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United States Nuclear Regulatory Commission
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SAFETY EVALUATION REPORT

Related to the License Renewal of
River Bend Station, Unit 1

Docket No. 50-458

Entergy Operations, Inc. and
Entergy Louisiana, LLC

Office of Nuclear Reactor Regulation

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Safety Evaluation Report

Related to the License Renewal of River Bend Station, Unit 1

Docket No. 50-458

Entergy Operations, Inc. and Entergy Louisiana, LLC

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ABSTRACT

This safety evaluation report documents the U.S. Nuclear Regulatory Commission staff's technical review of the River Bend Station, Unit 1 (RBS) license renewal application. By letter dated May 25, 2017, Entergy Louisiana, LLC and Entergy Operations, Inc. (collectively referred to as Entergy) submitted a license renewal application (LRA) in accordance with Title 10 of the *Code of Federal Regulations,* Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." Entergy requests renewal of the River Bend Station, Unit 1 Operating License No. NFP-47 for a period of 20 years beyond the current expiration date of midnight, August 29, 2025.

River Bend Station is located approximately 38.6 km (24 miles) northwest of Baton Rouge, LA. The NRC issued the RBS construction permit on March 25, 1977, and the operating license on November 20, 1985. RBS is a boiling-water reactor. General Electric Company supplied the nuclear steam supply system and Stone & Webster Engineering Corporation originally designed and constructed the balance of the plant. The RBS licensed power output is 3091 megawatts thermal with a gross electrical output of approximately 967 megawatts electric. In this report, staff reviewed information that Entergy submitted up to the cutoff date of August 13, 2018.

The staff identified no open or confirmatory items that would require a formal response from Entergy. Section 6 of this report provides the staff's final conclusion on its safety review of the application.

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ABBREVIATIONS AND ACRONYMS

AAI	applicant action item
AC	alternating current
ACI	American Concrete Institute
ACRS	Advisory Committee on Reactor Safeguards
ADAMS	Agencywide Document Access and Management System
ADV	atmospheric dump valve
AERM	aging effect requiring management
AFW	auxiliary feedwater
AISC	American Institute of Steel Construction
AMP	aging management program
AMR	aging management review
ANSI	American National Standards Institute
ART	adjusted reference temperature
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
B-10	boron-10
B&PV	boiler and pressure vessel
BTP	branch technical position
BWR	boiling-water reactor
BWRVIP	Boiling Water Reactor Vessel and Internals Project
°C	degrees Celsius
CAP	corrective action program
CASS	cast austenitic stainless steel
CCW	component cooling water
CFR	*Code of Federal Regulations*
CLB	current licensing basis
CMAA	Crane Manufacturers Association of America
CMTR	certified materials test report(s)
CRD	control rod drive
CRDM	control rod drive mechanism
CS	core spray
CST	condensate storage tank
Cu	copper
CUF	cumulative usage factor
CUI	corrosion under insulation

CVCS	chemical and volume control
C_VUSE	Charpy upper-shelf energy
DBA	design-basis accident
DBE	design-basis event
DC	direct current
EAF	environmentally assisted fatigue
ECCS	emergency core cooling system
EDG	emergency diesel generator
EFPY	effective full-power year
EPRI	Electric Power Research Institute
EQ	environmental qualification
ER	environmental report (applicant’s environmental report submitted as part of its license renewal application)
ES	engineered safety features
°F	degrees Fahrenheit
FAC	flow-accelerated corrosion
F_{en}	environmental fatigue life correction factor
FERC	Federal Energy Regulatory Commission
FR	*Federal Register*
ft-lb	foot-pound
GALL	Generic Aging Lessons-Learned Report (NUREG-1801)
GDC	general design criteria or general design criterion
GEH	General Electric-Hitachi
GEIS	Generic Environmental Impact Statement (NUREG-1437)
GL	generic letter
GSI	generic safety issue
HELB	high-energy line break
HEPA	high-efficiency particulate air
HPCS	high-pressure core spray
HPSI	high-pressure safety injection
HVAC	heating, ventilation, and air conditioning
I&C	instrumentation and controls
IASCC	irradiation-assisted stress corrosion cracking
IEEE	Institute of Electrical and Electronics Engineers
IGA	intergranular attack

IGSCC	intergranular stress corrosion cracking
ILRT	integrated leak rate testing
IN	information notice
INPO	Institute of Nuclear Power Operations
IPA	integrated plant assessment
ISG	interim staff guidance
ISI	inservice inspection
ISP	integrated surveillance program
ksi	kilopound-force per square inch
KV or kV	kilo-volt
LAR	license amendment request
LBB	leak before break
LDPE	low-density polyethylene
LLRT	local leakage rate test
LOC	loss-of-coolant accident
LTOP	low-temperature overpressurization protection
LRA	license renewal application
MCR	main control room
MFW	main feedwater
MIC	microbiologically influenced corrosion
MS	main steam
MSL	main steam line
MSIV	main steam isolation valve
MWe	megawatts-electric
MWt	megawatts-thermal
n/cm^2	neutrons per square centimeter
NDE	nondestructive examination
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
Ni	nickel
NPS	nominal pipe size
NRC	U.S. Nuclear Regulatory Commission
O_2	oxygen
ODSCC	outside-diameter stress corrosion cracking
OI	open item

PB	pressure boundary
pH	potential of hydrogen
PORV	power-operated relief valve
ppm	parts per million
psi	pound-force per square inch
psig	pound-force per square inch gauge
P-T	pressure-temperature
PTS	pressurized thermal shock
PVC	polyvinyl chloride
PVDF	polyvinylidene fluoride
PWR	pressurized-water reactor
PWSCC	primary water stress corrosion cracking
QA	quality assurance
RAI	request for additional information
RBS	River Bend Station
RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RG	regulatory guide
RHR	residual heat removal
RPV	reactor pressure vessel
RT_{NDT}	reference temperature nil ductility transition
RT_{PTS}	reference temperature for pressurized thermal shock
RV	rector vessel
RVI	reactor vessel internal
RVID	Reactor Vessel Integrity Database
RWST	refueling water storage tank
S_A	stress allowables
SAMA	severe accident mitigation alternatives
SBO	station blackout
SC	structure and component
SCC	stress corrosion cracking
SGTS	standby gas treatment system
SER	safety evaluation report
SFPC	spent fuel pit/pool cooling, spent fuel pit and cooling
SG	steam generator
SLC	standby liquid control
SO_2	sulfur dioxide

SOC	statement of consideration
SPU	stretch power uprate
SRP	Standard Review Plan
SRP-LR	Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (NUREG-1800)
SSC	system, structure, and component
SSE	safe-shutdown earthquake
SW	service water
TLAA	time-limited aging analysis
TS	technical specifications
USAR	updated safety analysis report
UFSAR	updated final safety analysis report
USE	upper-shelf energy
UT	ultrasonic testing
UV	ultraviolet
WCAP	Westinghouse Commercial Atomic Power
yr	year
Zn	zinc
1/4T	one-fourth of the way through the vessel wall measured from the internal surface of the vessel

1 INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

This safety evaluation report documents the U.S. Nuclear Regulatory Commission (NRC) staff's safety review of the River Bend Station, Unit 1 license renewal application. By letter dated May 25, 2017, Entergy Operations, Inc. and Entergy Louisiana, LLC (collectively, Entergy or the applicant) submitted an application to the NRC for renewal of the River Bend Station, Unit 1 operating license for an additional 20 years. The NRC staff performed a safety review of Entergy's license renewal application (LRA) in accordance with Title 10 of the *Code of Federal Regulations* Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants" (10 CFR Part 54). The NRC project manager for this safety evaluation report is Emmanuel Sayoc. You can contact Mr. Sayoc by telephone at (301) 415-4084 or by e-mail at Emmanuel.Sayoc@nrc.gov. You can also send written correspondence to the following address:

Division of Materials and License Renewal

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In its May 25, 2017, application submittal letter, Entergy requested that the NRC renew River Bend Station, Unit 1 Operating License No. NFP-47 for a period of 20 years beyond the current expiration date, which is midnight, August 29, 2025. River Bend Station is located approximately 38.6 km (24 miles) northwest of Baton Rouge, LA. The NRC issued the River Bend Station, Unit 1 (RBS) construction permit on March 25, 1977, and the operating license on November 20, 1985 (issued under Section 104b of the Atomic Energy Act of 1954, as amended). RBS is a boiling-water reactor. General Electric Company supplied the nuclear steam supply system and Stone & Webster Engineering Corporation originally designed and constructed the balance of the plant. The RBS licensed power output is 3091 megawatts thermal with a gross electrical output of approximately 967 megawatts electric. The RBS updated safety analysis report (USAR) shows details of the plant and the site (Agencywide Documents Access and Management System (ADAMS) Accession No. ML053110037).

