA. This exemption from the financial insurance requirements of 10 CFR 50.54 (w)(i) was withdraw by letter dated June 15, 1995; See Note 3 below.
2. The line items list the licensee as Duke Energy Company, but the company of reference in the issued exemption may be the parent company or a subsidiary of the components (e.g., Carolina Power and Light Company; Duke Power Corporation; etc.).
3. This exemption is among the list of regulatory exemptions that were referenced in the applicant's letter of June 15, 1995 (ADAMS Accession No. ML15238A095) as no longer being in effect for the licensee's CLB. The letter of June 15, 1995 effectively withdraws these regulatory exemptions from the scope of the applicant's CLB.

The staff noted that, in SLRA Section 4.1.4 (as supported by information in Enercon Report No. FPLCORP00036-REPT-038), the applicant identifies that it did not find any exemptions that were granted in accordance with 10 CFR 50.12 and that remain in effect and are based on a TLAA.

Based on its search and review of relevant exemption records in ADAMS, the staff observed that the Commission granted a total of 23 regulatory exemptions (including the exemption from the financial insurance requirements of 10 CFR 50.54(w)(i)) in accordance with the exemption approval and authorization criteria in 10 CFR 50.12). The staff made the following observations in relation to these exemptions:

- *Exemption Authorization Evaluation of August 2, 1967 – 10 CFR 50.10(b)*. The staff noted that, on this date, the staff granted the applicant a regulatory exemption from the requirements specified in 10 CFR Part 50, Appendix K. The staff observed that the incoming exemption request (as referenced in the exemption authorization evaluation) involved a request for staff approval of work at ONS Unit 1 prior to the staff's granting of a construction permit for the site. The staff observed that the exemption request was schedular in nature and that the basis for performing the work was not based on any TLAA in support of the schedular request. The staff observed that this supports the applicant's position that the referenced regulatory exemption does not need to be evaluated in the SLRA pursuant the requirements specified in 10 CFR 54.21(c)(2).

- *Exemption Authorizations of March 26, 1976; April 16, 1976; June 25, 1976. October 23, 1976; July 14, 1977; and June 16, 1982 – 10 CFR Part 50, Appendix H*. The staff noted that, on these dates, the staff granted the applicant regulatory exemptions from the requirements specified in 10 CFR Part 50, Appendix H, as applicable to reactor pressure vessel (RPV) material surveillance programs for ONS Unit 1, 2, and 3. The staff observed that the end effect of these exemptions (as referenced in the exemption authorization evaluations) granted staff approval and 10 CFR 50.12 authorization to permit licensed operations of ONS Units 1, 2 and 3 with the reactor pressure vessel surveillance capsules removed from the RPVs in the units. The staff observed that the need for all of the 10 CFR Part 50, Appendix H exemptions were removed in the applicant's letter to the staff of June 15, 1995, based on the staff's approval of the B&W MIRVSP for the ONS units (where the ONS RPV surveillance capsules and test specimens would be irradiated in the Crystal River Unit 3 reactor), as approved under the requirements of 10 CFR Part 50, Appendix H, and the subsequent removal of RPV

surveillance program requirements from the scope of the ONS Technical Specifications in license amendment of October 19, 1987. The staff observed that this supports the applicant's position that these referenced regulatory exemptions do not need to be evaluated in the SLRA pursuant the requirements specified in 10 CFR 54.21(c)(2).

- *Exemption Authorization Evaluation of July 6, 1978 – 10 CFR 50.46*. The staff noted that, on this date, the staff granted the applicant a regulatory exemption from the requirements specified in 10 CFR Part 50, Appendix E. The staff observed that the approved exemption (as referenced in the exemption authorization evaluation) permitted the applicant to operate the ONS units during a postulated LOCA using additional operator actions that would be incorporated into the emergency operating procedures for the reactor units. The staff observed that the exemption was based on a schedular basis and the exemption was not based on any TLAA in support of the modified emergency operation actions approved in the exemption. The staff observed that this supports the applicant's position that this regulatory exemption does not need to be evaluated in the SLRA pursuant the requirements specified in 10 CFR 54.21(c)(2).

- *Exemption Authorizations of February 2, 1982, August 31, 1983, December 27, 1984, August 21, 1989 – 10 CFR Part 50, Appendix R*. The staff noted that, on these dates, the staff granted the applicant regulatory exemptions from the requirements specified in 10 CFR Part 50, Appendix R. The staff observed that none of these fire protection exemptions remain in effect given the applicant's transition to the fire protection requirements of NFPA 805. The staff observed that this supports the applicant's position that these regulatory exemptions do not need to be evaluated in the SLRA pursuant the requirements specified in 10 CFR 54.21(c)(2).

- *Exemption Authorization of January 6, 1984 – 10 CFR Part 50, Appendix E*. The staff noted that, on this date, the staff granted the applicant a regulatory exemption from the requirements specified in 10 CFR Part 50, Appendix E. The staff observed that the exemption granted the applicant to perform its emergency operations training exercises using non-ONS personnel. The staff observed that, based on the reorganization of Duke Power Company, manning of the Emergency Operations Center at ONS is manned by ONS personnel. The staff observed that this exemption is human resource based and is not based on a TLAA. The staff observed that this exemption is no longer in effect. The staff observed that this supports the applicant's position that this regulatory exemption does not need to be evaluated in the SLRA pursuant the requirements specified in 10 CFR 54.21(c)(2).

- *Exemption Authorization of November 7, 1984 – 10 CFR 50.55a(g)(4)*. The staff noted that, on this date, the staff granted the applicant a regulatory exemption from the requirements specified in 10 CFR 50.55a, paragraph (g)(4). The staff observed that the granted exemption was a schedular exemption that granted the applicant to use a common start date for the inservice inspection (ISI) and inservice testing (IST) intervals for the 2nd 10-Year ISI and IST intervals of the units. The staff observed that this exemption was removed in the applicant's letter to the staff of June 15, 1995. The staff observed that this supports the applicant's position that this regulatory exemption does not need to be evaluated in the SLRA pursuant the requirements specified in 10 CFR 54.21(c)(2).

- *Exemption Authorization of February 24, 1987 – 10 CFR Part 50, Appendix J*. The staff noted that, on this date, the staff granted the applicant a regulatory exemption from the requirements specified in 10 CFR Part 50, Appendix J, Section III.A.3. The staff observed that the regulatory exemption granted the applicant permission to use the Mass-Plot method in ANSI 56.8-1981 as an alternative to the total-time method in ANSI N45.1-1972 as the basis for calculating containment Type A leak rates required by 10 CFR Part 50, Appendix J. The staff also observed that the applicant withdrew this exemption from the CLB in the applicant's letter of June 15, 1995. The staff observed that this supports the applicant's position that this regulatory exemption does not need to be evaluated in the SLRA pursuant the requirements specified in 10 CFR 54.21(c)(2).

- *Exemption Authorization of November 16, 1998 – 10 CFR 50.46*. The staff noted that, on this date, the staff granted the applicant a regulatory exemption from the requirements specified in 10 CFR 50.46. The staff observed that the regulatory exemption granted alternative LOCA probabilities for the reactor units and that the exemption was not based on a TLAA or an evaluated time-dependent parameter defined by the current operating term. The staff observed that this supports the applicant's position that this regulatory exemption does not need to be evaluated in the SLRA pursuant the requirements specified in 10 CFR 54.21(c)(2).

- *Exemption Authorization of December 23, 1999 –10 CFR Part 50, Appendix J*. The staff noted that, on this date, the staff granted the applicant a regulatory exemption from the requirements specified in 10 CFR Part 50, Appendix J, paragraph III.D.2(b)(ii). The staff observed that the regulatory exemption granted the applicant permission to implement alternative containment air-lock seal leak rate testing without the need for maintenance on the seals. The staff observed that the regulatory exemption was not based on a TLAA or an evaluated time-dependent parameter defined by the current operating term. The staff observed that this supports the applicant's position that this regulatory exemption does not need to be evaluated in the SLRA pursuant the requirements specified in 10 CFR 54.21(c)(2).

- *Exemption Authorization of March 23, 2000 – 10 CFR 50.44, 10 CFR 50.46, and 10 CFR Part 50, Appendix K*. The staff noted that, on this date, the staff granted the applicant a regulatory exemption from the requirements specified in 10 CFR 50.44, 10 CFR 50.46, and 10 CFR Part 50, Appendix K. The staff observed that the regulatory exemption granted the applicant permission to use alternative Framatome Cogema Fuel "M5" advanced alloy as the fuel cladding material for reactor units and that the exemption was not based on a TLAA or an evaluated time-dependent parameter defined by the current operating term. The staff observed that this supports the applicant's position that this regulatory exemption does not need to be evaluated in the SLRA pursuant the requirements specified in 10 CFR 54.21(c)(2).

- *Exemption Authorization of July 17, 2001 – 10 CFR 50.44; 10 CFR Part 50, Appendix A, General Design Criterion 41; and 10 CFR Part 50, Appendix E*. The staff noted that, on this date, the staff granted the applicant a regulatory exemption from the requirements specified in 10 CFR 50.44, 10 CFR Part 50, Appendix A, GDC 41, and 10 CFR Part 50, Appendix E, Section VI. The staff observed that the regulatory exemption granted the applicant permission to remove the hydrogen recombiner requirements for the containment design and operability during a postulated LOCA event from the CLB but did not grant the applicant authorization to eliminate post LOCA hydrogen monitoring as

part of the plant operations during a postulated LOCA event. The staff confirmed that this exemption was not based on a TLAA or an evaluated time-dependent parameter defined by the current operating term. The staff observed that this supports the applicant's position that this regulatory exemption does not need to be evaluated in the SLRA pursuant the requirements specified in 10 CFR 54.21(c)(2).

- *Exemption Authorization of April 26, 2012 – 10 CFR 50.61 and 10 CFR Part 50, Appendix G*. The staff noted that, on this date, the staff granted the applicant a regulatory exemption from the requirements for performing RPV component-specific adjusted reference temperature calculations (i.e., component-specific RT_{PTS} calculations as mandated in 10 CFR 50.61 and component-specific RT_{NDT} calculations are required in 10 CFR Part 50, Appendix G). The staff observed that the exemption granted the applicant permission to use the Framatome Proprietary Report BAW-2308, Revision 1-A and 2-A as the source of unirradiated $RT_{NDT}/RT_{NDT(U)}$ value and σ_I variance value inputs for the calculations. The staff confirmed that, although this exemption relates to and provides calculational inputs to the Pressurized Thermal Shock and Pressure-Temperature Limit TLAAs in SLRA Sections 4.2.3 and 4.2.4, the exemption is was not based on those TLAAs or on the time-dependent parameter defined by the current operating term (i.e., RPV neutron fluence) that is assessed in those TLAAs. The staff observed that this supports the applicant's position that this regulatory exemption does not need to be evaluated in the SLRA pursuant the requirements specified in 10 CFR 54.21(c)(2).

- *Exemption Authorizations of March 29, 1999 and July 29, 1999 and – 10 CFR 50.60 and 10 CFR Part 50, Appendix G*. The staff noted that, on these dates, the staff granted the applicant two different regulatory exemptions from the requirements specified in 10 CFR Part 50, Appendix G for pressure-temperature (P-T) limit curve calculations and the calculation of low temperature overpressure protection (LTOP) system pressure lift and arming temperature setpoints. The staff observed that, in the exemption authorization of March 29, 1999, the staff authorized use of ASME Section XI Code Case N-514 as an alternate methodology for calculating the LTOP system pressure lift and system arming setpoint values for the LTOP System Setpoint TLAA, as evaluated in SLRA Section 4.2.5. The staff observed that, in the exemption authorization of July 29, 1999, the staff authorized use of a different ASME Section XI Code Cases (i.e., Code Cases N-588 and N-640) for calculation of the unit-specific P-T limit curves but stated that an exemption for use of Code Case N-514 for the LTOP system setpoint values was not necessary for the CLB. The staff observed that, although the exemption granting authorization for use of ASME Code Cases N-588 and N-640 relates to and provides calculational inputs to the Pressure-Temperature Limits TLAA in SLRA Section 4.2.4, the exemption is was not based on that TLAA or on the time-dependent parameter defined by the current operating term (i.e., RPV neutron fluence) that is assessed in P-T limits TLAA. The staff observed that this supports the applicant's position that this regulatory exemption does not need to be evaluated in the SLRA pursuant the requirements specified in 10 CFR 54.21(c)(2).

  During the portion of the audit breakout session that discussed regulatory exemptions, the staff informed the applicant that SRP-SLR Section 4.1.3 identifies that regulatory exemptions related to use of ASME Code Case N-514 for LTOP setpoint calculations are an example of regulatory exemptions that may be based on a TLAA and remain in effect for the CLB. Thus, the staff informed the applicant that it could not determine whether an exemption for use of Code Case N-514 remains in effect for the CLB

because the NRC exemption authorization records March 23, 1999 and July 29, 1999 contradict each other as to whether an exemption for Code Case N-514 exists for the ONS CLB. During the portion of the audit breakout session on regulatory exemptions, the staff informed the applicant that the staff would need further clarification as to whether a regulatory exemption currently exists Code Case N-514 remains in effect for CLB and whether the applicant is using ASME Code Case N-514 as the calculational basis for the applicant's LTOP setpoint TLAA. The staff will evaluate this regulatory exemption in Section 4.1.3 of the SER. The staff may issue a RAI or RCI on the ASME Code N-514 regulatory exemption matter.

Audit of FSAR Supplement. The applicant is not required by the regulation in 10 CFR 54.21(d) to include an FSAR supplement for SLRA Section 4.1, "Identification of Time-Limited Aging Analyses," because the section only applies to the applicant's methodology that the applicant used to search for TLAAs that need to be identified and evaluated in the SLRA in accordance with 10 CFR 54.21(c)(1) and those regulatory exemptions that are required to be evaluated in accordance with 10 CFR 54.21(c)(2), and the applicant's results of those searches. However, the staff observed that the applicant conservatively includes an FSAR Supplement section for its TLAA and exemption identification activities, as given in SLRA Section A4.1, "Identification of Time-Limited Aging Analyses." The staff will evaluate SLRA Section A4.1 in Section 4.1 of the SER for the SLRA.

SLRA TLAA Section 4.2.1, Neutron Fluence Projections

Summary of Information in the Application. SLRA Section 4.2.1, "Neutron Fluence Projections," discusses the analysis for the for neutron fluence projections of the reactor vessel that have been used as inputs to the neutron embrittlement analyses that evaluate the reduction of the fracture toughness aging effects resulting from neutron irradiation. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii). To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
ANP-3898P/NP	Framatome Reactor Vessel and RCP TLAA and Aging Management Review Input to the ONS SLRA	Revision 0
BAW-2241P/NP	Fluence and Uncertainty Methodologies (Including Revision to Appendix G)	11/20/2007 & 04/30/2006
ANP-10348P/NP	Fluence Methodologies for SLR	Revision 0
Regulatory Guide 1.190	Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence	Revision 0

Regulatory Issue Summary 2014-11	Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components	10/2014
NUREG-1743	Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station Units 1, 2, and 3	03/2000
N/A	Oconee Nuclear Station, Units 1, 2, and 3 – Issuance of Amendment Nos. 420, 422, and 421, "Measurement Uncertainty Recapture Power Uprate (EPID L-2020-LLS-0000)	01/2021
Regulatory Guide 1.99	Radiation Embrittlement of Reactor Vessel Materials	Revision 2
N/A	Breakout Questions – TRPs 142.1 149.13 – Fluence (ParksMessina) - Response	09/2021
BAW-2192	Lower Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels A & B Service Loads	Revision 0, Supplement 1P-A, Revision 0
BAW-2178	Lower Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels C & D Service Loads	Revision 0, Supplement 1P-A, Revision 0

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(ii).

During the audit, the staff made the following observations:

- The staff verified that the applicant provided neutron fluence projections to 80 years of life (72 EFPY) for the beltline region of the reactor pressure vessel (RPV) and regions outside of the beltline that are projected to exceed the 1E17 neutrons per square centimeter stated in RIS 2014-11.

- The staff reviewed the referenced neutron fluence methodology employed in the RPV beltline region, BAW-2241, Revision 2, and verified that an NRC-approved methodology that is compliant with RG 1.190 guidance was used for beltline fluence estimates.

- The staff reviewed ANP-3898P/NP, ANP-10348, Revision 0, and the responses to the TRP 142.1 breakout questions to confirm that the dpa adjustment methodology used in the extended beltline region for fluence projections is conservative and takes into consideration spectral differences between the beltline and extended beltline.

- The staff noted that there is a significant difference in the nozzle welds estimated neutron fluence in the SLRA and in BAW-2192, Revision 0 Supplement 1P-A, Revision 0 and BAW-2178, Revision 0, Supplement 1P-A, Revision 0. The staff reviewed the responses to the TRP 142.1 breakout questions to understand the basis for the differences.

The staff also audited the description of the SLRA TLAA "Neutron Fluence Projections" provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.2.2, Upper-Shelf Energy

Summary of Information in the Application. SLRA Section 4.2.2, "Upper-Shelf Energy," discusses the evaluation of the TLAA that assesses the projected reduction in the upper-shelf energy properties of reactor pressure vessel base metal and weld materials through the licensed period of the reactor units. Duke Energy dispositioned the TLAA in accordance with

10 CFR 54.21(c)(1)(ii). To verify that Duke Energy provided a basis to support its disposition of the TLAA, the staff audited the TLAA.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLRA Section 4.2.2	Upper-Shelf Energy	Revision 0
ANP-3898NP	Framatome Reactor Vessel and RCP TLAA and Aging Management Review input to ONS SLRA Reactor Vessel Integrity Program Implementation	Revision 0, 05/2021
BAW-2192	Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels A & B Service Loads	Supplement 1P-A, Revision 0, 12/2018
BAW-2178	Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels C & D Service Loads	Supplement 1P-A, Revision 0, 12/2018
PWROG-17090-NP-A	Generic Rotterdam Forging and Weld Initial Upper-Shelf Energy Determination	Revision 0, 01/2020

During the audit of the TLAA, the staff verified that Duke Energy has provided sufficient information in its basis to support its disposition of upper-shelf energy in accordance with 10 CFR 54.21(c)(1)(ii).

During the audit, the staff made the following observations based on its in-house audit review of relevant information in SLRA Sections 4.2.2:

- For the beltline materials with projected upper-shelf energy values below 50 ft-lbs at 72 EFPY, as identified in ANP-3898NP, Revision 0, equivalent margins analyses have been performed to demonstrate that lower values of Charpy upper-shelf energy will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code.

- BAW-2178, Revision 0, Supplement 1P-A, Revision 0 and BAW-2192, Revision 0, Supplement 1P-A, Revision 0, include equivalent margins analyses for Oconee Units 1, 2, and 3, with the equivalent margins analysis for ONS Unit 1 weld SA-1135 addressed separately in ANP-3898NP. ONS Unit 1 weld SA-1135 is a circumferential weld that connects the lower nozzle belt forging to the intermediate weld.

- The ONS Units 1, 2 and 3 equivalent margins analyses utilized conservative 72 EFPY neutron fluence projections in the analyses.

During the audit of the OpE associated with the TLAA, the staff reviewed the plant-specific information to identify any previously unknown or recurring aging effects. The staff did not

identify any additional aging effects or mechanisms (i.e., other than loss of fracture toughness due to neutron irradiation embrittlement) that would have an impact on the applicant's evaluation of the TLAA.

The staff also audited the summary description of the SLRA upper-shelf energy TLAA provided in the UFSAR supplement. The staff verified this summary description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.2.3, Pressurized Thermal Shock

Summary of Information in the Application. This section discusses the evaluation of the time-limited aging analysis (TLAA) that assesses protection against pressurized thermal shock (PTS) events as required by 10 CFR 50.61. The licensee performed an assessment of the projected values of the PTS reference temperature (RT_{PTS}) evaluated at the 72 EFPY fluence projections through the subsequent period of extended operation for Oconee Units 1, 2, and 3.
SLRA Section 4.2.3, "Pressurized Thermal Shock," discusses the analysis of the reactor vessel beltline and extended beltline materials associated with the TLAA. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii). To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA. The staff will address issues identified but not resolved in this audit report in the SER

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
BAW-2325	Response to Request for Additional Information (RAI) Regarding Reactor Pressure Vessel Integrity	01/1999
ANP-3898P (PROPRIETARY)	Framatome Reactor Vessel and RCP TLAA and Aging Management Review Input to the ONS SLRA	0
[[XX]] (PROPRIETARY)	RTPTS Values for Oconee Units 1, 2, and 3 at 80 Calendar Years	0
[[XX]] (PROPRIETARY)	Oconee Nuclear Station Units 1, 2, and 3 ART Values at 72 EFPY to Support EMA	1
ANP-2650	Updated Results for Request for Additional Information Regarding Reactor Pressure Vessel Integrity	07/2007
BAW-2308	Initial RTNTD of Linde 80 Weld Materials	2-A
Duke responses to breakout questions: file *Breakout Questions – TRP 142.03 PTS Respenses.pdf*	Oconee SLRA: Breakout Session Questions – TRP 142.03: Pressurized Thermal Shock, SLRA Section 4.2.3 – Technical Reviewer: Isaac Anchondo-Lopez	NA

License Amendment Request No. 2012-10	Oconee Nuclear Station Unit 1, 2 and 3, Issuance of Amendments Regarding Revised Pressure-Temperature Limits (ADAMS ML130580060)	02/22/2013
BAW-2222	Response to Closure Letters to GL	1

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(ii). However, the staff found that sufficient information was not available to complete its review of the applicant's basis for its TLAA disposition. In order to obtain the necessary information, the staff will consider issuing RAIs.

During the audit, the staff made the following observations:

- Additional to the reactor vessel beltline materials contained in ONS current licensing basis, the licensee evaluated additional beltline material locations (i.e., extended beltline) that were found to exceed the peak neutron fluence of 10^{17} n/cm^2 (E >1 MeV) at the end of the subsequent period of extended operation. These new locations consisted of forging material made from ASTM A-508, Class 2, and associated welds from Linde 80 weld metal.

- The licensee calculated new mean and standard deviation initial RT_{NDT} values for certain forgings and plates in all three Units. The licensee stated that forgings and plates that were ordered before 1971 (i.e., pre-ASME Code) were not used to calculate the initial RT_{NDT} values during license renewal because it was not known whether these materials met all the applicable ASME Code requirements. For SLRA, the licensee determined that these forgings and plates met all applicable ASME Code requirements and provided new valid RT_{NDT} values. Therefore, the licensee established new mean and standard deviation initial RT_{NDT} values using the forging and plates that were ordered before 1971 in addition to the CLB values. This was similarly done for materials that have new Copper weight content (Cu wt%) values. The staff may need additional clarifications regarding the use of new data sets for coming up with new input values.

- The Cu wt% value changed for the lower nozzle belt (LNB) forgings for Unit 1 and Unit 3. During the breakout session discussion, the licensee stated that the new Cu wt% values came from specific test values from the fabrication information in BAW-2313, Revision 7. The change in Cu wt% for the LNB forging in Unit 3 was a conservative change that resulted in a lower RT_{PTS} value. The change in Cu wt% for the LNB forging in Unit 1 resulted in a minor change in the RT_{PTS} value at 72 EFPY. The staff may need additional clarification on the use of these specific test values.

- Similarly, the Cu wt% changed for the LNB forging in Unit 2. The licensee stated that it had originally used a Cu wt% generic value reported in BAW-2222. For SLRA, the licensee determined a new Cu wt% value for certain extended beltline welds using a data set to calculate the generic Cu wt% value. Consequently, this value was also used for the LNB forging material in Unit 2. The staff may need additional clarifications regarding the use of the new Cu wt% value.

The staff also audited the description of the SLRA Pressurized Thermal Shock TLAA provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.2.4, Pressure-Temperature Limits

Summary of Information in the Application. SLRA Section 4.2.4, "Pressure-Temperature Limits," discusses the analysis associated with the development of pressure-temperature (P-T) limits for the beltline and extended beltline region of the reactor pressure vessel including associated welds. The applicant stated that the P-T limits will be updated through the 10 CFR 50.90 process at a later date, prior to exceeding the effective full power years for which they remain valid. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(iii). To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA.

Audit Activities. During its audit, the staff reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the P-T limits TLAA. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
Action Request 01904908	Various, starting with "Subject: RCS pressure band 35-45 psig exceeded during PZR cooldown" on page 1	Various, starting from 1/10/2011
ANP-3898P (PROPRIETARY)	Framatome Reactor Vessel and RCP TLAA and Aging Management Review Input to the ONS SLRA	Revision 0, May 2021
NRC Letter to Duke Energy Carolinas, LLC (ADAMS Accession No. ML14041A093)	Oconee Nuclear Station, Units 1, 2, and 3, Issuance of Amendments Regarding Revised Pressure-Temperature Limits (TAC Nos. MF0763, MF0764, and MF0765)	February 27, 2014
NRC Letter to Duke Energy Carolinas, LLC (ADAMS Accession No. ML20335A001)	Oconee Nuclear Station, Units 1, 2, and 3, Issuance of Amendment Nos. 420, 422, and 421 Re: Measurement Uncertainty Recapture Power Uprate (EPID L-2020-LLS-0000)	January 26, 2021

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(iii).

During the audit, the staff observed that Action Request (AR) 01904908 described an event in ONS Unit 1 on January 10, 2011, when the reactor coolant system (RCS) cooldown rate exceeded those specified in the ONS Technical Specification (TS) Limiting Condition for Operation (LCO) 3.4.3 for approximately one hour. TS LCO 3.4.3 defines the operational limits with respect to the ONS Unit 1 P-T limit curves. This AR also described the evaluation that determined the acceptability of the ONS Unit 1 RCS for continued operation per required action C.2 of ONS Unit 1 TS LCO 3.4.3. The evaluation compared the event on January 10, 2011 with a similar event that occurred in ONS Unit 1 in April 2008, and determined that in terms of applied stresses, the April 2008 event bounded the January 10, 2011 event.

The staff also audited the summary description of the SLRA P-T limits TLAA provided in the UFSAR supplement. The staff verified this summary description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.2.5, Low Temperature Overpressure Protection

Summary of Information in the Application. SLRA Section 4.2.5, "Low Temperature Overpressure Protection," discusses the evaluation associated with the low temperature overpressure (LTOP) system setpoints and LTOP pressure-temperature limits, which are based on the pressure-temperature limits TLAA for the reactor pressure vessel (SLRA Section 4.2.4). The applicant stated that the LTOP setpoints and LTOP pressure-temperature limits will be updated through the 10 CFR 50.90 process at a later date and dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(iii). To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA.

Audit Activities. During its audit, the staff reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the LTOP TLAA. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
NRC Letter to Duke Energy Carolinas, LLC (ADAMS Accession No. ML14041A093)	Oconee Nuclear Station, Units 1, 2, and 3, Issuance of Amendments Regarding Revised Pressure-Temperature Limits (TAC Nos. MF0763, MF0764, and MF0765)	02/27/2014
NRC Letter to Duke Energy Carolinas, LLC (ADAMS Accession No. ML20335A001)	Oconee Nuclear Station, Units 1, 2, and 3, Issuance of Amendment Nos. 420, 422, and 421 Re: Measurement Uncertainty Recapture Power Uprate (EPID L-2020-LLS-0000)	01/26/2021

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(iii).

The staff also audited the summary description of the SLRA LTOP TLAA provided in the UFSAR supplement. The staff verified this summary description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.3.1, Transient Cycle Projections for 80 Years

Summary of Information in the Application. SLRA Section 4.3.1, "Transient Cycle Projections for 80 Years," discusses the 80-year projected transient cycles for the reactor coolant pressure boundary components. The applicant indicated that the transient cycle projections by themselves are not a TLAA but constitute what is considered to be the time-limited aspect of various fatigue analyses. Accordingly, the applicant addressed the fatigue TLAAs and their dispositions separately in SLRA Sections 4.3.2 (Class 1 fatigue evaluations), 4.3.3 (non-Class 1

fatigue analyses), 4.3.4 (environmentally assisted fatigue analysis), 4.3.5 (analytical flaw evaluations) and 4.3.6 (weld overlay fatigue analyses).

The staff audited the transient cycle projections to verify the adequacy of the cycle projections. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal. Furthermore, the staff conducted additional OpE searches on the applicant's corrective action program (CAP) database.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-OPEX-0100	Subsequent License Renewal Operating Experience Review Methodology and Results	Revision 4
SLR-ONS-TLAA-0302	Acceptability of 72 EFPY for Use in 80-year Time-Limited Aging Analysis Evaluations for Oconee Subsequent License Renewal	Revision 0
SLR-ONS-TLAA-0300	Time-Limited Aging Analyses of Mechanical System Thermal Fatigue for Subsequent License Renewal	Revision 1

During the audit of the TLAA, the staff reviewed the basis of the 80-year transient cycle projections, including the identification of the transients that are used in the fatigue TLAAs. However, the staff found that sufficient information was not available to complete its review of the applicant's basis for its transient cycle projections. In order to obtain the necessary information, the staff will consider issuing RAIs.

During the audit, the staff made the following observations. The staff will consider issuing RAIs to address the concerns associated with these observations.