The NRC staff's license renewal process consists of two reviews that the staff performs at the same time: a safety review and an environmental review. The NRC regulations in 10 CFR Part 54 set forth NRC requirements for the safety review while the regulations in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," set forth the requirements for the environmental review. The NRC staff conducted the safety review for RBS license renewal based on Entergy's application, as supplemented by Entergy's responses to the NRC staff's requests for additional information (RAIs). Entergy responded to the staff's requests for additional information in audits, meetings, and docketed correspondence. Unless otherwise noted, the staff reviewed and considered new information submitted up to the cutoff date of August 13, 2018. After that date, the staff may or may not have reviewed new information received, depending on the stage of the safety review and the volume and complexity of the new information. The public may view this license renewal application and all pertinent information and materials, including the USAR, at the NRC Public Document Room located on the first floor of One White Flint North, 11555 Rockville Pike, Rockville, MD 20852-2738. The phone number for the NRC Public Document Room is (301) 415-4737 or (800) 397-4209. The public may also view these documents at the West Feliciana Parish Library, 5114 Burnett Rd., St. Francisville, LA 70775. The phone number for the West Feliciana Parish Library is (225) 635-3364. In addition, the public may find the application, as well as materials related to the NRC staff's license renewal review, on the NRC Web site at https://www.nrc.gov/reactors/operating/licensing/renewal/subsequent-license-renewal.html

This safety evaluation report (SER) describes the technical details that the NRC staff considered in evaluating the safety aspects of Entergy's application to operate RBS for an additional 20 years beyond the term of the current operating license. The staff reviewed the application in accordance with NRC regulations and guidance, specifically 10 CFR Part 54 and NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (often called the SRP-LR), dated December 2010.

Section 2 through Section 4 of this report contain the NRC staff's evaluation of license renewal issues considered during the agency's review of the RBS license renewal application. Section 5 of this report, "Review by the Advisory Committee on Reactor Safeguards," is reserved for input from the Advisory Committee on Reactor Safeguards (ACRS). Section 6, "Conclusion," contains the staff's conclusions.

Appendix A of this report consists of a table showing Entergy's commitments for renewal of the operating license. Appendix B lists the staff and Entergy's principal correspondence regarding the license renewal application review. Appendix C lists the principal contributors to this safety evaluation report. Lastly, Appendix D is a bibliography of references.

In accordance with 10 CFR Part 51, which sets forth the NRC staff's environmental protection regulations for licensing actions, the staff referred to NUREG-1437, Volume 1, Revision 1, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (also known as the GEIS), and prepared a draft RBS plant-specific supplement to the GEIS. The RBS-specific supplement discusses the environmental considerations for issuing a renewed license for RBS. The staff's draft, RBS plant-specific evaluation was issued as, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 58, Regarding River Bend Station, Unit 1," on May 25, 2018 (ADAMS Accession No. ML18143B736). The staff expects to issue the final, RBS-specific GEIS Supplement 58, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 58, Regarding River Bend Station, Unit 1," in November 2018, following its consideration of any comments it receives concerning Draft GEIS Supplement 58.

1.2 License Renewal Background

Under the Atomic Energy Act of 1954, as amended, and NRC regulations, operating licenses for commercial power reactors are issued for 40 years and can be renewed for up to 20 additional years. The original 40 year license term was selected based on economic and antitrust considerations rather than on technical limitations; however, some individual plant and equipment designs may have been engineered for an expected 40 year service life.

In 1982, the NRC staff anticipated interest in license renewal and held a workshop on nuclear power plant aging. This workshop led the NRC to establish a comprehensive program plan for nuclear plant aging research. From the results of that research, a technical review group concluded that many aging phenomena are readily manageable and pose no technical issues that would prevent life extension for nuclear power plants. In 1986, the NRC staff published a request for comment on a policy statement intended to address major policy, technical, and procedural issues related to license renewal for nuclear power plants.

In 1991, the NRC published what it called the License Renewal Rule as 10 CFR Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants” (see Volume 56, page 64943, of the *Federal Register* (56 FR 64943), dated December 13, 1991). After publication of this original License Renewal Rule, the staff participated in an industry-sponsored demonstration program to apply 10 CFR Part 54 to a pilot plant and to gain experience to develop implementation guidance. To establish a scope of review for license renewal, the original 10 CFR Part 54 License Renewal Rule defined age-related degradation unique to license renewal; however, during the industry-sponsored demonstration program on the pilot plant, the NRC staff found that adverse aging effects on plant systems and components are managed during the period of initial license and that the scope of the license renewal review did not allow sufficient credit for these management programs. In particular, the original 10 CFR Part 54 License Renewal Rule did not sufficiently credit the implementation of 10 CFR 50.65, “Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” for regulating management of plant-aging phenomena. As a result of this finding, the NRC amended 10 CFR Part 54 on May 8, 1995 (60 FR 22461). Amended 10 CFR Part 54 establishes a regulatory process that is simpler, more stable, and more predictable than the original 10 CFR Part 54 regulatory process. In particular, the amended License Renewal Rule at 10 CFR Part 54 focuses on the management of adverse aging effects rather than on the identification of age-related degradation unique to license renewal. The NRC made these rule changes to ensure that important systems, structures, and components (SSCs) will continue to perform their intended functions during the period of extended operation. In addition, the amended 10 CFR Part 54 clarifies and simplifies the integrated plant assessment process to be consistent with the revised focus on passive, long-lived structures and components.

Concurrent with these initiatives, the NRC pursued a separate rulemaking effort to focus the scope of the environmental review of license renewal (61 FR 28467, June 5, 1996). This resulted in amended 10 CFR Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions,” which describes the NRC staff’s responsibilities under the National Environmental Policy Act of 1969.

1.2.1 Safety Review

License renewal requirements for power reactors are based on two key principles:

(1) The regulatory process is adequate to ensure that the licensing bases of all currently operating plants maintain an acceptable level of safety with the possible exceptions of the detrimental aging effects on the functions of certain systems, structures, and components, as well as a few other safety-related issues, during the period of extended operation.

(2) The plant-specific licensing basis must be maintained during the renewal term in the same manner and to the same extent as during the original licensing term.

In implementing these two principles, 10 CFR 54.4, "Scope," defines the scope of license renewal as including those systems, structures, and components that (1) are safety related, (2) whose failure could affect safety-related functions, or (3) are relied on to demonstrate compliance with the NRC staff's regulations for fire protection, environmental qualification (EQ), pressurized-thermal shock (PTS), anticipated transient without scram (ATWS), and station blackout (SBO).

Under 10 CFR 54.21(a), a license renewal applicant must review all systems, structures, and components within the scope of 10 CFR Part 54 to identify structures and components that are subject to an aging management review (AMR). To be subject to an aging management review, structures and components (1) must perform an intended function without moving parts or without change in configuration or properties and (2) must not be subject to replacement based on a qualified life or specified time period. Under 10 CFR 54.21(a), a license renewal applicant must demonstrate that it will manage the aging effects such that the intended function or functions of those structures and components will be maintained consistent with the current licensing basis (CLB) for the period of extended operation. In contrast, active equipment is not subject to aging management reviews. That is because for active equipment, existing programs provide routine surveillance, performance monitoring, and maintenance to identify and correct detrimental aging. NRC regulations require surveillance and maintenance programs for active equipment, as well as other maintenance aspects of plant design and licensing basis, throughout the period of extended operation.

Under 10 CFR 54.21(d), the NRC requires the license renewal application to include a final safety analysis report (FSAR) supplement with a summary description of the applicant's programs and activities for managing aging effects and an evaluation of time-limited aging analyses (TLAAs) for the period of extended operation. Entergy provided Appendix A to the LRA, "Update Safety Analysis Report Supplement" to meet this requirement.