- The following transients in UFSAR Table 5-2 are not listed in SLRA Table 4.3.1-1 that addresses 80-year cycle projections: (1) Transient 3, power loading 8 to 100 percent power; (2) Transient 4, power unloading 100 to 8 percent power; (3) Transient 5, 10 percent step load increase; (4) Transient 6, 10 percent step load decrease; (5) Transient 12, hydrotests; (6) Transient 18, loss of feedwater heater; (7) Transient 19, feed and bleed operations; and (8) Transient 20, miscellaneous transients. The SLRA does not clearly discuss why the transients discussed above are excluded from SLRA Table 4.3.1-1 that addresses the transient cycle projection and monitoring for 80-year operation.

- SLRA Sections 4.3.1 and 4.3.4 do not clearly provide the following information: (1) the reduced set of the transient cycles for the pressurizer surge line, main steam penetrations

and main feedwater penetrations and (2) whether the Fatigue Monitoring program will monitor actual cycles against the reduced set of the transient cycles.

- UFSAR Table 5-2, Note 2 indicates that, in order to analytically demonstrate a usage factor of less than 1.0, certain welds associated with the emergency high pressure injection (HPI) nozzles have been qualified for fewer than the design number of cycles of two transients as follows. Specifically, the sum of the cycles of the "manual actuation of HPI system after reactor trip" transient (Transient 8) and the cycles of "rapid depressurizations" transient (Transient 9) cannot exceed 29 cycles. Similarly, Note 7 of UFSAR Table 5-2 explains that the reactor vessel closure head (RVCH) assemblies are limited to 5000 cycles of "power loading and unloading" transient (Transients 3 and 4) and 15 cycles of "hydrotests" transient (Transient 12). In contrast, SLRA Table 4.3.1-1 does not include these design transients, which have the reduced set of transient cycles as specified in Notes 2 and 7 of UFSAR Table 5-2.

- UFSAR Table 5-2, Note 1 indicates that certain components have flaw tolerance evaluations (as addressed in UFSAR Sections 5.2.2 and 5.2.3.12.4) and that these evaluations assume a reduced number of heatup and cooldown cycles. Therefore, the staff found a need to further confirm that the analytical evaluations of the flaws discussed in SLRA Section 4.3.5 use the design transient cycles identified in SLRA Section 4.3.1 without using a reduced set of transient cycles. The staff needs a similar confirmation for the weld overlay fatigue analyses discussed in SLRA Section 4.3.6.

The staff also audited the description of the SLRA transient cycle projections for 80 years provided in the UFSAR supplement. The staff verified this description provides an adequate summary of the transient cycle projections for 80 years.

SLRA TLAA Section 4.3.2, Class 1 Component Fatigue Analysis

Summary of Information in the Application. SLRA Section 4.3.2, "Class 1 Component Fatigue Evaluations," discusses the fatigue analysis for Class 1 piping and components. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(iii). To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal. Furthermore, the staff conducted additional OpE searches on the applicant's CAP database.

The table below lists documents that were reviewed by the staff and were found relevant to the TLAA. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-OPEX-0100	Subsequent License Renewal Operating Experience Review Methodology and Results	Revision 4
SLR-ONS-TLAA-0300	Time-Limited Aging Analyses of Mechanical System Thermal Fatigue for Subsequent License Renewal	Revision 1
BAW- 2248A	Demonstration of the Management of Aging Effects for the Reactor Vessel Internals	04/21/2000
Framatome Technologies Engineering Information Record 1234566-02	Demonstration of the Management of Aging Effects for the Reactor Vessel Internals	Revision 2
OSC-7220.23	Exemption Analysis of ONS 1 – 3 Cold Leg Pressurizer Spray Nozzle	11/20/2001
OSC-7220.51	Exemption Analysis of ONS 1 – 3 Letdown Line	09/17/2002
OSC-7220.52	Exemption Analysis of ONS 1 – 3 Decay Heat Line	10/5/2004
OSC-7220.57	Exemption Analysis of ONS 1 – 3 Core Flood Piping	03/15/2004
OSC-8745.12	ONS Units 1 and 2 RCS Small Bore Nozzle Component Replacements	Revision 2
SIA Calculation 1000922.314	ONS Hot and Cold Leg Alloy 600 Component Replacement	Revision 0
OSC-7220.55	Exemption Analysis of ONS 1 – 3 Loop Drain Piping and Nozzles	07/20/2010
OSC-8749	MRP-146 Turbulent Swirl Evaluations for Stagnant Class 1 Piping – Oconee Units 1, 2 and 3	08/6/2012
FP-ONS-402	System Review and Recommendations for the Fatigue Management Program at the Oconee Nuclear Station Units 1, 2 and 3 for Subsequent License Renewal	Revision 0
OSC-8745.13	Vendor Analysis for Alloy 600 Mitigation – ONS Units 1, 2 and 3 – RCS Abandoned Thermowell Mitigation	06/28/2017
33-1171355-00	ASME Stress Report – CRDM for Duke Power	03/11/1988
33-5002556-04	Stress Report for Type C Replacement CRDMs	07/12/2001

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(iii). However, the staff found that sufficient information was not available to complete its review of the applicant's basis for its TLAA disposition. In order to obtain the necessary information, the staff will consider issuing RAIs. During the audit, the staff made the following observations. The staff will consider issuing an RAI to address the potential concerns associated with these observations.

- SLRA Section 4.3.2.2 addresses the low-cycle fatigue TLAA only for the reactor vessel internal (RVI) thermal shield replacement bolts, excluding the fatigue TLAA for the other RVI components. Therefore, the fatigue TLAA in SLRA Section 4.3.2.2 is not potentially consistent with the BAW-2248A report and Action Item 11 of the BAW- 2248A report (Reference: BAW-2248A, "Demonstration of the Management of Aging Effects for the Reactor Vessel Internals," March 2000, ADAMS Accession No. ML003708443). Specifically, Action item 11 addresses the monitoring activity to ensure that the implicit fatigue TLAA remains valid for the RVI components including the thermal shield replacement bolts. The action item also states that the applicant must address the plant-specific plans to continue monitoring and tracking design transient occurrences.

- In addition, the following reference indicates that the current licensing basis fatigue analysis for the RVI bolts of the Oconee plant is based on the design cycles of the "power loading 8 to 100 percent power" and "power unloading 100 to 8 percent power" transients (Reference: Table 6 of Framatome Technologies Engineering Information Record 1234566-02, "Fatigue Trackable Component & Transients," May 30, 1996). The staff found a need to clarify whether the fatigue analysis for the RVI bolts (including bolts other than thermal shield replacement bolts) is a TLAA.

The staff also audited the description of the SLRA fatigue TLAA for the Class 1 components provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.3.3, Non-Class 1 Piping Fatigue Analysis

Summary of Information in the Application. SLRA Section 4.3.3, "Non-Class 1 Fatigue Analyses," discusses the fatigue analyses for non-Class 1 piping systems. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii). To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal. Furthermore, the staff conducted additional OpE searches on the applicant's CAP database.

The table below lists documents that were reviewed by the staff and were found relevant to the TLAA. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-OPEX-0100	Subsequent License Renewal Operating Experience Review Methodology and Results	Revision 4
SLR-ONS-TLAA-0300	Time-Limited Aging Analyses of Mechanical System Thermal Fatigue for Subsequent License Renewal	Revision 1

Document	Title	Revision / Date
Calculation Number OSC-2245	Oconee Unit 1 Pressurizer Water Sample Piping Analysis Problem Number 1-64-09	Revision 15
Calculation Number OSC-2404	Oconee Unit 2 Pressurizer Water Sampling and Vent Line Problem Number 2-64-04	Revision 20
Calculation Number OSC-2191	Oconee Unit 3 Pressurizer Water Sample and Vent Analysis Piping Analysis Problem Number 3-64-06	Revision 27
OSC-11909	Thermal Cycle Fatigue Analysis	12/9/2020

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(ii). However, the staff found that sufficient information was not available to complete its review of the applicant's basis for its TLAA disposition. In order to obtain the necessary information, the staff will consider issuing RAIs.

During the audit, the staff made the following observations. The staff will consider issuing RAIs to address the potential concerns associated with these observations.

- SLRA Section 4.3.3 addresses the fatigue TLAA for non-Class 1 piping systems. In the section, Table 4.3.3-2 provides 80-year thermal cycle projections for the piping systems and the conservative cycle assumptions used in the cycle projections. Specifically, SLRA Table 4.3.3-2 describes the specific cycle numbers associated heatup, cooldown or other relevant cycles, or cycle number per a specific time period (e.g., monthly cycles). However, the SLRA does not clearly describe how the conservative cycle basis of the cycle projections was determined.

- SLRA Section 4.3.3 indicates that none of non-Class 1 piping lines in the scope for SLR exceed the allowable number of thermal cycles specified in ANSI B31.1 Code and, therefore, the stress range reduction factors applied to the piping systems remain valid in all locations. In comparison, SLRA Table 4.3.3-2, Note 1 indicates that the stress range reduction factor for the pressurizer sampling piping has been reduced from 1.0 to 0.7 to allow a total of 45000 cycles for the piping. However, SLRA Section 4.3.3 does not clearly address (a) whether the updated stress reduction factor for the pressurizer sampling piping (from 1.0 to 0.7) is adequately used in the stress analysis for the piping and (b) whether the related stress analysis is acceptable.

- The SLRA does not clearly describe whether the implicit fatigue analysis for the non-Class 1 piping systems, which involves a stress range reduction factor, may have a potential impact on the HELB location postulation.

The staff also audited the description of the SLRA non-Class 1 fatigue TLAA provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.3.4, Environmentally-Assisted Fatigue (EAF)

Summary of Information in the Application. SLRA Section 4.3.4, "Environmentally-Assisted Fatigue," as supplemented by the SLR-ONS-TLAA-0306NP report, discusses the

environmentally-assisted fatigue (EAF) analysis for reactor coolant pressure boundary (Class 1) piping and components. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(iii). To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal. Furthermore, the staff conducted additional OpE searches on the applicant's CAP database.

The table below lists documents that were reviewed by the staff and were found relevant to the TLAA. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-OPEX-0100	Subsequent License Renewal Operating Experience Review Methodology and Results	Revision 4
SLR-ONS-TLAA-0300	Time-Limited Aging Analyses of Mechanical System Thermal Fatigue for Subsequent License Renewal	Revision 1
ANP-3898P	Framatome Reactor Vessel and RCP TLAA and Aging Management Review Input to the ONS SLRA	Revision 0
BAW-2251A	Demonstration of the Management of Aging Effects for the Reactor Vessel	08/1999
ANP-3899P	Framatome Reactor Vessel Internals TLAA Input to the ONS SLRA	Revision 0
SLR-ONS-TLAA-0306NP	Environmentally-Assisted Fatigue Oconee Subsequent License Renewal Application Supplemental Section 4.3.4 (non-proprietary version)	Revision 0
SLR-ONS-TLAA-0306P	Environmentally-Assisted Fatigue Oconee Subsequent License Renewal Application Supplemental Section 4.3.4 (proprietary version)	Revision 0
AR 1543791	NRC Regulatory Issue Summary 2008-30	12/22/2008
AR 1908115	ASME Code Section III Fatigue Analysis on Steam Generator Tube-to-Tubesheet Welds	03/26/2015
Calculation Number OSC 11520	Replacement Once Through Steam Generators Tube-to-Tubesheet Weld Stress Analysis 318A-SR-02	Revision 0

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(iii). However, the staff found that sufficient information was not available to complete its review of the applicant's basis for its TLAA disposition. In order to obtain the necessary information, the staff will consider issuing RAIs.

During the audit, the staff made the following observations. The staff will consider issuing RAIs to address the potential concerns associated with these observations.

- SLRA Section 4.3.4, as supplemented by the SLR-ONS-TLAA-0306NP report, indicates that, to reduce excess conservatism for stainless steel location due to the very large maximum F_{en} (environmental fatigue correction factor) the strain rate is calculated as the average of the value based on a qualitative estimate of strain rate and the value based on the worst possible strain rate. The SLRA does not clearly describe the meanings of (1) the qualitative estimate of strain rate and (2) the worst possible strain rate.

- SLRA Section 4.3.4, as supplemented by the SLR-ONS-TLAA-306NP report, indicates that, for locations where the conservatively determined screening CUF_{en} (environmental cumulative usage factor) exceeded 1.0, further evaluations were performed in accordance with NUREG/CR-6909, Revision 1. The SLRA does not clearly discuss how the conservatism associated with the screening CUF_{en} calculation has been removed in the further evaluations.

- SLRA Section 4.3.4, as supplemented by the SLR-ONS-TLAA-306NP report, indicates that the high pressure injection (HPI) piping stop valve-to-check valve location is bounding for the HPI nozzle that is identified in NUREG/CR-6260 as one of the leading locations for EAF in B&W designed plants. The SLRA does not discuss the F_{en} and CUF_{en} values of these piping locations for 80 years that can be used to confirm the adequacy of the applicant's evaluation.

- Table 4.3.4-1 of SLRA Section 4.3.4, as supplemented by the SLR-ONS-TLAA-306NP report, indicates that the control rod drive mechanism (CRDM) weld is part of the RVCH replacement. The table also indicates that the 80-year CUF of the CRDM weld is based on reduced "power loading/unloading" cycles. The table further states that the "power loading/unloading" transients are excluded from the Fatigue Monitoring program, which will require reconsideration if the applicant implements flexible power operation (i.e., operation involving load following). Given that the reduced "power loading/unloading" cycles are used in the CUF_{en} calculation, the staff notes that the transients may need to be monitored by the Fatigue Monitoring program to ensure that the projection basis with the reduced cycles remains valid. However, these transients are excluded from the fatigue monitoring as discussed above.

- The following reference provides the fatigue analysis and cumulative usage for the SG tube-to-tubesheet welds (Reference: Calculation Number OSC 11520, Revision 0, "Replacement Once through Steam Generators Tube-to-Tubesheet Weld Stress analysis"). Table 1.1 of the reference indicates that the projected CUF of the welds is slightly less than the design limit (1.0). However, the reference above and SLRA Section 4.3.4 (as supplemented by SLR-ONS-TLAA-0306NP) do not clearly address the EAF analysis for the SG tube-to-tubesheet welds.

- The following reference indicates that the 80-year CUF_{en} for the venturi exceeds the fatigue design limit (1.0) but the CUF_{en} is acceptable because it is not a reactor coolant pressure boundary component that requires an EAF analysis (Reference: Section 8.5 of ANP-3898P, Revision 0, "Framatome Reactor Vessel and RCP TLAA and Aging Management Review Input to the ONS SLRA"). However, the related discussion in the reference above does not clearly address how the applicant will manage the aging effect of fatigue for the venturi.

- Table 4.3.4-1 of SLRA Section 4.3.4, as supplemented by the SLR-ONS-TLAA-306NP report, describes the leading EAF locations for thermal zones. For the following thermal

zones, the fabrication material for the leading EAF locations is only stainless steel: (1) pressurizer lower head and surge line; (2) pressurizer spray; (3) high pressure injection; (4) decay heat removal system; and (5) core flood. The SLRA does not clearly discuss why the thermal zones mentioned above do not identify any leading EAF locations that are fabricated of materials other than stainless steel.

The staff also audited the description of the SLRA EAF TLAA provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.3.5, Analytical Evaluations of Flaws

Summary of Information in the Application. SLRA Section 4.3.5, "Analytical Evaluation of Flaws," discusses crack growth analyses for flaws that may be acceptable through analytical evaluation. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(iii). To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal. Furthermore, the staff conducted additional OpE searches on the applicant's CAP database.

The table below lists documents that were reviewed by the staff and were found relevant to the TLAA. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
OSC-2077-03-SLR0400	Identification of ISI Fracture Mechanics Flaw Evaluations for Oconee Subsequent License Renewal	Revision 1 10/15/2020
Framatome Document [[XX]]	Review of FM Calculations of RCS Indications in Oconee Units	Revision 3 08/12/2020
SLR-ONS-OPEX-0100	Subsequent License Renewal Operating Experience Review Methodology and Results	Revision 4

During the audit of the TLAA, the staff verified that the applicant has provided the basis that supports its disposition of 10 CFR 54.21(c)(1)(iii). The staff also audited the description of the SLRA Analytical Evaluation of Flaws provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.3.6, Weld Overlay Class 1 Fatigue Analysis

Summary of Information in the Application. SLRA Section 4.3.6, "Weld Overlay Fatigue Analysis," discusses weld overlay fatigue analyses and postulated flaw growth analyses. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(iii). To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA. The staff will address issues identified but not resolved in this audit report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal. Furthermore, the staff conducted additional OpE searches on the applicant's CAP database.

The table below lists documents that were reviewed by the staff and were found relevant to the TLAA. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
AR 01783903	Weld Overlay in Alloy 600 Letdown Nozzle	05/02/2010
OSC-2077-03-SLR0400	Identification of ISI Fracture Mechanics Flaw Evaluations for Oconee Subsequent License Renewal	Revision 1 10/15/2020
Framatome Document [[XX]]	Review of FM Calculations of RCS Indications in Oconee Units	Revision 3 08/12/2020
SLR-ONS-TLAA-0302	Acceptability of 72 EFPY for Use in 80-year Time-Limited Aging Analysis Evaluations for Oconee Subsequent License Renewal	Revision 0
SLR-ONS-OPEX-0100	Subsequent License Renewal Operating Experience Review Methodology and Results	Revision 4
SLR-ONS-TLAA-0300	Time-Limited Aging Analyses of Mechanical System Thermal Fatigue for Subsequent License Renewal	Revision 1
AD-EG-ALL-1632	Integrated Fatigue Management	Revision 2

During the audit of the TLAA, the staff verified that the applicant has provided the basis that supports its disposition of 10 CFR 54.21(c)(1)(iii). The staff also audited the description of the SLRA Weld Overlay Fatigue Analysis provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.4, Environmental Qualification of Electric Equipment

Summary of Information in the Application. SLRA Section 4.4, "Environmental Qualifications (EQ) of Electrical Equipment," discusses the thermal, radiation, and cyclical aging analyses for the plant electrical and I&C equipment. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(iii). To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal. For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.
The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
WO Number 01985140	1RX PN WA10, Replace Damaged Terminal Blacks in 1WA10	02/04/2021
AR01812645	Phenolic barrier cracked/broken	06/22/2011
AR01909022	Information in the Cable Entrance Sealing Sections of EQMM-1	03/31/2015
AR02095407	2017 NRC EQ Program Inspection Item on EQ NAMCO Limit Switch	09/21/2017
AR01839062	3LWD-1 Exceeded EQ Replacement Interval	07/02/2013
AR01905579	Elevated Radiation Levels Along North Wall	08/26/2020
AR02210548-05/AD-PI-ALL-0300	Self-Assessment Report	Revision 4
AR-2210548	2018 ONS EQ Program Readiness Assessment (EQ DBA Inspection)	01/13/2020
EQMM-1393.01	Environmental Qualification Maintenance Manual Introduction	Revision 40
AD-EG-ALL-1117	Design Analyses and Calculations	Revision 7
NEI 14-12	Aging Management Program Effectiveness	Revision 0
OSS-0274.00-00-0008	Time-Limited Aging Analysis of Electrical Components for License Renewal	Revision 1
O-EQCM	Environmental Qualification Criteria Manual (EQCM)	Revision 4
EQMM-1393.01-N03-01	Environmental Qualification Maintenance Manual Equipment Type: Limit Switch Manufacturer: NAMCO Model/Series: EA-180, Revision H or Later	Revision 13
DPC-1381.05-00-0008	NAMCO Limit Switches – Qualified Life – All Models	Revision 3
DPM-1393.01-0021.001	NGO Test Summary for NAMCO Limit Switch Model EA180, TR-155	Revision 3
EQMM-1393.01-P02-05	Environmental Qualification Maintenance Manual – Equipment Type: Pressure Transmitter – Manufacturer: Rosemount – Model/Series: 3154N Series	Revision 5
OSC-7622	Penetration Room Rosemount Transmitter Qualified Life Analysis	Revision 3
DPM-1393.01-0034.001	Environmental Qualification Test Report Summary for Rosemount 3150N-Series Pressure Transmitters	Revision 2
EQMM-1393.01-A02-00	Environmental Qualification Maintenance Manual Equipment Type: Actuator – Manufacturer: Limitorque – Model/Series: SMB/SBD/SB Inside & Outside Containment	Revision 18

Document	Title	Revision / Date
OSC-7167	Qualified Life Analysis for Limitorque Motor Operated Valves	Revision 6
OM-245.0979.001	Limitorque Valve Actuator Qualification for Nuclear Power Station Service Report B0058	Revision 6
EQMM-1393.01-N07-00	Environmental Qualification Maintenance Manual Equipment Type: Pressure Switch – Manufacturer: Automatic Switch Company (ASCO) Model/Series: SB11AR/TG10A32R, SB11AR/TG10A42R, SA21AR/TD20A32R, SA31AR/TD30A32R, SA21AR/TD20A42R & SA31AR/TD30A42R	Revision 6
OSC-7403	ASCO Pressure Switch Qualified Life Analysis	Revision 0
OM-267.A—0050.001	NIB-ASCO Pressure Switch Qualification Test Reports	Revision 3
N/A	2021 NRC SLR Audit	08/11/2021
SLR-ONS-IPAR-E001	Oconee Subsequent License Renewal Electrical and I&C Component Integrated Plant Assessment	Revision 1
Duke Nuclear Condition Report (NCR) 02397996	EPRI Document NP-1558 R1 May Potentially Impact EQ	09/16/2021

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(iii). The staff notes that the applicant generated Nuclear Condition Report 02397996 during the audit to evaluate whether the recent revision to the EPRI Report NP-1558 has any adverse effects on the qualification of electric equipment at ONS (specifically related to the activation energy used to determine the qualification of components).

The staff also audited the description of the SLRA Appendix A3.3, “Environmental Qualification of Electric Equipment,” provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR Report.

SLRA TLAA Section 4.5, Concrete Containment Unbonded Tendon Prestress Analysis

Summary of Information in the Application. SLRA Section 4.5, “Concrete Containment Unbonded Tendon Prestress Analysis,” discusses the analysis for the losses in prestress force in the containment unbonded tendons. Each containment is prestressed by 176 vertical tendons, 632 hoop tendons, and 162 dome tendons. The prestressing forces are measured and plotted, and trend lines are developed, to ensure the average tendon group prestressing values remain above the respective minimum required values until the next scheduled surveillance. The predicted lower limit force values and regression analyses are used to evaluate the acceptability of the containment structure to over the life of the plant. The prestress losses, and the associated aging effects, will be managed by the Concrete Containment Unbonded Tendon Prestress AMP and the ASME Section XI, Subsection IWL AMP. Therefore, the applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(iii).

To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-TLAA-0303	Concrete Containment Unbonded Tendon Prestress Time-Limited Aging Analysis Evaluation for Oconee Subsequent License Renewal	Revision 1
MP-0-A-1400-022	Tendon – Reactor Building – Surveillance	Revision 25
OSC-10410	License Renewal Documentation Calculation – Containment Post-Tensioning System (Commitment 4.9) – Time Limited Aging Analysis (TLAA)	Revision 0
	Unit 2, Year 45 Tendon Surveillance Summary Report	03/09/2020
3EOC21	Oconee Nuclear Station, Unit 3, IWL Year 30 Tendon Surveillance Summary and Evaluation Report	03/06/2012
3EOC24	Oconee Nuclear Station, Unit 3 EOC24, IWL Year 35 Tendon Surveillance Summary and Evaluation Report	

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(iii).

The staff also audited the description of the SLRA Concrete Containment Unbonded Tendon Prestress Analysis TLAA provided in the UFSAR supplement. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR supplement was an adequate description of the SLRA Concrete Containment Unbonded Tendon Prestress Analysis TLAA. The staff will consider issuing an RAI in order to obtain the information necessary to verify the sufficiency of the UFSAR supplement program description.

SLRA TLAA Section 4.6.1, Containment Liner Plate

Summary of Information in the Application. SLRA Section 4.6.1, "Containment Liner Plate," discusses the analysis for fatigue of the containment liner plate. The applicant dispositioned the TLAA for the containment liner plate, in accordance with 10 CFR 54.21(c)(1)(iii).

To verify that the applicant provided a basis to support its disposition of the TLAAs, the staff audited the above TLAAs. The staff will address issues identified during the audit in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-TLAA-0300	Time-Limited Aging Analyses of Mechanical System Thermal Fatigue for Subsequent License Renewal	Revision 1
N/A	Whitepaper on ONS Reactor Building Liner Plate and Penetration Design Criteria (authored by David W. Peltola)	09/28/2021
Drawing O-62C	Reactor Building Units 1, 2 & 3 Liner Plate, Penetration & Bulkhead Details	Revision 42
UFSAR 3.8.1.5.3	Liner Plate	Revision 28

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(iii). However, the staff found that sufficient information was not available to complete its review of the applicant's basis for its TLAA disposition. In order to obtain the necessary information, the staff will consider issuing RAIs and/or use a voluntary SLRA supplement offered by the applicant.

During the audit, the staff observed that during the audit breakout session on September 29, 2021, the applicant indicated that it did not have an analysis (calculation) of record in the CLB in support of its TLAA disposition for the containment liner plate. The applicant indicated during the breakout session on September 30, 2021, that it planned to possibly perform a fatigue waiver analysis for the containment liner plate and potentially other containment pressure-retaining boundary components with no CLB fatigue analysis, using the guidance in SRP-SLR Section 3.5.2.2.2.1.5, as modified by Appendix A of Interim Staff Guidance SLR-ISG-2021-03-STRUCTURES (ADAMS Accession No. ML20181A381), and provide it in a voluntary SLRA supplement.

The staff also audited the description of the SLRA TLAA "Containment Liner Plate" provided in the UFSAR supplement. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR supplement was an adequate description of the SLRA TLAA "Containment Liner Plate." The staff will consider issuing an RAI and/or use a voluntary SLRA supplement offered by the applicant in order to obtain the information necessary to verify the sufficiency of the UFSAR supplement program description.

SLRA TLAA Section 4.6.3, Containment Penetrations Fatigue Analysis

Summary of Information in the Application. SLRA Section 4.6.3, "Containment Penetrations Fatigue Analysis," discusses the analyses for fatigue of the main steam and main feedwater containment piping penetrations. The applicant dispositioned the TLAAs for the containment main steam and main feedwater piping penetrations in accordance with 10 CFR 54.21(c)(1)(iii).

To verify that the applicant provided a basis to support its disposition of the TLAAs, the staff audited the above TLAAs. The staff will address issues identified during the audit in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-TLAA-0300	Time-Limited Aging Analyses of Mechanical System Thermal Fatigue for Subsequent License Renewal	Revision 1
OSC-11500	Design Loads for Penetrations 25, 26, 27, and 28 (Main Steam and Feedwater)	Revision 4
Drawing O-62C	Reactor Building Units 1, 2 & 3 Liner Plate, Penetration & Bulkhead Details	Revision 42
UFSAR 3.8.1.5.4	Penetrations	Revision 28

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(iii). However, the staff found that sufficient information was not available to complete its review of the applicant's basis for its TLAA disposition. In order to obtain the necessary information, the staff will consider issuing RAIs and/or use a voluntary SLRA supplement offered by the applicant.

During the audit, the staff made the following observations:

- Based on the audit review of SLRA Section 4.6.3 TLAA and its supporting documents provided on the ePortal, the staff noted that fatigue TLAAs existed only for the main steam and main feedwater penetrations.

- The staff further noted that the non-applicability claim for SLRA Table 3.5.1, AMR item 3.5.1-027 to manage cracking due to cyclic loading for steel, stainless steel and DMI weld containment pressure-retaining boundary components was not adequately justified.

- The applicant indicated that penetrations that do not have a CLB fatigue analysis will be managed by the IWE AMP and Appendix J AMP. The AMR line items will need to be added, along with changes to the AMR item 3.5.1-027 and Section 3.5.2.2.2.1.5, to provide additional information, which could include possible fatigue waiver analyses, for how ONS will address cracking due to cyclical loading where no CLB fatigue analysis exists. The applicant offered to provide this information in a voluntary SLRA supplement.

- Based on the audit review of drawing O-62C, the staff noted that some of the containment penetrations do contain stainless steel pipes with stainless attachment plates that connect back to carbon steel components with DM welds. The applicant indicated that these items will be managed by voluntarily supplementing the SLRA to

include the applicable line items to age manage these components using the ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J AMPs.

- The staff noted an apparent discrepancy in the reported Current Count and Projected Cycles for 80 years between Table 4.6.3-1 and Table 4.3.1-1 for the total reactor trips transient (135 vs 122 and 194 vs 204 for current and projected cycles, respectively) obtained by the addition of transients 8A, 8B, 8C, and 8D in Table 4.3.1-1.

- Based on audit review of Appendix B of SLR-ONS-TLAA-0300, the staff noted that 5 operating basis earthquake (OBE) events of 9 cycles each and 3 OBE events of 9 cycles each were included in the fatigue usage evaluations for the main steam penetration and main feedwater penetration, respectively.

The staff also audited the description of the SLRA TLAA "Containment Penetrations Fatigue Analysis" provided in the UFSAR supplement. The staff found that sufficient information was not available to determine whether the description provided in the UFSAR supplement was an adequate description of the SLRA TLAA "Containment Penetrations Fatigue Analysis." The staff will consider issuing an RAI and/or use a voluntary SLRA supplement in order to obtain the information necessary to verify the sufficiency of the UFSAR supplement program description.