License renewal also requires time-limited aging analyses identification and updating. During the plant design phase, certain assumptions about the length of time the plant can operate are incorporated into design calculations for several plant systems, structures, and components. In accordance with 10 CFR 54.21(c)(1), the applicant must either show that these calculations will remain valid for the period of extended operation, project the analyses to the end of the period of extended operation, or demonstrate that the applicant will adequately manage the aging effects on these systems, structures, and components through the period of extended operation.

In 2005, the NRC revised Regulatory Guide (RG) 1.188, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses." This regulatory guide endorses Nuclear Energy Institute (NEI) 95-10, Revision 6, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 —The License Renewal Rule," issued in June 2005. NEI 95-10 details an acceptable method of implementing 10 CFR Part 54. The staff uses NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (known as the SRP-LR) to review the license renewal application.

In the license renewal application, the applicant also used the process defined in NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report," dated December 2010. The GALL Report summarizes staff-approved aging management programs (AMPs) for many structures and components subject to an aging management review. If an applicant commits to implementing these staff-approved aging management programs, it can greatly reduce the time, effort, and resources for license renewal application review, thereby improving the efficiency of the review process. The GALL Report summarizes the aging management evaluations, programs, and activities credited for managing aging for most of the structures and components used throughout the nuclear power plant industry. The report also serves as a quick reference on aging management programs and activities that can manage aging adequately during the period of extended operation.

1.2.2 Environmental Review

As described earlier, the NRC staff's license renewal application review consists of two concurrent reviews: a safety review and an environmental review. To perform the environmental review, the NRC staff uses 10 CFR Part 51, which contains the NRC staff's environmental protection regulations for domestic licensing and other functions. In December 1996, the NRC revised the environmental protection regulations to help facilitate the environmental review for license renewals. The staff prepared NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (the GEIS), to document its evaluation of possible environmental impacts associated with nuclear power plant license renewals. For certain types of environmental impacts, the GEIS contains generic findings that apply to all nuclear power plants. These generic findings are codified in Appendix B, "Environmental Effect of Renewing the Operating License of a Nuclear Power Plant," to Subpart A of 10 CFR Part 51. According to the requirements in 10 CFR 51.53(c)(3)(i), a license renewal applicant may incorporate these generic findings in its environmental report. In accordance with 10 CFR 51.53(c)(3)(ii), Entergy's environmental report also must include analyses of environmental impacts that must be evaluated on a plant-specific basis (i.e., Category 2 issues).

In accordance with the National Environmental Policy Act of 1969 (NEPA) and 10 CFR Part 51, the staff reviewed the plant-specific environmental impacts of RBS license renewal, including any new and significant information not considered in the NRC staff's GEIS. As part of its scoping process, the staff held a public meeting on September 19, 2017 in St. Francisville, LA, to identify plant-specific environmental issues. The staff issued an environmental scoping summary report on April 24, 2018 (ADAMS Accession No. ML17362A554). On May 25, 2018, the staff issued the draft, RBS-specific GEIS Supplement 58 (ADAMS Accession No. ML18143B738), which documents the results of the NRC staff's environmental review and makes a preliminary recommendation on RBS license renewal based on environmental considerations. The staff will consider comments received from members of the public and local, State, Federal, and Tribal governmental entities. After considering comments on the draft, the staff will publish the final, RBS-specific GEIS Supplement 58 separately from this report.

1.3 Principal Review Matters

Part 54 of 10 CFR describes the NRC staff's requirements for issuing a renewed nuclear power plant operating license. The staff performed its safety review of the RBS license renewal application in accordance with NRC guidance and 10 CFR Part 54 requirements. Section 54.29, "Standards for Issuance of a Renewed License," of 10 CFR sets forth the NRC staff's license renewal standards. This safety evaluation report documents the results of the staff's safety review of the RBS license renewal application in accordance with 10 CFR Part 54 requirements.

In accordance with 10 CFR 54.19(a), the NRC requires license renewal applicants to submit general information, which Entergy provided in Section 1 of its license renewal application. The staff reviewed Section 1 of the license renewal application and finds that Entergy has submitted the required information.

In accordance with 10 CFR 54.19(b), the NRC requires that the license renewal application include “conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license.” On this issue, Entergy states in its application:

> The current Indemnity Agreement (No. B-104) for River Bend Station states in Article VII that the Agreement shall terminate at the time of expiration of the license specified in Item 3 of the Attachment (to the Agreement). Item 3 of the Attachment to the Indemnity Agreement, as revised through Amendment No. 4, lists River Bend Station facility operating license number NPF-47. Entergy has reviewed the original Indemnity Agreement and the Amendments. Neither Article VII nor Item 3 of the Attachment specifies an expiration date for license number NPF-47. Therefore, no changes to the Indemnity Agreement are deemed necessary as part of this application. Should the license number be changed by NRC upon issuance of the renewed license, Entergy requests that NRC amend the Indemnity Agreement to include conforming changes to Item 3 of the Attachment and other affected sections of the Agreement.

If the NRC approves the RBS license renewal application and issues a renewed license, the staff intends to maintain the original license numbers. Therefore, Entergy need not make conforming changes to the indemnity agreement, and the application has met 10 CFR 54.19(b) requirements.

According to the regulations in 10 CFR 54.21, “Contents of Application—Technical Information,” the NRC requires that the license renewal application contain the following:

(a) an integrated plant assessment

(b) a description of any current licensing basis changes during the NRC staff’s review of the license renewal application

(c) an evaluation of time-limited aging analyses

(d) a final safety analysis report supplement

Section 3, Section 4, and Appendix B of the license renewal application address the license renewal requirements of 10 CFR 54.21(a), (b), and (c). Appendix A of the license renewal application satisfies the license renewal requirements of 10 CFR 54.21(d).

In accordance with 10 CFR 54.21(b), the NRC requires that each year following submission of the license renewal application and at least 3 months before the scheduled completion of the NRC staff’s review, the applicant submit a license renewal application amendment. The amendment must identify any current licensing basis changes to the facility that affect the contents of the license renewal application, including the USAR. Entergy plans to submit a license renewal application update in August 2018, which will summarize the current licensing basis changes that have occurred during the NRC staff’s review of the application. This submission will satisfy 10 CFR 54.21(b) requirements. The staff will then review the license renewal application update and will publish its findings following the issuance of this SER.

In accordance with 10 CFR 54.22, “Contents of Application—Technical Specifications,” the NRC requires that the license renewal application include changes or additions to the technical specifications (TS) that are necessary to manage aging effects during the period of extended operation. In Appendix D of its license renewal application, Entergy stated that it has not identified any technical specification changes necessary for issuance of the renewed RBS operating license. This statement adequately addresses the 10 CFR 54.22 requirement.

The staff evaluated the technical information required by 10 CFR 54.21 and 10 CFR 54.22 in accordance with NRC regulations and the guidance of NUREG-1800, Revision 2, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants” (SRP-LR). In Section 2, Section 3, and Section 4 of this SER, the staff evaluates the technical information provided in the license renewal application.

As required by 10 CFR 54.25, “Report of the Advisory Committee on Reactor Safeguards,” the ACRS will issue a report evaluating the staff’s review of the RBS license renewal application. For this reason, the staff reserves Section 5 of this SER for the ACRS report when it is issued. Section 6 of this safety evaluation report documents the findings required by 10 CFR 54.29.

1.4 Interim Staff Guidance

License renewal is a living program. The staff, industry, and other interested stakeholders gain experience and develop lessons learned with each license renewal review. The lessons learned contribute to the staff’s performance goals of maintaining safety, improving effectiveness and efficiency, reducing regulatory burden, and increasing public confidence. The NRC issues license renewal interim staff guidance (LR-ISG) that the staff, industry, and other interested stakeholders can use until the NRC can incorporate the guidance into license renewal guidance documents like NUREG-1800, Revision 2, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” and the GALL Report.

Table 1.4-1 shows the current set of license renewal interim staff guidance topics, as well as the sections in this safety evaluation report that address each topic.