SLRA TLAA Section 4.7.1.1, Reduction in Fracture Toughness due to Neutron Embrittlement

Summary of Information in the Application. SLRA Section 4.7.1, "Reactor Vessel Internals, Subsection 4.7.1.1, "Reduction of Fracture Toughness due to Neutron Embrittlement," discusses the analysis on reduction of ductile fracture toughness for the reactor vessel internal (RVI) components that are included in the reactor designs of ONS Units 1, 2, and 3. The applicant dispositioned the TLAA accordance with 10 CFR 54.21(c)(1)(iii).

To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA. The staff will address issues identified but not resolved in this audit report in the SER, and where appropriate through use of the NRC's RAI or RCI processes.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision
ONS SLRA Basis Document No. SLR-ONS-TLAA-0301	Time-Limited Analysis Evaluations and Dispositions for Oconee Subsequent License Renewal	Revision 1
Framatome Proprietary Report No. ANP-3899	Framatome Reactor Vessel Internals TLAA Input to the ONS SLRA	Revision 0 (ADAMS Accession Nos. ML21158A201;

Document	Title	Revision
		ML21158A200 for the publicly available, redacted version of the report)
Babcock and Wilcox (B&W) Report No. BAW-10008 [1]	Reactor Internals Stress and Deflection due to Loss-of-Coolant Accident and Maximum Hypothetical Earthquake	Part 1, Revision 1 [1] (ADAMS Accession No. ML20315A214)
Babcock and Wilcox Owners Group Report No. BAW-1621	Effects of Asymmetric LOCA Loadings, Phase II Analysis	07/1980 (ADAMS Accession No. ML19320B058)
Babcock and Wilcox Owners Group Report No. BAW-1621, Supplement 1	Effects of Asymmetric LOCA Loadings, Phase II Analysis, Supplement 1, Responses to NRC Questions	06/1981 (ADAMS Accession No. ML20009B628)
Framatome Proprietary [[XX]]	Oconee-Specific RV Internals Aging Management Strategy Development and Inspection Categorization for SLR	08/12/2020

Table Note:

1. The staff assumes the report is proprietary, as ADAMS indicates that the report is not available to members of the general public. The staff did not locate an associated redacted version of the report in NRC's ADAMS database for docketed records.

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(iii).

The staff made the following observations:

- The staff observed that it would need clarification on whether the RVI reduction of ductility TLAA for CLB that will be applied during the subsequent period of extended operation is based on the updated analysis in Framatome Proprietary Report No. ANP-3899, Revision 0 or on the previous reduction of ductility analysis for the RVI components, as evaluated in B&W Report No. BAW-10008, Revision 1.

  During the audit breakout session, the applicant clarified that the analysis in BAW-10008, Revision 1 will remain as the RVI reduction of ductility analysis for the CLB that that will be applied during the subsequent period of extended operation and that the analysis in ANP Proprietary Report No. 3899, Revision 0 is only used to demonstrate that the analysis in BAW-10008, Revision 1 will remain valid for the subsequent period of extended operation. In relation to this comment by the applicant, the staff responded that the applicant is dispositioning the referenced reduction of ductility using the acceptance criteria in 10 CFR 54.21(c)(1)(iii) through use of the PWR Vessel Internals Program (SLRA AMP B2.1.7) to manage the impacts of the effects of aging on the RVI components during the period of extended operation. The staff commented that the applicant was not using 10 CFR 54.21(c)(1)(i) to disposition the RVI reduction of ductility TLAA declaring in the SLRA that the analysis remains valid for the subsequent period of extended operation.

  The staff also informed the applicant that SLRA Section A4.7.1.1 does not include any statements in the UFSAR supplement summary description for the RVI reduction of ductility analysis that indicates the updated analysis in Framatome Proprietary Report No. ANP-3899, Revision 0 is being used to confirm and demonstrate the applicability of the reduction of ductility analysis in BAW-10008, Revision 1 for the

subsequent period of extended operation. The staff further discusses this matter in the staff's observation for the UFSAR supplement for the RVI reduction of ductility analysis that follows later in this audit report section.

- The staff observed that it would need further clarifications on whether the component-specific analyses in ANP-3899, Revision 0 are based on the assumed loading combinations defined for Case IV assessments in BAW-10008 Part 1, Revision 1 and the revised faulted conditions for the components in BAW-1621, as approved by the staff. The staff discussed this matter with the applicant during the audit breakout session with the applicant. The applicant confirmed that the applicable loading combinations are defined in BAW-10008, Revision 1, and for seismic loading conditions, using the updated and revised faulted loading condition defined in BAW-1621. The staff considers this to be part of the updated CLB for the RVI components and this matter is closed for the audit.

- The staff observed that it would need further clarifications on how the RVI components were re-evaluated in ANP-3899, Revision 0 for appropriate P_m, P_L, and P_b stress intensity values and how appropriate LOCA and faulted condition loads were incorporated into those values (as applicable and appropriate for the updated component-specific assessments. The staff discussed this matter with the applicant during the audit breakout session. The applicant stated that the appropriate P_m, P_L, and P_b stress intensity values were determined using the applicable loading conditions and the applicable ASME Code stress intensity equations in ASME Code Section III. The staff considers this to be part of the updated CLB for the RVI components and this matter is closed for the audit.

- The staff observed that it would need further clarifications on the analytical basis for changing the stress allowable basis for Case IV loading assessments. During the audit breakout session, the applicant clarified the stress allowables used in the analysis as shown in ANP-3899, Revision 0**.** The staff had no further questions on this matter, and the matter is closed for the audit.

- For the seven RVI components needed revised Case IV analyses, the staff observed that it would need further clarifications from the applicant on how the re-evaluated TLAA basis for each of the components relates to the final inspection category for the components, as evaluated and finalized in the gap analysis for SLRA AMP B2.1.7, "PWR Vessel internals," and in Framatome Proprietary Report [[XX]], "Oconee-Specific RV Internals Aging Management Strategy Development and Inspection Categorization for SLR." During the audit breakout session, the applicant stated that, given that ANP-3899P, Revision 0, is being used to demonstrate the validity of BAW-10008, Revision 1, for the subsequent period of extended operation, the analysis does not result in any changes to the gap analysis of SLRA AMP B2.1.7, such that the AMP would need to adjust any of the augmented inspection bases in MRP-277, Revision 1-A to manage loss of fracture toughness in any of the RVI components as a result of a reduced ductility capability. Given that the applicant is dispositioning this TLAA using the criteria in 10 CFR 54.21(c)(1)(iii) and is using the PWR Vessel Internals Program to manage potential loss of fracture toughness due to reduced component-specific ductility in the RVI components during the subsequent period of extended operation, the staff will assess the validity of this basis as part of the staff's evaluation of the RVI gap analysis results for the applicable PWR Vessel Internals AMP, as evaluated in Section 3.0.3.2.# of the SER for Oconee SLRA. This matter is closed for the audit.

The staff also audited the description of the SLRA TLAA A4.7.1.1, "Reduction of Fracture Toughness Due to Neutron Embrittlement," provided in the UFSAR supplement. The staff did not find that sufficient information was available to determine whether the description provided in the UFSAR supplement was an adequate description of the applicable TLAA. Consistent with the matter established in the previous bulleted observation, the staff informed the applicant that the UFSAR supplement summary description for the TLAA does not establish that Framatome Proprietary Report No. ANP-3899P, Revision 0 was being used to confirm and verify the validity of the analysis in Report BAW-10008, Revision 1 for the subsequent period of extended operation. During the audit breakout session of October 6, 2021, the applicant stated that it would be amending SLRA Section A4.7.1.1 to include the applicable discussion and statement. The staff will consider issuing an RAI or RCI on this matter.

SLRA AMR Section 3.1.2.2.3, Subsection [3.1.1-015], Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

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

- SLRA Section 3.1.2.2.3, Subsection [3.1.1-015] (SLRA page 3-26)
- SLRA Table 3.1.1, AMR item 3.1.1-015 (SLRA page 3-45)
- AMR line item in SLRA Table 3.1.2-2 that cross-references to SLRA Table 3.1.1, item 3.1.1-015 (SLRA page 3-110)

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal. The table below lists documents that were reviewed by the staff and were found relevant to SLRA Section 3.1.2.2.3, Subsection [3.1.1-015] (SLRA page 3-26), and its associated AMR items. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
NRC NUREG-2192	Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants (SRP-SLR Report) (ADAMS Accession No. ML16274A402)	
NRC NUREG-2191	Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report (ADAMS Accession No. ML16274A389)	Volume 1

During the audit, the staff made the following observation:

- The staff noted that in SLRA Section 3.1.2.2.3, Subsection [3.1.1-015], the applicant references the applicable TLAA for the reactor vessel internals given in SLRA Section 4.2, "Reactor Vessel Neutron Embrittlement Analysis." However, the staff also observed that, in SRP-SLR Section 3.1.2.2.3, Subsection 3, the applicable TLAA is referenced as a loss of fracture toughness and reduction of ductility analysis for the RVI components. The staff observed that, although the applicant appropriately includes and evaluates the applicable TLAA for the RVI components in SLRA Section 4.7.1.1, the associated AMR section was referencing the wrong TLAA for the components. The staff pointed out this apparent inconsistency to the applicant during the staff's audit breakout session meeting with the applicant of October 1, 2021. During the audit breakout session, the applicant stated it

would review SLRA Section 3.1.2.2.3, Subsection [3.1.1-015] to determine whether the specified SLRA TLAA section referenced in Subsection [3.1.1-015] was correct.

Following the audit session of October 1, 2021, the applicant informed the staff that the staff perception on this matter was correct and that the applicant would be amending SLRA Section 3.1.2.2.3, Subsection [3.1.1-015] in SLRA Supplement 1 or Supplement 2 to reference SLRA Section 4.7 for the applicable RVI TLAAs, including the TLAA on RVI reduction of ductility analysis. The staff may consider this topic for an RAI or RCI.

SLRA TLAA Section 4.7.1.2, Reactor Vessel Internals Flow Induced Vibration Endurance Limits

Summary of Information in the Application. SLRA Section 4.7.1.2, "Reactor Vessel Internals Flow Induced Vibrations Endurance Limits," discusses the analysis for the high cycle fatigue associated with flow induced vibrations. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii).

To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-TLAA-0301	TLAA and Dispositions for Oconee SLRA	Revision 1
ANP-3899P-000	Framatome Reactor Vessel Internals TLAA Input to the ONS SLRA	Revision 0

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(ii).

During the audit, the staff made the following observations:

- The licensee extrapolated the ASME fatigue curves in the 2013 edition of the ASME Code, Section III to account for 80-years of operation.

- The licensee accounted for the effects of reactor water environment on fatigue and thermal adjustment of the fatigue curve in its evaluation.

The staff also audited the description of the SLRA TLAA Reactor Vessel Internals Flow Induced Vibrations Endurance Limits provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.7.1.3, Reactor Vessel Internals Irradiation Embrittlement

Summary of Information in the Application. SLRA Section 4.7.1.3, "Reactor Vessel Internals Irradiation Embrittlement," discusses the analysis to demonstrate that the reactor vessel internals (RVI) neutron fluence values assumed in TLAA 4.7.1.1 remain valid to the end of the subsequent period of extended operation. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii).

To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
ANP-3898P/NP	Framatome Reactor Vessel and RCP TLAA and Aging Management Review Input to the ONS SLRA	Revision 0
ANP-3899P/NP	Framatome Reactor Vessel Internals TLAA Input to the ONS SLRA	Revision 0
BAW-2241P/NP	Fluence and Uncertainty Methodologies (Including Revision to Appendix G)	11/20/2007 & 04/30/2006
ANP-10348P/NP	Fluence Methodologies for SLR	Revision 0
Regulatory Guide 1.190	Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence	Revision 0
Regulatory Issue Summary 2014-11	Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components	10/2014
NUREG-1743	Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station Units 1, 2, and 3	03/2000
N/A	Oconee Nuclear Station, Units 1, 2, and 3 – Issuance of Amendment Nos. 420, 422, and 421, "Measurement Uncertainty Recapture Power Uprate (EPID L-2020-LLS-0000)	01/2021
Regulatory Guide 1.99	Radiation Embrittlement of Reactor Vessel Materials	Revision 2
N/A	Breakout Questions – TRPs 142.1 149.13 – Fluence (ParksMessina) - Response	09/2021
N/A	Breakout Questions – TRPs 142.1 149.13 – Fluence (ParksMessina) – Follow-Up Response	09/2021
MRP-189	"Materials Reliability Program: Screening, Categorization, and Ranking of Babcock & Wilcox–Designed Pressurized Water Reactor Internals Component Items and Welds	Revision 3
BAW-10008	Reactor Internals Stress and Deflection Due to Loss-of-Coolant Accident and Maximum Hypothetical Earthquake	Part 1, Revision 1

During the audit, the staff made the following observations:

- The staff reviewed ANP-3899P/NP, BAW-2241, Revision 2, and ANP-10348P/NP, Revision 0 to verify that the method employing both BAW-2241P/NP, Revision 2 and ANP-10348P/NP to estimate neutron fluence meets or exceeds the guidance provided in RG 1.190 in the reactor pressure vessel (RPV) beltline. These documents were also used to evaluate the acceptability of the method described in ANP-3899P/NP for best-estimate fluence projections in the reactor vessel internals (RVI) to 80 years of life (72 EFPY).

- The staff reviewed the MRP-189, Revision 3, the responses to the TRP 149.13 breakout questions, and the follow-up responses to better understand the basis of the neutron fluence values used in the TLAA 4.7.1.1 evaluation.

- The staff reviewed ANP-3899P/NP to verify that fluence projections to 72 EFPY were provided for the RVI components that were deemed susceptible to IE based on BAW-10008, Part 1, Revision 1, and the evaluation provided in TLAA 4.7.1.1. These RVI components were the baffle plates, plenum cover, plenum cylinder reinforcing plate, and the CSS top flange.

- The staff reviewed ANP-3899P/NP to verify that there is sufficient margin of the best-estimate fluence projections in the RVI to the fluence values assumed in the TLAA 4.7.1.1 evaluation for the four RVI components that were deemed susceptible to irradiation embrittlement.

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(ii).

The staff also audited the description of the SLRA TLAA “Reactor Vessel Internals Irradiation Embrittlement” provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.7.2, Reactor Coolant Underclad Cracking

Summary of Information in the Application. SLRA Section 4.7.2, “Reactor Vessel Underclad Cracking,” discusses the analysis associated with the intergranular separations in the heat affected zone of reactor vessel low-alloy steel under austenitic stainless steel cladding (i.e., underclad cracking). The applicant dispositioned the TLAAs in accordance with 10 CFR 54.21(c)(1)(ii).

To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA.

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant’s methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-TLAA-0301	TLAA and Dispositions for Oconee SLRA	Revision 1
ANP-3898P-000	Framatome Reactor Vessel and RCP TLAA and Aging Management Review Input to the ONS SLRA	Revision 0

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(ii). However, the staff found that sufficient information was not available to complete its review of the applicant's basis for its TLAA disposition.

During the audit, the staff made the following observations:

- The methodology used to evaluate underclad cracking for 80 years is consistent with the one used for the 60-year analysis.
- A plant-specific analysis was performed to account for 72 effective full power years and measurement uncertainty recapture conditions.
- The analysis assessed five regions of the reactor vessel: flange top, nozzle belt, shell taper, shell, and transition forging.
- Axial and circumferential oriented flaws were considered in the evaluation, along with normal and upset condition transients and emergency and faulted condition transients that impact the reactor vessel.
- Both axial and circumferential flaws meet the acceptance criteria of in the ASME Code, Section XI for normal, upset, emergency and faulted loading conditions.

The staff also audited the description of the SLRA TLAA for reactor vessel underclad cracking provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.7.3, Reactor Coolant Pump Flywheel Fatigue Analysis

Summary of Information in the Application. SLRA Section 4.7.3, "Reactor Coolant Pump Flywheel Analysis," discusses the analysis for the number of reactor coolant pump motor start as a potential initiator for fatigue cracking in the reactor coolant pump motor flywheel. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii).

To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OpE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal. The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
OSC-2077-03-SLR-0501	SLR - Reactor Coolant Pump Flywheel - TLAA	Revision 1
OM-201.D-0038.002	RCP Shaft Seal Outline	
OP/1/A/1102/001	Controlling Procedure for Unit Startup	Revision 323

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(ii).

During the audit, the staff made the following observations:

- The licensee assessed plant data from January 1, 2000 to January 1, 2019 from the station's operator aid computer for Unit 1.

- The method used for assessing the plant data for RCP start/stop cycles reasonably ensured all events were accounted for (i.e., assessing data at 5-minute intervals).

The staff also audited the description of the SLRA TLAA Reactor Coolant Pump Flywheel Analysis provided in the UFSAR supplement. The staff verified this description is consistent with the description provided in the SRP-SLR.

SLRA TLAA Section 4.7.4, Leak Before Break

Summary of Information in the Application. SLRA Section 4.7.4, "Leak-Before-Break Analysis for Reactor Coolant System Piping," discusses the leak-before-break (LBB) analysis for the reactor coolant system piping. Oconee dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(i).

To verify that Oconee provided a basis to support its disposition of the TLAA, the staff audited the TLAA. The staff will address issues identified but not resolved in this report in the SER.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal. The staff conducted its review of the Oconee OpE database using keywords: "leak before break," "rupture," "crack," "leak rate," "leaks in RCS primary piping," "through wall leaks in RCS primary piping."

The table below lists the documents that were reviewed by the staff and were found to be relevant to TLAA Section 4.7.4, "Leak-Before-Break Analysis for Reactor Coolant System Piping." These documents were identified in the staff's search of Oconee's OpE database.

During the audit of the "operating experience" program element, the staff's independent database search did not identify any OpE that would indicate the LBB analysis may not be adequate to manage the aging effects. The staff will document its review of relevant OpE in the SER.

Documents	Title	Revision/Date
BAW-1847	The B&W Owners Group Leak-Before-Break Evaluation of Margins Against Full Break for RCS Primary Piping of B&W Designed NSSS	Revision 1 09/1985
NUREG/CR-6177	Assessment of Thermal Embrittlement of Cast Stainless Steels	05/1994
Framatome Engineering [[XX]] (PROPRIETARY)	Assessment of TLAA Issues in LBB Analysis of RCS Primary Piping	Revision 002 02/2018
NUREG-1723	Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3	
NUREG-0800, Section 3.6.3	Leak-Before-Break Evaluation Procedures	Revision 1 03/2007
NUREG/CR-4513	Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems	Revision 2 05/2016
NCR02227944	Effective Review Plan	02/28/2019
AR02206577	VT-2 3351-19 Leaks	05/05/2018
SLR-ONS-AMPR-XI.M1	Fatigue Monitoring Program	Revision 1

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(i). The staff found that sufficient information was available to complete its review of the applicant's basis for its TLAA disposition. If further information is needed to complete the staff's SE input, the staff will consider issuing RAIs.

The staff also audited the description of the SLRA LBB TLAA provided in the UFSAR supplement. The staff verified that this description is consistent with the information provided in the UFSAR supplement of the SLRA LBB TLAA. If further information is needed to complete the staff's SE input, the staff will consider issuing RAIs.

SLRA TLAA Section 4.7.5, Crane Load Cycle Limit

Summary of Information in the Application. SLRA Section 4.75, "Crane Load Cycle Limit," discusses the analyses of crane load cycles for the containment polar cranes, spent fuel pool cranes, spent fuel auxiliary crane, turbine building pump aisle cranes, turbine aisle crane, turbine aisle auxiliary crane and heater bay crane. The applicant dispositioned the TLAAs in accordance with 10 CFR 54.21(c)(1)(i).

To verify that the applicant provided a basis to support its disposition of the TLAA, the staff audited the TLAA.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal.

For the OpE review, the applicant made a presentation on the process used to identify and evaluate the pertinent OE. Afterwards, the staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

The table below lists documents that were reviewed by the staff and were found relevant to the program. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
OSC-2077-03-SLR-0502	SLR – Fatigue of Cranes - TLAA	Revision 01
CMAA Specification No. 70	ONS Crane Manufacturers Association of America, Inc. Specification No. 70	1975
NRC SE	SE NRR Control of Heavy Loads – Phase I Duke Power Company ONS Units 1, 2 and 3	04/20/1983
ONS UFSAR	Section 3.12 Cranes and Control of Heavy Loads Section 9.1.5 Overhead Heavy – Load Handling System 18.3.5 Crane Inspection Program	Revision 27

During the audit of the TLAA, the staff verified that the applicant has provided its basis that supports its disposition of 10 CFR 54.21(c)(1)(i).

The staff also audited the description of the SLRA Crane Load Cycle Limit TLAA provided in the UFSAR supplement. The staff verified this description is consistent with the guidance provided in the SRP-SLR Section 4.7.3.

AMR Items Not Associated with an AMP

SLRA AMR Further Evaluation (FE) 3.6.2.2.2, Reduced Insulation Resistance Due to Degradation of Cable Bus Arrangement Caused by Intrusion of Moisture, Dust, Industrial Pollution, Rain, Ice, Photolysis, Ohmic Heating, and Loss of Strength of Support Structures and Louvers of Cable Bus Arrangement Due to General Corrosion and Exposure to Air Outdoor

Summary of Information in the Application. During the audit, the staff reviewed plant documentation associated with the following five AMR items discussed in SLRA 3.6.2.2.2 further evaluation section:

- SLRA Table 3.6.1-027, “Cable bus: external surface of enclosure assemblies galvanized steel, aluminum; air-indoor controlled or uncontrolled”
- SLRA Table 3.6.1-029, “Cable bus: electrical insulation; insulators – exposed to air-indoor controlled or uncontrolled; air - outdoor”
- SLRA Table 3.6.1-030, “Cable bus: external surface of enclosure assemblies composed of steel exposed to air-indoor uncontrolled or air - outdoor”
- SLRA Table 3.6.1-031, “Cable bus external surface of enclosure assemblies composed of galvanized steel, aluminum exposed to air-outdoor”
- SLRA Table 3.6.1-032, “Cable bus – external surface of enclosure assemblies: composed of steel; air – indoor uncontrolled”

Audit Activities. During its audit, the staff interviewed the applicant’s staff and review documentation contained in the SLRA and provided by the applicant via ePortal. The table below lists documents that were reviewed by the staff and were found relevant to the further evaluation 3.6.2.2.2. The staff will document its review of this information in the SER.

The table below lists the documents that were reviewed by the staff and were found relevant to the review of these items. These documents were provided by the applicant.

Document	Title	Revision / Date
SLR-ONS-IPAR-E001	Oconee Subsequent License Renewal Electrical and I&C Component Integrated Plant Assessment	Revision 1
AR01981365	I/R CT3 “Y” phase main power line not attached to the bushing	12/07/2015
	Duke Response to ONS Electrical Scoping and OE Observation	09/13/2021
N/A	Breakout Question 5 – TRP 58 (cable bus) + ONS Response	N/A

During the audit, the staff made the following observations:

Section 3.6.2.2.2 of NUREG-2192 (GALL-SLR) states that reduced insulation resistance due to age degradation of cable bus caused by intrusion of moisture, dust, industrial pollution, rain, ice, photolysis (for ultraviolet sensitive material only), ohmic heating and loss of strength of support structures, covers or louvers of cable bus arrangements due to general corrosion or exposure to air-outdoors could occur in cable bus assemblies. A cable bus may omit the top cover or use a louvered top cover and enclosure. Both the cable bus and enclosure are not sealed against intrusion of dust, industrial pollution, moisture, rain, and ice and therefore may introduce debris into the internal cable bus assembly. In SLRA Section 3.6.2.2.2, the applicant states that aging management of the cables is implemented under the Electrical Insulation of Electrical Cables and Connections Not Subject to 10 CFR 50.49, “Environmental qualification of electric equipment important to safety for nuclear power plants,” Environmental Qualification Requirement AMP (B2.1.36), whereas aging management of the cable tray and associated hardware is accomplished using Structures Monitoring program (B2.1.33). GALL-SLR Report AMP XI.E1 calls for visual inspection of accessible insulated cables and connections subject to an adverse localized environment (ALEs) (high heat, radiation, or moisture) which may not be applicable to cable bus due to inaccessibility or applicability of aging mechanisms and effects. During the in-office breakout meeting with the applicant, the staff requested the applicant to clarify how AMP B2.1.36 is applicable to the cable bus (in terms of accessibility or applicability of aging mechanism and effects) or address each aging mechanism and effect identified in GALL-SLR and explain why these aging effects are not significant and no AMP is required.

In response to the staff’s request, the applicant responded in its ePortal that the AMP in ONS SLRA B2.1.36 is applicable to the protected service water (PSW) Keowee 13.8 kV power cables in enclosed cable tray, as the program inspected for ALEs within plant structure including Keowee. If an ALE found near the PWS Keowee enclosed cable tray, it would be further investigated as part of the corrective action program, which could include opening up a tray enclosure. Despite their being termed “cable bus” in UFSAR 8.3.1.4, the PSW Keowee power cables in enclosed ladder cable tray (whose covers were added per regulatory separation concerns) are not true cable bus. This contrast is stated in SLRA 3.6.2.2.2 and Table 3.6.1. The actual cable bus is a manufacturer’s designed engineered system that consists of single-conductor cables installed in rows within a metallic enclosure with conductor-spacing insulated blocks that are integrated to and span the width of the enclosure. By contrast, the PSW Keowee cables are an enclosed cable tray design with the three individual phase conductors’ field-installed and braced together by metallic cleats in a triangular configuration, not in pre-

manufactured rows. The NUREG-2192, Section 3.6.2.2.2 identified cable bus mechanisms (e.g., intrusion of moisture, dust, industrial pollution, rain, ice, photolysis (for ultraviolet sensitive material only), ohmic heating) are not applicable to the normally unloaded PSW Keowee power cables in enclosed tray which are constrained to the hydro station's indoor environment. The staff finds the applicant response acceptable because cable bus design at ONS is different from the manufacturer's design in that the PSW Keowee cables are an enclosed cable tray design with the three individual phase conductors' field-installed and braced together by metallic cleats in a triangular configuration, not in pre-manufacturer rows. The NUREG-2192, Section 3.6.2.2.2 aging mechanisms are not applicable to ONS because PSW Keowee power cable buses are unloaded in the enclosed tray design in an indoor environment. The applicant will manage the cable bus by AMP B2.1.36. The issue with cable bus was resolved.

This input will be used in SER Section 3.6.2.2.2.

SLRA AMR FE 3.5.2.2.2.6, Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation

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

- SLRA Table 3.1.2-1, "Reactor Vessel, Reactor Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation," which cites steel support skirt exposed to indoor air (external) environment.

- SLRA Table 3.5.2-2, "Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation," which cites anchorage/embedments/attachments and bolting (structural) exposed to indoor air (external) environment.

- SLRA Table 3.5.2-22, "Containments, Structures, and Component Supports - Component Supports - Aging Management Evaluation," which cites anchorage and bolting (structural) exposed to indoor air (external) environment.

- SLRA Table, "Table 3.5.2-2 Containments, Structures, and Component Supports - Reactor Building - Aging Management Evaluation," which cites concrete elements exposed to indoor air (external) with plant-specific notes that state in part:

    - The concrete for the primary shield wall and reactor vessel support skirt embedment is not subject to reduction of strength and modulus due to elevated temperatures." See Further Evaluation in SLRA Section 3.5.2.2.2.2.

    - The concrete for the primary shield wall and reactor vessel support skirt embedment is not subject to reduction of strength and mechanical properties due to irradiation. See Further Evaluation in SLRA Section 3.5.2.2.2.6.