Table 1.4-1 Current License Renewal Interim Staff Guidance

License Renewal Interim Staff Guidance (ISG) Topic (Approved LR-ISG Number)	Purpose	SER Section
Aging Management of Stainless Steel Structures and Components in Treated Borated Water, Revision 1 LR-ISG-2011-01	This LR-ISG clarifies the staff’s existing position on aging management in treated borated water environments.	Not applicable to RBS because it is a boiling-water reactor and does not use borated water
Aging Management Program for Steam Generators LR-ISG-2011-02	This LR-ISG evaluates the suitability of using Revision 3 of NEI 97-06, “Steam Generator Program Guidelines,” for implementing the licensee’s steam generator aging management program.	Not applicable to boiling-water reactors
Generic Aging Lessons Learned (GALL) Report Revision 2 AMP XI.M41, "Buried and Underground Piping and Tanks" LR-ISG-2011-03	This LR-ISG gives additional guidance on managing the effects of aging on buried and underground piping and tanks.	SER Sections 3.0.3.1.2 and 3.0.3.2.7

License Renewal Interim Staff Guidance (ISG) Topic (Approved LR-ISG Number)	Purpose	SER Section
Updated Aging Management Criteria for Reactor Vessel Internal Components of Pressurized Water Reactors LR-ISG-2011-04	This LR-ISG updates the GALL Report, Revision 2, and SRP-LR, Revision 2, to ensure consistency with Electric Power Research Institute (EPRI) materials reliability program document MRP-227-A, “Applicability Guidelines for Combustion Engineering and Westinghouse Pressurized Water Reactor Designs,” for managing the effects of age-related degradation for components of pressurized-water reactor vessel internal components during the term of a renewed operating license.	Not applicable to boiling-water reactors
Ongoing Review of Operating Experience LR-ISG-2011-05	This LR-ISG clarifies the staff’s existing position in the SRP-LR that acceptable license renewal aging management programs should be informed and enhanced when necessary, based on the ongoing review of both plant-specific and industry operating experience.	SER Section 3.0.5.2
Wall Thinning Due to Erosion Mechanisms LR-ISG-2012-01	This LR-ISG gives additional guidance on managing the effects of wall thinning due to erosion mechanisms.	SER Section 3.0.3.2.11
Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation LR-ISG-2012-02	This LR-ISG gives guidance on managing the effects of aging for internal surfaces, fire water system, atmospheric storage tanks, and corrosion under insulation.	SER Sections 3.0.3.1.1, 3.0.3.1.11, 3.0.3.2.7, 3.0.3.2.10, 3.0.3.3.1, 3.3.2.1.14, and 3.3.2.3.3
Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks LR-ISG-2013-01	This LR-ISG gives guidance on aging management for coating or lining integrity for internal coatings/linings on in-scope piping, piping components, heat exchangers, and tanks.	SER Sections 3.0.3.2.24, 3.2.2.3.2, 3.3.2.1.1, 3.3.2.3.3, and 3.4.2.3.3
Changes to Buried and Underground Piping and Tank Recommendations LR-ISG-2015-01	This LR-ISG replaces GALL Report AMP XI.M41, “Buried and Underground Piping and Tanks,” and the associated USAR summary description. The LR-ISG provides revised guidance on managing the aging effects associated with buried and underground piping and tanks.	SER Section 3.0.3.1.2
Changes to Aging Management Guidance for Various Steam Generator Components LR-ISG-2016-01	This LR-ISG gives guidance on aging management for various steam generator components	Not applicable to boiling-water reactors

1.5 Summary of Open Items

After reviewing the RBS license renewal application, including additional information Entergy submitted through August 13, 2018, the staff has determined that no open items exist that require a formal response from Entergy.

1.6 Summary of Confirmatory Items

After reviewing the RBS license renewal application, including additional information Entergy submitted through August 13, 2018, the staff has determined that no confirmatory items exist that require a formal response from Entergy.

1.7 Summary of Proposed License Conditions

After reviewing the RBS license renewal application, including subsequent information and clarifications from Entergy, the NRC staff identified two proposed license conditions.

The first license condition requires Entergy, following NRC staff's issuance of the renewed license, to include the USAR supplement (containing a summary of programs and activities for managing the effects of aging and an evaluation of time-limited aging analyses for the period of extended operation (as required by 10 CFR 54.21(d)) in its next periodic USAR update required by 10 CFR 50.71(e). The regulations at 10 CFR 50.71(e) require nuclear power plant licensees to periodically update their plant's final safety analysis report, "to assure that the information included in the report contains the latest information developed." Entergy may make changes to the programs and activities described in the USAR update and supplement provided Entergy evaluates such changes under the criteria set forth in 10 CFR 50.59, "Changes, Tests and Experiments," and otherwise complies with the requirements in that section.

The second license condition requires Entergy to complete future activities described in the USAR and supplement before the beginning of the period of extended operation. Entergy must complete these activities no later than 6 months before the beginning of the period of extended operation, and shall notify the NRC in writing when it has completed these activities.

2 STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW

2.1 Scoping and Screening Methodology

2.1.1 Introduction

Title 10 of the *Code of Federal Regulations* (10 CFR) Section 54.21, “Contents of Application—Technical Information,” requires license renewal applications to identify, using 10CFR 54.4(a), the structures, systems, and components (SSCs) within the scope of license renewal. In addition, 10 CFR 54.21(a), “An Integrated Plant Assessment (IPA),” requires the license renewal application to contain an integrated plant assessment (IPA) that identifies (from within the SSCs in the scope of license renewal) those structures and components that are subject to an aging management review.

The process of identifying SSCs that fall within the scope of license renewal is called scoping. The process of identifying from within the list of SSCs in the scope of license renewal those structures and components that are subject to aging management review is called screening. In this section of the safety evaluation report, the NRC staff evaluates the adequacy of Entergy’s scoping and screening methodology in its River Bend Station, Unit 1 (RBS) license renewal application.

2.1.2 Summary of Technical Information in the Application

Entergy’s license renewal application (LRA) Section 2.0, “Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results,” provides the technical information required by 10 CFR 54.21(a), “An Integrated Plant Assessment (IPA).” LRA Section 2.0 states that Entergy considered the following in developing the scoping and screening methodology:

- 10 CFR Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants” (also called the License Renewal Rule)

- Nuclear Energy Institute (NEI) 95-10, Revision 6, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54—The License Renewal Rule,” dated June 2005

LRA Section 2.1, “Scoping and Screening Methodology,” describes the methodology used by Entergy to identify the SSCs at RBS within the scope of license renewal (scoping) and the structures and components (within the identified SSCs) subject to an aging management review (screening).

2.1.3 Scoping and Screening Program Review

The NRC staff evaluated Entergy’s scoping and screening methodology using the guidance in NUREG-1800, Revision 2, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants” (Standard Review Plan-License Renewal or SRP-LR), Section 2.1, “Scoping and Screening Methodology.” The following regulations provide the basis for the NRC staff’s acceptance criteria when evaluating the adequacy of an applicant’s scoping and screening methodology:

- 10 CFR 54.4(a) as it relates to the identification of SSCs within the scope of the License Renewal Rule

- 10 CFR 54.4(b) as it relates to the identification of the intended functions of SSCs within the scope of the License Renewal Rule

- 10 CFR 54.21(a) as it relates to the methods used by Entergy to screen the SSCs within the scope of license renewal to then identify those plant structures and components subject to an aging management review

The staff reviewed LRA Section 2.1 to confirm that Entergy described a process for (1) scoping or identifying SSCs that are within the scope of license renewal (in accordance with 10 CFR 54.4(a)) and for (2) screening or identifying structures and components within the identified SSCs that are subject to an aging management review (in accordance with 10 CFR 54.21(a)).

In addition, the NRC staff conducted a scoping and screening methodology audit at the RBS site (located in St. Francisville, LA) from October 23-27, 2017. During the audit, the staff focused on ensuring that Entergy had developed and implemented adequate guidance to conduct the scoping and screening of SSCs in accordance with the methodology in its LRA while also meeting the requirements of the License Renewal Rule. The staff reviewed the project-level guidelines, technical basis documents, and implementing procedures that describe Entergy's scoping and screening methodology. The staff conducted detailed discussions with Entergy on its implementation and control of the license renewal methodology, its quality practices during the LRA development, and its training of staff that participated in the LRA development.

On a sampling basis, the NRC staff also reviewed scoping and screening result reports and supporting current licensing basis (CLB) information. In addition, the staff performed walkdowns for portions of the fire protection water system (including the water-supply tanks, the electrically driven fire pump, diesel-driven fire pumps, jockey fire pump, fire water yard mains, hydrants, standpipe hose stations, system piping and valves, and corresponding structures) as a part of the sampling review of Entergy's implementation of its 10 CFR 54.4(a)(2) scoping methodology (i.e., Entergy's scoping methodology for identifying nonsafety-related SSCs whose failure could prevent the functioning of certain safety-related SSCs).