Audit Activities. During its audit, the staff interviewed the applicant's staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal. The table below lists documents that were reviewed by the staff and were found relevant to SLRA AMR 3.5.2.2.2.6. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
SLR-ONS-FERR-0100	Oconee Nuclear Station Units 1, 2, and 3 (ONS), Subsequent License Renewal Further Evaluation Required Report	Revision 1
TRP 76 – Set 1 Question 2 Response	Configuration, Reactor Cavity Concrete and RV Pedestal)	Revision 0
DWG O-0068-A	ONS Units 1-3 Reactor Building Unit 1 Reactor Foundation Concrete	Revision 19
DWG O-0068-B	ONS Units 1 & 2 Reactor Foundation Reinforcing	Revision 5
DWG O-0069-A	ONS Unit 1 Reactor Building Primary & Secondary Shield Walls Plan at El 777'+6" & 802'+0" Concrete	Revision 14
DWG O-0069-D	ONS Reactor Building Unit 1 Primary & Secondary Shield Walls Concrete Sections & Elevations	Revision 20
DWG O-0069-L	ONS Units 1, 2 & 3 Reactor Building Primary Shield Wall Reinforcing	Revision 6
OS-160	Specification for Concrete for the Reactor Building, Duke Power Company Oconee 1-3	04/05/1973
TRP 76 – Set 1 Question 4 Response	RV Support Embedment, RV Concrete Anchorage, Inspections	Revision 0
AR 01868962	Sequence of Tasks Relating to Rx Annulus Area Inspections – Needs Refined	04/17/2019
NDE-NE-ALL-7302	VT-3 Visual Examination of Component Supports	Revision 1
TRP 76 – Set 1 Question 5 Response	Thermal Loads, Insulation	Revision 0
[[XX]] (Proprietary)	Framatome Calculation: Oconee Reactor Vessel Cavity Concrete Temperature	Revision 0
ANP-3898P	Framatome Reactor Vessel and RCP TLAA and Aging Management Review Input to the ONS SLRA	Revision 0
TRP 76 – Set 1 Question 6 Response	SLRA Section FER 3.5.2.2.2.6 Cavity/Pedestal Concrete Evaluation, Question 6 - Thermal Loads, Insulation	Revision 0
AR 0121889	Exposure on RWP 3026 Annulus Inspection has exceeded estimate by > 25%	04/16/2012
AR 01786270	Special tools could not be located to removed mirror insulation	10/11/2009
AR 1771812	ONS response to IN 2007-21, NRC IN 07-21: Damaged pipe due to metal insulation	06/21/2007
AR 2363166	ONS response to IN 2007-21 Supp 1: Pipe wear due to interaction of flow-induced vibration and reflective metal insulation	03/24/2021
TRP 76 – Set 1 Questions 7 and 8 Responses	Thermal Loads and Analysis of Reactor Cavity and Thermal Calculations and Analysis of Reactor Cavity	Revision 0
TRP 76 – Set 1 Question 3 and Set 2, Questions 3 and 4 Responses	FER Item 3.5.2.2.2.6 Meeting Presentation: RV Support Components/Embedment, RV Skirt Load Transfer, Loading Conditions; Calculations, RV Steel Support Assembly Configuration, Loads and Loading Conditions, Acceptance Limits and Calculations, RV Steel Support Assembly Design Stresses	Revision 0
TRP 76 – Set 2, Question 5 Response	Uncertainty in fluence, gamma dose; DORT methodology used; reported dpa location; NDT margins	Revision 0
[[XX]] (Proprietary)	Oconee SLR Fluence and Gamma Heating Analyses Summary	Revision 2

TRP 76 – Set 2 Question 6 Response	Calculations, Initial NDT of RV Steel Support Materials	Revision 0
Set 2 Q6 [[XX]] Section 3.8	Oconee Reactor Vessel Skirt Lowest Service Temperature, 3.8, Material Properties." (Proprietary)	Revision 0
Set 2 Q6 [[XX]] Section 2.3	Oconee Reactor Vessel Skirt Lowest Service Temperature, 2.3, "Modeling Simplifications," (Proprietary)	Revision 0
Set 2 Q6 [[XX]] Table 5-7 (Proprietary)	Oconee Reactor Vessel Skirt Lowest Service Temperature, Table 5-7, "Reduced Values of Thermal Conductivity for Carbon Steel"	Revision 0
Set 2 Q6 [[XX]] Section 5.2	Oconee Reactor Vessel Skirt Lowest Service Temperature, 5.2, "Heat Transfer Boundary Conditions," (Proprietary)	Revision 0
Set 2 Q6 [[XX]] Section 5.4	Oconee Reactor Vessel Skirt Lowest Service Temperature, 5.4, "Solving," (Proprietary)	Revision 0
DUKE-002-002	Assessment of the Oconee Nuclear Station ONS3 ISI Assessment Report	Revision 0
OISI-0169.10-0050 BASIS DOC	Oconee Nuclear Station Units 1, 2, and 3 ASME Section XI Program Basis Document for the 5th Inservice Interval	07/24/2014
TRP 76 – Set 2 Question 7 Response	Inspections, Required ASME Code Section XI for RV steel supports	Revision 0
[[XX]] (Proprietary)	Irradiation Embrittlement of ONS RPV Supports for SLR	Revision 1
TRP 76 – Set 2 Question 8 Response	Inspections, Embrittlement Evaluations Consistent with NUREG-1509	Revision 0
NDE-91	Nondestructive Examination Program Manual	Revision 7
TRP 76 - Set 2 Question 9 Response	Inspections, Corrosion of Anchor Bolts stated in ISI Examination Report	Revision 1
ANP-3898P	Framatome Reactor Vessel TLAA and Aging Management Review, ONS Framatome Topical Report	Revision 0
RPV Support Skirt Inspection Presentation	ONS RPV Support Skirt Inspection Meeting	08/20/2021
TRP 76 – Set 2 Question 10 Response	Inspections, Corrosion of Anchor Bolts stated in ISI Examination Report	Revision 1
AR 01809387	3EOC25 Startup Reactor Vessel Annulus QC Inspection	11/18/2010
AR 01795403	Boric Acid Residue - Annulus	05/28/2010
AR 01910016	Operational Decision making (ODM) Evaluation	05/18/2015
AR 02300737	Potential Corrosion of Support Anchor Plate	11/05/2018
TRP 76 – Set 2 Question 10 Pictures	Question 10 (AR 1809387 Pictures)	11/18/2010
AD-EG-PWR-1611	Boric Acid Corrosion Control Program Implementation	Revision 2
PD-EG-PWR-1611	Boric Acid Corrosion Control Program Description	Revision 1
EPRI TR 1025145	Materials Reliability Program: Boric Acid Corrosion Guidebook – Revision 2: Managing Boric Acid Corrosion Issues at PWR Power Stations (MRP-058 Rev 2)	07/2012
TRP 76 – Set 2 Question 11 Response	RV Skirt TLAA	Revision 0

TRP 76 Set – 2 Questions 12, 13, 14 Responses	Confirm Applicability of Evaluation to All ONS Units	Revision 0
WO 01875343-01	ReacVT-2 2142L-21 Class A Test (Work on Unit 2 Reactor Coolant Piping)	05/28/2010
DWG 500625-0720	36" I.D. Coolant Outlet Piping Insulation for Duke Power Co. PW Reactor Oconee I	Revision D1
DWG 500626-8550	36" I.D. Coolant Outlet Piping Insulation Steam Generator 2-A (West), Duke Power Co. PW Reactor Oconee II	Revision 1
DWG 500626-8560	36" I.D. Coolant Outlet Piping Insulation Steam Generator 2-A (East), Duke Power Co. PW Reactor Oconee II	Revision 1
DWG 500627-390-CA (OM2241-0022.001)	36" I.D. Coolant Outlet Piping Insulation Steam Generator 2-A (East), Duke Power Co. PW Reactor Oconee III	Revision A
DWG 500627-391-CA (OM2241-0023.001)	36" I.D. Coolant Outlet Piping Insulation Steam Generator 2-A (West), Duke Power Co. PW Reactor Oconee III	Revision A
DWG O-2069K	Reactor Shield Walls Misc. Steels, Duke Power Company, Oconee Nuclear Station Units 1, 2, & 3 (Bechtel Corp./ Greenville steel & Foundry Co.)	04/04/1969
DWG O-2069J	Oconee Nuclear Station Units 1, 2, & 3 Reactor Building. Reactor Annulus Assembly. Concrete & Miscellaneous Steel. Bechtel Corp./ Greenville steel & Foundry Co.)	Revision 5
DWG 128702 E (OM 201. – 3153 001)	Arrgt. Reactor Vessel Long. Sec.	Revision D18
DWG 128668 E (OM 271. -0017 001)	Reactor Building Functional Requirements. Elev. – Section W-W. Duke Power Company Oconee Unit I	Revision D7
O-66G	Reactor Building Restraint for 36" I.D. Reactor Coolant Outlet Pipe Oconee Nuclear Station Units 1, 2, & 3 (Bechtel Corp.)	Revision 6
Vessel Layout Figure 1	Reactor Vessel Support, Reactor Vessel General Layout (Ref OM 271.0017-001)	Revision 0
DWG O-1069-D	Reactor Building Units 2 & 3. Primary & Secondary Shiel Walls. Sections & Elevations. Concrete	Revision 15
DWG O-0069-B	ONS Unit 1 Reactor Building Primary & Secondary Shield Walls Plan at El 816'+6" & 844'+6" Concrete	Revision 17
DWG O-0069-M	ONS Unit 1 Reactor Building Shield Walls for Core Flooding Lines Reinforcing	Revision 2
DWG O-0070-X	ONS Unit 1 Reactor Building Primary Shield Wall Reinforcing	Revision 3
ONS UFSAR	Chapters: 3.0 Design of Structures, Components, Equipment, and Systems; 5.0 Reactor Coolant System and Connected Systems; and 7.0 Instrumentation and Control	12/31/2019

During the audit of SLRA AMR Section 3.5.2.2.2.6, "Reduction of Strength and Mechanical Properties of Concrete due to Radiation":

- The applicant provided ePortal OpE searches for RV cavity concrete and RV steel support assembly condition assessment that included keywords and phrases "Annulus," "Cavity," "Shield," "Nelson Studs," "Concrete Pedestal, "Anchor Bolts," "Steel Vertical Bearing Plate, "Support Steel Skirt," "Support Steel Flange," "Steel Sole Plate," and provided related Action Requests (ARs) to support the development of "Audit Breakout Questions."

- The staff conducted its review of the applicant's methodology and OpE by reviewing documentation contained in the SLRA and ePortal.

- To confirm factual data for the review of SLRA AMR 3.5.2.2.2.6 the staff will consider issuing RCIs.

In addition, the staff made the following observations:

- It was not clear what the level of expected uncertainties is and whether the bias can be quantified in the extended beltline region when the radial power distribution is set to "1" in every peripheral assembly in the fluence calculations performed.

- For the existing physical conditions and proposed management of aging effects for the following structures and components, relevant SLRA Sections (e.g., B2.1.4, "Boric Acid Corrosion;" B2.1.30, "ASME XI, Subsection IWF;" B2.1.33, "Structures Monitoring;" B3.1, "Fatigue Monitoring;" 4.3, "Metal Fatigue") in addition to SLRA AMR 3.5.2.2.2.6 need to be reevaluated and augmented as needed to accommodate necessary enhancements/exceptions including:

    (a) Reactor Cavity Concrete Wall
    (b) Reactor Vessel Embedment Pedestal Concrete
    (c) Reactor Vessel Support Steel Assembly

- Furthermore, additional Table 2 AMR line items may be needed to manage the effects of aging at these locations:

    (a) RV support skirt assembly including RV anchorage
    (b) RV cavity concrete, for example at hot leg PSW penetrations
    (c) RV support skirt assembly components for cycle counting

For observations noted above, the staff will consider issuing RAIs as needed to obtain the necessary information to address these issues identified during the audit. The staff will address the issues identified in this audit report in the SER.

SLRA AMR FE 3.6.2.2.3, Loss of Material Due to Wind-Induced Abrasion, Loss of Conductor Strength Due to Corrosion, and Increased Resistance of Connection Due to Oxidation or Loss of Preload for Transmission Conductors, Switchyard Bus, and Connections

Summary of Information in the Application. During the audit, the staff reviewed plant documentation associated with the following five AMR items discussed in SLRA 3.6.2.2.3 further evaluation section:

- SLRA Table 3.6.1-004, "transmission conductors composed of aluminum, and steel exposed to air-outdoor"

- SLRA Table 3.6.1-005, "transmission connectors composed of aluminum, and steel exposed to air-outdoor"

- SLRA Table 3.6.1-006, "switchyard bus and connections composed of aluminum, copper, bronze, stainless steel, and galvanized steel exposed to air-outdoor"

- SLRA Table 3.6.1-007, "transmission conductors composed of aluminum, and steel exposed to air-outdoor"

- SLRA Table 3.6.1-021, “transmission conductors composed of aluminum exposed to air-outdoor”

Audit Activities. During its audit, the staff interviewed the applicant’s staff and review documentation contained in the SLRA and provided by the applicant via ePortal. The table below lists documents that were reviewed by the staff and were found relevant to the further evaluation 3.6.2.2.3. The staff will document its review of this information in the SER.

The table below lists the documents that were reviewed by the staff and were found relevant to the review of these items. These documents were provided by the applicant.

Document	Title	Revision / Date
SLR-ONS-IPAR-E001	Oconee Subsequent License Renewal Electrical and I&C Component Integrated Plant Assessment	Revision 1
AR01981365	I/R CT3 “Y” phase main power line not attached to the bushing	12/07/2015
	Duke Response to ONS Electrical Scoping and OE Observation	09/13/2021
	Duke Response to TRP 059 Follow-Up Questions	10/04/2021

During the audit, the staff made the following observations:

The staff noted that on December 7, 2015, the “Y” phase power feed to the Unit 3 startup transformer power cable severed due to fatigue cracking caused by Aeolian vibrations. In the Oconee SLRA, the applicant proposed no AMP for these dropline transmission conductors because it proposed to replace these dropline transmission conductors every 10 years. During the discussion on the broken conductor event, the NRC staff questioned the basis of the 10-year frequency replacement interval for the overhead dropline conductors associated with the startup transformers. In response to the staff’s request, the applicant responded in its ePortal that the original startup transformer CT3 Y-phase drop-line conductor failed in December 2015 after over 40 years of service and all drop-lines for startup transformer CT1, CT2, and CT3 have been replaced and a 10-year replacement frequency has been established. It further stated that the startup transformer drop-line replacement frequency was conservatively selected based on 10 years being approximately 25 percent of the life of the original droplines. In the staff Integrated Inspection Report 05000269/2026002, 05000270/2016002, 05000287/2016002 (ADAMS Accession No. ML16217A009), the staff noted that the Unit 2 startup transformer had also experienced broken strands in its dropline power cable in 2002. The applicant’s corrective actions for the Unit 2 issue included replacing the portions of these power cables which drop vertically down from the horizontally run lines from the Oconee 230kV switchyard.

In light of the 2002 operating experience, during the on-site and OpE follow-up audit, the staff requested the applicant to describe other OpE of startup transformer conductor droplines and corrective actions taken at Oconee and confirm that the 10-year replacement frequency was conservatively selected. In response to the staff’s request, the applicant responded in its ePortal that in October 2002, non-conformance report (NCR) 01733811 documented broken strands on the “Y” phase lighting arrestor conductor on startup transformer CT2. Additional inspection on CT2, the lighting arrestor, and transformer bushing conductors found a single broken strand on a transformer bushing connection. Immediate corrective actions included

trimming back the damaged conductor and reinstalling the conductor. Long term actions were established for conductor inspection on other startup transformer and possible connector design modification. Subsequent re-inspection of the CT2 conductor during 2004 found continued conductor damage and the conductors were replaced. Re-inspection in 2005 found no additional signs of degradation. At the time, existing preventive measures were judged sufficient to detect future degradation. While a formal cause analysis was not performed, engineering surmised that the relatively small conductor size made them susceptible to both wind and possible electromagnetic-induced conductor movement. In December 2015, NCR 01981365 found a broken Y-phase bushing conductor of startup transformer CT3 resulting in an open phase condition. Extent of condition inspections were performed on all startup transformers with conductor damage found on CT1 and other conductor on CT3. No conductor damage was found on CT2 (previously replaced from the 2002 NCR). As in 2002, conductor damage was attributed to wind induced conductor movement. Due to the significance of this event, extensive corrective actions were initiated including dropline replacement for all startup transformer, periodic dropline replacement on a 10-year basis and enhanced inspection for conductor degradation between replacement intervals startup transformer inspection includes: daily rounds by operations that include specific checks for failed transformer connections; monthly inspection by maintenance that include checks for degraded on damaged conductors and connections using visual aids (binoculars and spotting scope); every two years the startup transformers undergo inspection and maintenance that include dropline inspections for broken strands, fraying, corrosion, or fatigue; additionally, the startup transformer for all three units have equipment that actively monitors for open phase conditions. The applicant further stated that 2002 dropline issue (partially severed conductor) occurred after approximately 30 years of operating while the 2015 dropline issue (fully severed conductor) occurred after approximately 40 years of operations. The 10-year frequency combined with daily, monthly, and biennial inspections for degraded dropline conductor provides conservative margin to preclude future conductor failure. If the results of future inspection detect unexpected degradation between dropline replacement, this internal OE will be used to adjust the replacement frequency or make other changes as necessary. The applicant also committed to supplement its SLRA to provide justification for the 10-year frequency dropline replacement. The staff found the 10-year frequency acceptable because the startup transformer drop-line replacement frequency was conservatively selected. The 10-year replacement of the conductor dropline frequency with periodic inspection between dropline replacement will prevent future conductor failure. Furthermore, the applicant will adjust the replacement frequency if the inspections detect degradation between dropline replacement. The issue with 10-year frequency was resolved.