2.1.3.1 Implementation Procedures and Documentation Sources Used for Scoping and Screening

2.1.3.1.1 <u>Summary of Technical Information in the Application</u>

Entergy developed implementing procedures to (1) identify SSCs within the scope of license renewal and (2) identify structures and components within the identified SSCs that are subject to an aging management review (LRA Sections 2.0 and 2.1). Additionally, Entergy's implementing procedures provide guidance on the review and consideration of current licensing basis documentation sources, relative to the requirements of 10 CFR 54.4, "Scope," and 10 CFR 54.21, "Contents of Application—Technical Information."

LRA Section 2.1.1, "Scoping Methodology," lists the following as information sources that Entergy used to develop its license renewal scoping and screening process:

- updated safety analysis report (USAR)
- RBS equipment database
- system design criteria documents
- site plans
- plant area drawings
- fire hazards analysis
- post-fire shutdown analysis
- structural design requirement documents
- site station blackout report
- station drawings

2.1.3.1.2 Staff Evaluation

Scoping and Screening Implementation Procedures

The NRC staff reviewed Entergy's scoping and screening methodology implementing procedures (including license renewal guidelines, documents, and reports) to ensure that Entergy's procedures are consistent with the requirements of the License Renewal Rule, the guidance in the SRP-LR, and the guidance in Regulatory Guide (RG) 1.188, Revision 1, "Standard Format and Content for Applications to Renew Nuclear Plant Operating Licenses," dated September 2005 (RG 1.188 endorses the use of industry guidance document NEI 95-10). The staff determines that Entergy's scoping and screening methodology implementing procedures (including license renewal guidelines, documents, and reports) are consistent with the License Renewal Rule, the SRP-LR, and RG 1.188. The NRC staff documented its review of Entergy's scoping and screening methodology implementing procedures in an audit report, dated July 8, 2018, (see the Agencywide Documents Access and Management System (ADAMS) under Accession No. ML17348B142).

Entergy's scoping and screening implementing procedures contain guidance for (1) identifying SSCs within the scope of the License Renewal Rule and (2) identifying structures and components within those SSCs that are subject to an aging management review. During the review of Entergy's implementing procedures, the staff focused on the consistency of the detailed procedural guidance with information contained in the LRA, including the implementation of NRC staff positions documented in the SRP-LR. After reviewing the LRA and supporting documentation, the staff determines that the scoping and screening methodology implementing procedures are consistent with the methodology described in LRA Section 2.1. The staff also determines that the methodology is sufficiently detailed in the implementing procedures to provide Entergy's staff with concise guidance on the scoping and screening process for LRA activities.

Sources of Current Licensing Basis Information

For each structure or component determined to be subject to an aging management review, 10 CFR 54.21(a)(3) requires the applicant to, "demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation." The regulation at 10 CFR 54.3(a) defines the current licensing basis as:

> the set of NRC requirements applicable to a specific plant and a licensee's written commitments for ensuring compliance with and operation within applicable NRC requirements and the plant-specific design basis (including all modifications and additions to such commitments over the life of the license) that are docketed and in effect. The CLB includes the NRC regulations contained in 10 CFR parts 2, 19, 20, 21, 26, 30, 40, 50, 51, 52, 54, 55, 70, 72, 73, 100 and appendices thereto; orders; license conditions; exemptions; and technical specifications. It also includes the plant-specific design-basis information defined in 10 CFR 50.2 as documented in the most recent final safety analysis report (FSAR) as required by 10 CFR 50.71 and the licensee's commitments remaining in effect that were made in docketed licensing correspondence such as licensee responses to NRC bulletins, generic letters, and enforcement actions, as well as licensee commitments documented in NRC safety evaluations or licensee event reports.

The staff considered the scope and depth of Entergy's current licensing basis review to verify that Entergy's methodology is comprehensive enough to identify (1) SSCs within the scope of license renewal and to screen for (2) structures and components within those SSCs that are subject to an aging management review.

During the scoping and screening methodology audit, the NRC staff confirmed that Entergy's detailed license renewal program guidelines specify the use of the current licensing basis source information in developing scoping evaluations. The staff reviewed pertinent information sources that Entergy has used, including the USAR, the RBS equipment database, system design criteria documents, site plans, fire hazards analysis, post-fire shutdown analysis, structural design requirement documents, site station blackout report, and station drawings.

During the scoping and screening methodology audit, the staff also discussed Entergy's administrative controls for the RBS equipment database and the other information sources Entergy used to verify system information. These controls are described and implemented by plant procedures. Based on a review of the administrative controls and a sample of the system classification information contained in the applicable documentation, the NRC staff determined that Entergy has established adequate measures to control the integrity and reliability of system identification and safety classification data; therefore, the staff determines that the information sources Entergy used during the scoping and screening process provide a controlled source of system and component data to support scoping and screening evaluations.

In addition, the staff reviewed the implementing procedures and result reports that Entergy used to identify SSCs within the scope of license renewal (as defined by 10 CFR 54.4(a)). Entergy's license renewal program guidelines list documents that it used to support scoping evaluations. The staff determines that these documents provide sufficient information to ensure that Entergy could identify SSCs within the scope of license renewal consistent with the plant's current licensing basis.

2.1.3.1.3 Conclusion

Based on the NRC staff's review of LRA Section 2.0, Section 2.1, Section 2.1.1, and Entergy's scoping and screening implementing procedures, as well as the results from the NRC staff's scoping and screening audit, the NRC staff concludes that Entergy's use of implementing procedures and consideration of document sources, including current licensing basis information, is consistent with the License Renewal Rule, the SRP-LR, and RG 1.188.

Therefore, the NRC staff concludes that Entergy's scoping and screening implementation procedures and documentation sources are acceptable.

2.1.4 Plant Systems, Structures, and Components Scoping Methodology

LRA Section 2.1.1 describes Entergy's methodology for identifying SSCs within the scope of license renewal (consistent with the requirements of 10 CFR 54.4(a)). The LRA states that Entergy's scoping process identified SSCs that:

(1) are safety related and perform and support an intended function for responding to a design-basis event (DBE)

(2) are nonsafety-related but whose failure could prevent accomplishment of a safety-related function

(3) support a specific requirement for one of the regulated events applicable to license renewal

In addition, the LRA states that Entergy's scoping methodology was consistent with the regulations in 10 CFR Part 54 and with the industry guidance in NEI 95-10.

2.1.4.1 Application of Scoping Criteria in 10 CFR 54.4(a)(1): Safety-Related Systems, Structures, and Components

2.1.4.1.1 <u>Summary of Technical Information in the Application</u>

Entergy described the methods it used to identify SSCs within the scope of license renewal (in accordance with the requirements of 10 CFR 54.4(a)(1)) in LRA Section 2.1.1.1, "Application of Safety-Related Scoping Criteria," which states:

> The RBS equipment database maintains the controlled component-level list of quality classifications. Mechanical system safety functions were identified by reviews of the USAR, the SDCs [system design criteria], and the equipment database. Mechanical systems whose only safety-related components are electrical and [instrumentation and control] I&C components or structural components are not included in scope for 10 CFR 54.4(a)(1); however, the electrical and I&C components in the system are included in scope by default, and structural components are included in the structural evaluations.
>
> Structures with safety functions were identified by reviews of the USAR, site plans, plant area drawings, and structural design requirements documents. Structural safety functions include providing containment or isolation to mitigate post-accident offsite doses and providing support or protection to safety-related equipment. Structures with a safety function or that support or protect a safety-related component are included within the scope of license renewal on the basis of 10 CFR 54.4(a)(1). Structures and structural components that provide protection to safety-related equipment from external events and natural phenomena are included in the scope of license renewal on the basis of 10 CFR 54.4(a)(1).As described in Section 2.1.1 [of the LRA], plant electrical and I&C systems are included in the scope of license renewal by default.

2.1.4.1.2 Staff Evaluation

In accordance with 10 CFR 54.4(a)(1), the applicant must consider all safety-related SSCs relied on to remain functional during and following a design-basis event to ensure the following:

(1) the integrity of the reactor coolant pressure boundary

(2) the ability to shut down the reactor and maintain it in a safe shutdown condition

(3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to those referred to in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR Part 100.11, "Determination of Exclusion Area, Low Population Zone, and Population Center Distance," as applicable

With regard to identification of design-basis events, SRP-LR Section 2.1.3, "Review Procedures," states:

> The set of design basis events as defined in the rule is not limited to Chapter 15 (or equivalent) of the UFSAR. Examples of design basis events that may not be described in this chapter include external events, such as floods, storms, earthquakes, tornadoes, or hurricanes, and internal events, such as a high energy line break. Information regarding design basis events as defined in 10 CFR 50.49(b)(1) may be found in any chapter of the facility UFSAR, the Commission's regulations, NRC orders, exemptions, or license conditions within the CLB. These sources should also be reviewed to identify systems, structures, and components that are relied on to remain functional during and following design basis events (as defined in 10 CFR 50.49(b)(1)) to ensure the functions described in 10 CFR 54.4(a)(1).

During the NRC staff's audit, Entergy stated that it evaluated the types of events listed in NEI 95-10 (e.g., anticipated operational occurrences, design-basis accidents (DBAs), external events, and natural phenomena) that were applicable to RBS. The staff reviewed Entergy's basis documents that describe design-basis conditions in the current licensing basis and address events defined by 10 CFR 50.49(b)(1) and 10 CFR 54.4(a)(1). The USAR and basis documents discuss events, such as internal and external flooding, tornados, and missiles. The staff concludes that Entergy's evaluation of design-basis events is consistent with the SRP-LR.

The staff determined that Entergy performed scoping of SSCs for the 10 CFR 54.4(a)(1) criterion in accordance with its own license renewal implementing procedures, which provide guidance for the preparation, review, verification, and approval of the scoping evaluations to ensure the adequacy of the results of the scoping process. The NRC staff reviewed the implementing procedures governing Entergy's evaluation of safety-related SSCs and sampled Entergy's reports of the scoping results to ensure that Entergy applied the methodology in accordance with the implementing procedures. In addition, the NRC staff discussed the methodology and results with Entergy personnel who were responsible for these evaluations.

The staff reviewed LRA Section 2.1.1.1, which contains Entergy's evaluation of the License Renewal Rule and current licensing basis definitions pertaining to 10 CFR 54.4(a)(1). The staff determined that Entergy's current licensing basis definition of "safety related" meets the definition of "safety related" as defined in the License Renewal Rule.

The staff reviewed a sample of the license renewal scoping results for the portions of the fire protection water system (including the water-supply tanks, the electrically driven fire pump, diesel-driven fire pumps, jockey fire pump, fire water yard mains, hydrants, standpipe hose stations, system piping and valves, and corresponding structures) to provide additional assurance that Entergy adequately implemented its scoping methodology with respect to 10 CFR 54.4(a)(1).

The staff verifies that Entergy developed the scoping results for the sampled systems and structures consistently with the methodology, identified the SSCs credited for performing intended functions, and adequately described the basis for the results and the intended functions. The staff also confirms that Entergy identified and used pertinent engineering and licensing information to identify the SSCs required by 10 CFR 54.4(a)(1) to be within the scope of license renewal.

2.1.4.1.3 Conclusion

On the basis of the NRC staff's review of the LRA, Entergy's implementing procedures and reports, results from NRC staff's sampling basis, and discussions with Entergy, the staff concludes that Entergy's methodology for identifying safety-related SSCs that are relied on to remain functional during and following design-basis events and for including those SSCs within the scope of license renewal is in accordance with the requirements 10 CFR 54.4(a)(1). Therefore, the NRC staff concludes that Entergy's application of scoping criteria for identifying safety-related SSCs within the scope of license renewal is acceptable.

2.1.4.2 Application of the Scoping Criteria in 10 CFR 54.4(a)(2): Nonsafety-Related Systems, Structures, and Components

2.1.4.2.1 Summary of Technical Information in the Application

Entergy describes the methods it used to identify certain nonsafety-related SSCs within the scope of license renewal (as defined by 10 CFR 54.4(a)(2)) in LRA Section 2.1.1.2, "Application of Criterion for Nonsafety-Related SSCs Whose Failure Could Prevent the Accomplishment of Safety Functions," and LRA Section 2.1.2.1.2, "Identifying Components Subject to Aging Management Review Based on Support of an Intended Function for 10 CFR 54.4(a)(2)." Entergy identified the following three categories of nonsafety-related SSCs that fall within the scope of license renewal:

(1) Nonsafety-Related SSCs Providing Functional Support for Safety-Related SSC[s] 10 CFR 54.4(a)(1) Functions

LRA Section 2.1.1.2.1, "Function Failures of Nonsafety-Related SSCs," states that systems and structures required to perform a function to support a safety function are classified as safety related and have been included in the scope of license renewal (in accordance with 10 CFR 54.4(a)(1)). One nonsafety-related SSC supporting 10 CFR 54.4(a)(1) was identified—the plant drains system—which supports maintaining suppression pool inventory for use following a loss-of-coolant accident (LOCA), and was included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

(2) Nonsafety-Related SSCs Connected to and Providing Structural Support for Safety-Related SSCs

LRA Section 2.1.2.1.2, states the following:

> Appropriate flow diagrams for the systems were reviewed to identify safety-to-nonsafety interfaces. Piping isometrics were also used to identify seismic anchors and equivalent anchors (restraints or supports) when required to establish scope boundary. For each interface, the boundary was determined by one of the following:
>
> 1) The first seismic anchor, which is defined as a device or structure that ensures that forces and moments are restrained in three orthogonal directions.
>
> 2) An equivalent anchor (restraints or supports), which is defined as a boundary point that encompasses at least two supports in each of three orthogonal directions.
>
> 3) A boundary determined using the bounding approach, which included piping beyond the safety-to-nonsafety interface up to a flexible connection or the end of a piping run (such as a vent or drain line) or up to and including a base mounted component.

(3) Nonsafety-Related SSCs with the Potential for Spatial Interactions with Safety-Related SSCs

LRA Section 2.1.1.2.2, "Physical Failures of Nonsafety-Related SSCs," states:

> Moderate- and low-energy systems have the potential for spatial interactions of leakage or spray. Nonsafety-related systems and nonsafety-related portions of safety-related systems with the potential for leakage or spray that could prevent safety-related SSCs from performing their required safety function are in the scope of license renewal and subject to aging management review.

LRA Section 2.1.2.1.2 states:

> Walls, curbs, dikes, doors, etc., that provide flood barriers to safety-related SSCs are subject to aging management review based on the criteria of 10 CFR 54.4(a)(2) and 54.21(a). Missiles can be generated from internal or external events, such as failure of rotating equipment. Nonsafety-related design features that protect safety-related equipment from missiles require aging management review based on the criteria of 10 CFR 54.4(a)(2) and 54.21(a). Specific components in overhead handling systems are subject to aging management review based on the criteria of 10 CFR 54.4(a)(2) and 54.21(a).
>
> Nonsafety-related supports for non-seismic (including seismic II/I) piping systems and electrical conduit and cable trays with potential for spatial interaction with safety-related structures or components (SCs) are subject to aging management review based on the criteria of 10 CFR 54.4(a)(2) and 54.21(a).

In addition, LRA Section 2.1.2.1.2 states:

Nonsafety-related portions of high-energy lines were evaluated against the criterion of 10 CFR 54.4(a)(2). Documents reviewed included the USAR and other relevant site documentation. High-energy systems were evaluated to ensure identification of components that are part of nonsafety-related high-energy lines that can affect safety-related equipment.

If a HELB analysis assumes that a nonsafety-related piping system does not fail or assumes failure only at specific locations, then that piping system is within the scope of license renewal per 10 CFR 54.4(a)(2) and subject to aging management review in order to provide reasonable assurance that those assumptions remain valid through the period of extended operation.

2.1.4.2.2 Staff Evaluation

As stated in 10 CFR 54.4(a)(2), the applicant must consider all nonsafety-related SSCs whose failure could prevent satisfactory accomplishment of safety-related SSCs relied on to remain functional during and following a design-basis event to ensure (1) the integrity of the reactor coolant pressure boundary, (2) the ability to shut down the reactor and maintain it in a safe shutdown condition, or (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures, comparable to those referred to in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR Part 100.11, as applicable.