The staff reviewed the applicant's further evaluation in SLRA Section 3.6.2.2.3, "Loss of Material Due to Wind-Induced Abrasion, Loss of Conductor Strength Due to Corrosion, and Increased Resistance of Connection Due to Oxidation or Loss of Preload for Transmission Conductors, Switchyard Bus, and Connections." This input will be used in SER Section 3.6.2.2.3.

SLRA AMR FE 3.6.2.3.2, High Voltage Electrical Insulators

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

- SLRA Table 3.6.2, item corresponding to SLRA Table 3.6.1-002, "high-voltage electrical insulators" composed of porcelain, malleable iron, aluminum, galvanized steel, and cement exposed to air-outdoor

- SLRA Table 3.6.2, item corresponding to SLRA Table 3.6.1-003, “high-voltage electrical insulators” composed of porcelain, malleable iron, aluminum, galvanized steel, and cement exposed to air-outdoor

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed documentation provided by the applicant. The staff reviewed the following relevant documents.

Document	Title	Revision / Date
SLR-ONS-IPAR-E001	Oconee Subsequent License Renewal Electrical and I&C Component Integrated Plant Assessment	Revision 1
N/A	Duke Response to ONS SLR Electrical Scoping and OE Observations (September 13 – Final)	N/A
AR 01981365	I/R CT3 “Y” phase main power line not attached to the bushing	12/07/2015

During the audit, the staff reviewed the applicant’s further evaluation 3.6.2.3.2 – High-Voltage Electrical Insulators and noted that SLRA concluded that no AMP is required for these components. Based on OpE at Byron Nuclear Plant where a failure of an insulator resulted in an open phase condition, during a breakout session with the applicant, the staff requested the applicant to discuss why Oconee does not have any AMP for detecting age-related cracking of insulators. The applicant responded in its ePortal that the 2012 Byron OpE documents failure of an Ohio Brass 345kV post stacking assembly-inverter taper used in an underhung application. The insulator failed mechanically due to a latent manufacturing defect in the porcelain vitrification process. The Byron event also identified a design vulnerability that resulted in a failure to detect a single open phase condition. The licensee subsequently replaced all Ohio Brass Inverted insulator with Lapp insulators. Oconee does not use in-scope Ohio Brass Inverted post insulator of this type. This input will be used in SER Section 3.6.2.3.2.

Reactor Pressure Vessel (RPV) Components in SLRA Table 2.3.1-1; AMR FEs of RPV Components in SLRA Section 3.1.2.2.3, Subsections [3.1.1-013] and [3.1.1-014]; and AMR Items for RPV Components in SLRA Table 3.1.2-1

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

- The applicant’s integrated plant assessment screening results for RPV components in SLRA Table 2.3.1-1 (as required by 10 CFR 54.21(a)(1))

- The applicant’s AMR further evaluation results for RPV components in SLRA Section 3.1.2.2.3, Subsections [3.1.1-013] and [3.1.1-014]

- The applicant’s AMR items for RPV components, as included and specified in SLRA Table 3.1.2-1

Audit Activities. During its audit, the staff interviewed the applicant’s staff and reviewed documentation contained in the SLRA and provided by the applicant via the ePortal. The table below lists documents that were reviewed by the staff and were found relevant to the referenced RPV screening results and AMR results. The staff will document its review of this information in the SER.

Document	Title	Revision / Date
ONS UFSAR Table 5-14	Reactor Vessel Outline (Unit 1)	12/31/2003
ONS UFSAR Table 5-15	Reactor Vessel Outline (Unit 2)	12/31/2003
ONS UFSAR Table 5-16	Reactor Vessel Outline (Unit 3)	12/31/2003

During the audit, the staff made the following observations:

- *Consistency with RPV Design Outlines in UFSAR Figures 5-14, 5-15, and 5-16*. During the audit of the SLRA, the staff noted from its review of UFSAR Figures 5-14, 5-15, and 5-16 that the design of the RPV in ONS Unit 1 was different from the design of the corresponding RPVs in ONS Units 2 and 3. Specifically, the staff observed that ONS Unit 1 RPV was designed with three RPV shell courses in the beltline region of the RPV, whereas the corresponding designs of the ONS Units 2 and 3 RPVs included two RPV shell courses in the beltline regions of the RPVs. As a result of its audit review of these UFSAR figures, the staff observed that the RPV screening results for RPV components in SLRA Table 2.3.1-1 did not appropriately account for design differences between the design of the RPV beltline components in ONS Unit 1 from the corresponding design of the RPV beltline components in the ONS Units 2 and 3 reactor designs. The staff also observed that the component-specific screening results in SLRA Table 2.3.1-1 appeared to be omitting some component-specific screening line item results for some of the RPV non-beltline base metal or weld components in the ONS Units 1, 2, and 3 RPV designs. The staff determined that these RPV component-specific screening issues impacted the comprehensiveness of the AMR line item results, which the staff found to be: (1) reported for the RPV components in SLRA Table 3.1.2-1; and (2) cross-referenced to the applicant's AMR further evaluation criteria for TLAA analysis and aging management of RPV neutron embrittlement in SLRA Section 3.1.2.2.3, Subsections [3.1.1-013] and [3.1.1-014].

  The staff discussed these issues with the applicant during a teleconference with the applicant that was held on July 13, 2021. During the teleconference, the applicant acknowledged the staff's audit observations regarding the comprehensiveness of the integrated plant assessment screening results in SLRA Table 2.3.1-1 that affected AMR item determinations for RPV components in SLRA Table 3.1.2-1. During the meeting, the applicant informed the staff that it would address the RPV screening results and AMR item results through issuance of a future SLRA supplement that would resolve the noted information gaps in the contents of SLRA Tables 2.3.1-1 and 3.1.2-1. The staff will address resolution of this issue in its SER evaluation for SER Section 3.1.2.2.3.

3. Supplements to the SLRA

By letters dated October 28, 2021 (ADAMS Accession No. ML21302A208), November 11, 2021 (ADAMS Accession No. ML21315A012), and December 15, 2021 (ADAMS Accession No. ML21349A005), Duke voluntarily submitted three supplements to the SLRA resulting from discussions held during the audit.

4. Audit Questions Provided to Duke

Over the course of the audit, the NRC staff provided audit questions to Duke to facilitate the audit discussions (ADAMS Accession No. ML22024A002).

Subject Area	Meeting Date	Questions Provided to Duke
Virtual Audit: Electrical – Onsite and OE Audit	8/18/21 9/13/21 10/5/21	ML22024A060 ML22024A059 ML22024A058
Breakout Session: TRP 30 – Fuel Oil Chemistry	8/30/21	ML22024A025
Breakout Session: TRP 29 – Atmospheric Metallic Tanks	9/3/21	ML22024A024
Breakout Session: TRP 32 – One Time Inspection	9/3/21	ML22024A026
Breakout Session: TRP 33 – Selective Leaching	9/7/21 9/30/21	ML22024A027
Breakout Session: TRP 14 – Buried Piping	9/7/21 9/10/21 9/30/21	ML22024A012
Breakout Session: TRP 141 – Identification of TLAAs	9/8/21	ML22024A042
Breakout Session: TRP 15 – Internal Coatings	9/8/21	ML22024A013
Breakout Session: TRP 38 – Internal Surfaces	9/8/21	ML22024A028
Breakout Session: TRP 85 – No Aging Effects	9/8/21	ML22024A040
Breakout Session: TRP 60 – Fatigue Monitoring	9/8/21	ML22024A036
Breakout Session: TRP 143.9 – Cycle Projections	9/8/21	ML22024A049
Breakout Session: TRP 143.1 – Metal Fatigue of Class 1	9/8/21	ML22024A045
Breakout Session: TRP 143 – Metal Fatigue	9/8/21	ML22024A044
Breakout Session: TRP 143.2 – Non-Class 1 Fatigue Analyses	9/8/21 10/7/21	ML22024A046 ML22024A047
Breakout Session: TRP 19 – Steam Generators	9/9/21	ML22024A018
Breakout Session: TRP 26 – Fire Protection	9/9/21	ML22024A021
Breakout Session: Fire Protection Scoping and Screening	9/9/21	ML22024A003
Breakout Session: TRPs 149.3, Reactor Coolant Pump Flywheel Fatigue Analysis, 149.12, Reactor Vessel Internals Flow Induced Vibration Endurance Limits and 149.2, Reactor Vessel Underclad Cracking	9/10/21 9/16/21	ML22024A053 (Proprietary Version: ML22024A227)
Breakout Session: TRPs 142.1, Neutron Fluence and 149.13 – Reactor Vessel Internals Irradiation Embrittlement	9/10/21	ML22024A056
Breakout Session: TRPs 12, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS), 143.7, Analytical Evaluation of Flaws, and 143.8, Weld Overlay Fatigue Analysis	9/10/21	ML22024A011
Breakout Session: TRP 143.3 – Environmentally Assisted Fatigue	9/13/21	ML22024A048
Breakout Session: Scoping – Letdown Cooler	9/13/21	ML22024A004
Breakout Session: TRP 20 – Open Cycle Cooling Water	9/13/21	ML22024A019
Breakout Session: TRP 21 – Closed Treated Water System	9/13/21	ML22024A020
Breakout Session: Scoping and Screening – Reactor Coolant System	9/13/21	ML22024A005
Breakout Session: TRP 17 – Flow Accelerated Corrosion	9/14/21 10/7/21	ML22024A016 ML22024A015
Breakout Session: T RP 42 – ASME XI, Subsection IWL	9/14/21	ML22024A030
Breakout Session: TRP 62 and 145 – Tendon Prestress	9/14/21 9/27/21	ML22024A055
Breakout Session: Structural Scoping and Screening	9/14/21	ML22024A006
Breakout Session: TRP 45 – Masonry Walls	9/15/21	ML22024A033
Breakout Session: TRP 77 – Corrosion Structural	9/15/21	ML22024A039
Breakout Session: TRP 44 – Appendix J	9/15/21	ML22024A032
Breakout Session: TRP 149.4 – Leak Before Break	9/15/21	ML22024A051
Breakout Session: TRP 27 – Fire Water System	9/15/21 9/29/21	ML22024A023 ML22024A022
Breakout Session: TRP 2 – Water Chemistry	9/15/21	ML22024A008 (Proprietary Version: ML22024A225)
Breakout Session: TRP 140 – Secondary Shield Wall Tendon Surveillance	9/16/21	ML22024A041

Breakout Session: TRP 149.5 and 23 – Crane and Inspection of Load Handling	9/16/21	ML22024A057
Breakout Session: TRP 3 – RPV Closure Head Studs	9/16/21	ML22024A009
Breakout Session: TRP 10 – Boric Acid Corrosion	9/16/21	ML22024A010
Breakout Session: TRPs 53.1, 53.2, 54, 58, and 63 – Electrical	9/20/21	ML22024A054
Breakout Session: TRP 76 – Irradiated Concrete	9/20/21 9/21/21 9/22/21 9/23/21 9/27/21 9/28/21	ML22024A038 (Proprietary Version: ML22024A226)
Breakout Session: TRP 43 – ASME Section XI, Subsection IWF	9/21/21	ML22024A031
Breakout Session: TRP 142.03 – Pressurized Thermal Shock	9/21/21	ML22024A043
Breakout Session: TRP 74 – Concrete	9/24/21	ML22024A037
Breakout Session: TRP 47 – Water Control Structures	9/24/21	ML22024A035
Breakout Session: TRP 18 – Bolting Integrity	9/27/21	ML22024A017
Breakout Session: TRP 46 – Structures Monitoring	9/28/21	ML22024A034
Breakout Session: TRP 146 – Containment Liner Plate, Metal Containments, and Penetration Fatigue Analyses	9/29/21	ML22024A050
Breakout Session: TRP 41 – ASME XI, Subsection IWE	9/30/21	ML22024A029
Breakout Session: TRP 16 – PWR Vessel Internals	10/1/21 10/6/21	ML22024A014
Breakout Session: TRP 149.11 – Reactor Vessel Ductility	10/1/21	ML22024A052 (Proprietary Version: ML22024A228)
Breakout Session: TRP 1 – ASME XI – ISI	10/4/21	ML22024A007

5. Applicant Personnel Contacted During Audit

Name	Affiliation
Ed Asbury	Duke
Jim Batton	Duke
Keith Beddingfield	Duke
Rachel Lee Doss	Duke
Charles Dover II	Duke
Bob Fetterly	Duke
Heather Galloway	Duke
Reene Gambrell	Duke
Anna Ginn	Duke
Steven Graham	Duke
Paul Guill	Duke
Mark T Hager	Duke
Keak Hear	Duke
Lori Hekking	Duke
Adam T Johnson	Duke
Brian Michael Kandell	Duke
Scott Karriker	Duke
Austin Charles Keller	Duke
David Lee	Duke
Daniel Mayes	Duke
Brian Mitchell	Duke
David Morris	Duke
Casey Muggleston	Duke
Rounette Nader	Duke
David Peltola	Duke
Daniel William Roberts	Duke
Greg Robison	Duke
Chris Saville	Duke
Albert Spear III	Duke

Joe Terrell	Duke
Erik Wagner	Duke
Gerry Wald	Duke
Ryan Weatherwax	Duke
Sarah Zetts	Duke
Pascal Brocheny	Framatome
Justin Byard	Framatome
Sarah Davidsaver	Framatome
Frank Gregory	Framatome
Ryan Hosler	Framatome
Ashok Nana	Framatome
Mark Rinckel	Framatome
Stacy Yoder	Framatome
Terry Herrmann	Structural Integrity Associates

6. Exit Meeting

An exit meeting was held with the applicant on October 13, 2021, to discuss the results of the regulatory audit. The staff is considering the issuance of RAIs and RCIs to support the completion of the staff's SLRA review.