Regulatory Guide 1.188, Revision 1, endorses the use of industry guidance document NEI 95-10, Revision 6. NEI 95-10 discusses the implementation of the NRC staff's position on 10 CFR 54.4(a)(2) scoping criteria, to include nonsafety-related SSCs that may have the potential to prevent satisfactory accomplishment of safety-related intended functions. This includes nonsafety-related SSCs connected to safety-related SSCs, nonsafety-related SSCs in proximity to safety-related SSCs, and mitigative and preventive options related to nonsafety-related and safety-related SSCs interactions. LRA Section 1.5, "Application Structure," states that Entergy's methodology is consistent with the guidance contained in Revision 6 to NEI 95-10, Appendix F, "Industry Guidance on Revised 54.4(A)(2) Scoping Criteria (Non-Safety Affecting Safety)."

In addition, the staff's position (as discussed in SRP-LR Section 2.1.3.1.2, "Nonsafety-Related," scoping review procedures) is that applicants should not consider hypothetical failures but rather should base their evaluation on the plant's current licensing basis, engineering judgment and analyses, and relevant operating experience. NEI 95-10 further describes operating experience as all documented plant-specific and industrywide experience that can be used to determine the plausibility of a failure. Such documentation would include NRC generic communications and event reports, plant-specific condition reports, industry reports (such as safety operational event reports), and engineering evaluations. The staff reviewed LRA Section 2.1.1.2 in which Entergy described its scoping methodology for identifying nonsafety-related SSCs that fall within the scope of license renewal according to the regulations in 10 CFR 54.4(a)(2). In addition, the staff reviewed Entergy's implementing procedure and results report, which document the guidance and corresponding results of Entergy's scoping review for identifying nonsafety-related SSCs (in accordance with 10 CFR 54.4(a)(2)).

Nonsafety-Related SSCs Required to Perform a Function that Supports a Safety-Related SSC

The staff reviewed LRA Section 2.1.1.2 , LRA Section 2.1.1.2.1, and Entergy's 10 CFR 54.4(a)(2) implementing procedure for identifying nonsafety-related SSCs that are required to perform a function that supports a safety-related SSC intended function (in accordance with 10 CFR 54.4(a)(2)). The staff confirms that Entergy reviewed the USAR, plant drawings, the RBS equipment database, and other current licensing basis documents to identify the nonsafety-related SSCs that function to support a safety-related system whose failure could prevent the performance of a safety-related intended function. The staff determined that Entergy identified the nonsafety-related SSCs that perform a safety function or support a safety system that would be required to be included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

The staff determined that Entergy's methodology for identifying nonsafety-related SSCs that perform functions that support safety-related intended functions and inclusion of them within the scope of license renewal is in accordance with the guidance of the SRP-LR and the requirements of 10 CFR 54.4(a)(2).

<u>Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs</u>

The staff reviewed LRA Section 2.1.1.2, LRA Section 2.1.1.2.2, LRA Section 2.1.2.1.2, and Entergy's 10 CFR 54.4(a)(2) implementing procedure for identifying nonsafety-related SSCs that are directly connected to safety-related SSCs (to be placed within the scope of license renewal in accordance with 10 CFR 54.4(a)(2)). Entergy had reviewed the safety-related-to-nonsafety-related interfaces for each mechanical system to identify the nonsafety-related components located between the safety- to nonsafety-related interface and license renewal structural boundary.

The staff determined that Entergy used a combination of the following to identify the portion of nonsafety-related piping systems to include within the scope of license renewal:

- seismic anchors
- equivalent anchors
- bounding conditions described in Revision 6 to NEI 95-10, Appendix F (base-mounted component, flexible connection, or the end of the piping run)

The staff determined that Entergy's methodology for identifying nonsafety-related SSCs directly connected to safety-related SSCs and inclusion of them within the scope of license renewal is in accordance with the guidance of the SRP-LR and the requirements of 10 CFR 54.4(a)(2).

<u>Nonsafety-Related SSCs with the Potential for Spatial Interaction with Safety-Related SSCs</u>

The staff reviewed LRA Section 2.1.1.2, LRA Section 2.1.1.2.2, LRA Section 2.1.2.1.2, and Entergy's 10 CFR 54.4(a)(2) implementing procedure for identifying nonsafety-related SSCs with the potential for spatial interaction with safety-related SSCs, and for including those SSCs within the scope of license renewal (in accordance with 10 CFR 54.4(a)(2)).

The staff determined that Entergy used a spaces approach to identify the portions of nonsafety-related systems with the potential for spatial interaction with safety-related SSCs. The spaces approach focused on the interaction between nonsafety-related and safety-related SSCs that are located in the same space, which was described in the LRA as a structure or a portion of a structure that contains active or passive safety-related SSCs. Additionally, Entergy identified nonsafety-related mitigating features, such as pipe conduits or separation by a surface providing spray and drip shielding, which protected safety-related SSCs from the failure of nonsafety-related SSCs. Entergy included the nonsafety-related mitigating features within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

The staff determined that Entergy's methodology for identifying nonsafety-related SSCs that have the potential for spatial interaction with safety-related SSCs, and for inclusion of these within the scope of license renewal was in accordance with the guidance of the SRP-LR and the requirements of 10 CFR 54.4(a)(2).

2.1.4.2.3 Conclusion

The NRC staff reviewed the LRA, Entergy's implementing procedures and reports, and results on a sampling basis and held discussions with Entergy. Based on the above, the staff concludes that Entergy's methodology for identifying nonsafety-related SSCs whose failure could prevent satisfactory accomplishment of the intended functions of safety-related SSCs, and inclusion of these within the scope of license renewal, is in accordance with the requirements of 10 CFR 54.4(a)(2). Therefore, the staff concludes that Entergy's methodology is acceptable.

2.1.4.3 Application of the Scoping Criteria in 10 CFR 54.4(a)(3)

2.1.4.3.1 Summary of Technical Information in the Application

In the LRA, Entergy addresses the methods it used to identify SSCs included within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(3).

LRA Section 2.1.1.3, "Application of Criterion for Regulated Events," states:

> The scope of license renewal includes those systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61) [not applicable to RBS, a BWR], anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63).

2.1.4.3.2 Staff Evaluation

The staff reviewed LRA Section 2.1.1.3 and associated subsections, which describe Entergy's method to identify and include within the scope of license renewal those SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for the following:

- fire protection (10 CFR 50.48, "Fire Protection")
- environmental qualification (10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants")
- pressurized thermal shock (10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events")

- anticipated transients without scram (10 CFR 50.62, “Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants”)

- station blackout (10 CFR 50.63, “Loss of All Alternating Current Power”)

The staff notes that because RBS is a BWR, the regulations of 10 CFR 50.61, “Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events,” do not apply to RBS.

The staff reviewed Entergy’s implementing procedures and technical basis document that describe its method for identifying SSCs within the scope of license renewal in accordance with 10 CFR 54.4(a)(3). The implementing procedures describe a process that considered current licensing basis information (including the USAR), applicable portions of the LRA, and license renewal drawings to verify that the appropriate SSCs were included within the scope of license renewal.

During the scoping and screening methodology audit, the staff had discussions with Entergy and reviewed implementing procedures, license renewal drawings, and selected scoping results reports. The staff determined that Entergy evaluated current licensing basis information to identify SSCs that perform functions addressed in 10 CFR 54.4(a)(3) and included these SSCs within the scope of license renewal as documented in the scoping reports. In addition, the staff determined that the scoping report results referenced the information sources Entergy used to determine the SSCs credited for compliance with the specified events. Based on its review of the current licensing basis documents and certain sample reports, the staff determined that Entergy’s methodology is adequate for identifying and including SSCs credited in performing functions within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)(3).

2.1.4.3.3 <u>Conclusion</u>

On the basis of the NRC staff’s review of the LRA, review of Entergy’s implementing procedures and reports, results from a sampling basis, and discussions with Entergy, the staff concludes that Entergy’s methodology for identifying and including SSCs, which are relied on to remain functional during the specified events, is consistent with the requirements of 10 CFR 54.4(a)(3). Therefore, the NRC staff finds Entergy’s methodology acceptable.

2.1.4.4 Scoping of Systems and Structures

2.1.4.4.1 <u>Summary of Technical Information in the Application</u>

LRA Section 2.1.1 states:

> NEI 95-10 provides industry guidance for determining what SSCs are within the scope of license renewal. The process used to determine the systems and structures within the scope of license renewal for RBS followed the recommendations of NEI 95-10.
>
> Consistent with NEI 95-10, the scoping process developed a list of plant systems and structures and identified their intended functions. Intended functions are those functions that are the basis for including a system or structure within the

> scope of license renewal (as defined in 10 CFR 54.4(b)) and are identified by comparing the system or structure function with the criteria in 10 CFR 54.4(a).
>
> The RBS equipment database and the site procedure for system and equipment designations were used to identify the system codes in use at the plant. The equipment database is a controlled list of plant components, with each component assigned to one plant system code.

LRA Section 2.1.1 further states, relative to mechanical scoping:

> For mechanical system scoping, a system is defined as the collection of mechanical components with that system code in the component database. While some structural commodities, such as racks and panels, are included in the equipment database and assigned system codes, these components are evaluated with the structural bulk commodities.

LRA Section 2.1.1 further states, relative to structural scoping:

> As the starting point for structural scoping, a list of plant structures was developed from a review of the USAR, site plans, plant area drawings, the fire hazards analysis, and structural design requirements documents. Structures performing an intended function in accordance with 10 CFR 54.4(a)(1) were identified first, and then those structures that potentially support plant operations or could adversely impact structures that support plant operations (i.e., seismic II/I, station blackout) were addressed. In addition to buildings and facilities, the identified structures include other components and commodities that support plant operation (e.g., foundations for freestanding tanks and electrical manholes).

LRA Section 2.1.1 further states, relative to electrical scoping:

> For the purposes of system level scoping described in this report, plant electrical and instrumentation and control (I&C) systems and electrical and I&C components in mechanical systems are included in the scope of license renewal by default. Intended functions for electrical and I&C systems are not identified since the bounding scoping approach makes it unnecessary to determine if an electrical and I&C system has an intended function. Switchyard equipment, not normally considered part of the plant's electrical and I&C systems, was reviewed for station blackout (SBO) intended functions based on NRC guidance.

2.1.4.4.2 Staff Evaluation

To verify that Entergy met the requirements of 10 CFR 54.4(a) for identifying SSCs within the scope of license renewal, the NRC staff reviewed LRA Section 2.1.1 and its subsections. LRA Section 2.1.1 describes Entergy's methodology for identifying SSCs within the scope of license renewal. Entergy developed implementing procedures to (1) identify the systems and structures that are subject to 10 CFR 54.4 license renewal review, (2) determine whether the system or structure performed its intended functions consistent with the criteria of 10 CFR 54.4(a), and (3) document the activities in scoping results reports. Entergy's process defined the plant in terms of systems and structures, and Entergy personnel completed the process for all onsite systems and structures thus ensuring that it had assessed the entire plant.

The NRC staff determined that Entergy identified the SSCs within the scope of license renewal and documented the results of the scoping process in reports in accordance with Entergy's implementing procedures. The reports included a description of the structure or system, a listing of functions performed by the system or structure, identification of intended functions, the 10 CFR 54.4(a) scoping criteria met by the system or structure, references, and the basis for the classification of the system or structure's intended functions.

During the audit, the NRC staff reviewed a sampling of the implementing procedures, documents, and reports and determined that Entergy's scoping results contained an appropriate level of detail for documenting the scoping process. The staff reviewed LRA Section 2.1.1 and subsections, implementing procedures, reports, and the current licensing basis source information associated with identifying SSCs within the scope of license renewal. The staff determined that Entergy's current licensing basis source information and implementing procedure guidance are acceptable for identifying SSCs within the scope of license renewal. During the scoping and screening methodology audit, the staff conducted detailed discussions with Entergy's license renewal project personnel and reviewed documentation pertinent to the scoping process. The staff assessed whether Entergy appropriately applied the scoping methodology outlined in the LRA and implementing procedures and whether the scoping results were consistent with current licensing basis requirements. The staff determined that Entergy's process was (1) consistent with the description in LRA Section 2.1 and subsections, (2) consistent with the guidance in SRP-LR Section 2.1, and (3) adequately implemented.

Mechanical Scoping

On a sampling basis, the NRC staff reviewed Entergy's scoping reports for the fire protection water system (including the water-supply tanks, the electrically driven fire pump, diesel-driven fire pumps, jockey fire pump, fire water yard mains, hydrants, standpipe hose stations, system piping and valves) and reviewed Entergy's process for determining whether the system and components met the scoping criteria of 10 CFR 54.4(a). The staff reviewed the implementing procedures, verified that Entergy used pertinent engineering and licensing information, and discussed the methodology and results with Entergy. As part of the review process, the staff evaluated the system's documented intended functions and Entergy's process for identifying system component types. The staff verified that Entergy identified and highlighted license renewal drawings in order to identify the license renewal boundaries in accordance with the implementing procedure guidance. Additionally, the staff determined that Entergy verified the results in accordance with the implementing procedures. The staff confirmed that Entergy's license renewal personnel who verified the results had performed independent reviews of the scoping reports and the applicable license renewal drawings. The staff confirmed that Entergy evaluated its identified systems and components against the criteria of 10 CFR 54.4(a)(1), (a)(2), and (a)(3). The staff verified that Entergy used pertinent engineering and licensing information to determine mechanical SSCs that it identified as within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a).

Structural Scoping

On a sampling basis, the NRC staff reviewed Entergy's scoping reports for the fire protection water system's corresponding structures, the fire pump house and fire protection storage tanks foundations, and the process Entergy used to identify structures and components that met the scoping criteria of 10 CFR 54.4(a). The staff reviewed the implementing procedures, verified that Entergy used pertinent engineering and licensing information, and discussed the methodology and results with Entergy. As part of the review process, the staff evaluated the structure's documented intended functions and the process Entergy used to identify structural component types. Additionally, the staff determined that Entergy verified the results in accordance with the implementing procedures. The staff confirmed that Entergy license renewal personnel who verified the results had performed independent reviews of the scoping reports and the applicable license renewal drawings. The staff confirmed that the structures and components that Entergy identified were evaluated against the criteria of 10 CFR 54.4(a)(1), (a)(2), and (a)(3). The staff determined that Entergy used pertinent engineering and licensing information to identify the structures and include them within the scope of license renewal (in accordance with the requirements of 10 CFR 54.4(a)).

Electrical Scoping

The staff determined that Entergy included in the scope of license renewal (1) electrical and instrumentation and controls systems and (2) electrical and instrumentation and controls components in mechanical or structural systems. Entergy categorized the in-scope electrical components into electrical commodity groups. Commodity groups include electrical and instrumentation and controls components with common characteristics. Entergy identified component-level intended functions of the component types. As part of this review, the staff discussed the methodology with Entergy, reviewed the implementing procedures Entergy developed to support the review, and reviewed the scoping results for a sample of SSCs identified by Entergy as within the scope of license renewal. The staff determined that Entergy used pertinent engineering and licensing information to identify electrical and instrumentation and controls components, as well as electrical and instrumentation and controls components contained in mechanical or structural systems and included these within the scope of license renewal on a commodity basis (in accordance with the requirements of 10 CFR 54.4(a)).

2.1.4.4.3 Conclusion

Based on its review of the LRA and implementing procedures as well as a sampling review of scoping results, the NRC staff concludes that Entergy's scoping methodology is consistent with the guidance in the SRP-LR and effectively identified those SSCs (1) that are safety related, (2) whose failure could affect safety-related intended functions, and (3) that are necessary to demonstrate compliance with the NRC staff's regulations for fire protection, environmental qualification, anticipated transients without scram, and station blackout. The staff concludes that Entergy's methodology is consistent with the requirements of 10 CFR 54.4(a) and, therefore, is acceptable.

2.1.5 Screening Methodology

2.1.5.1 Summary of Technical Information in the Application

LRA Section 2.1.2, "Screening Methodology," describes Entergy's methods for identifying structures and components within the scope of license renewal that are also subject to an aging management review (in accordance with the requirements of 10 CFR 54.21, "Contents of Application—Technical Information"). LRA Section 2.1.2 states, in part:

> NEI 95-10 provides industry guidance for screening structures and components to identify the passive, long-lived structures and components that support an intended function. The screening process for RBS followed the recommendations of NEI 95-10.

> Within the group of systems and structures that are in scope, passive long-lived components or structural elements that perform intended functions require aging management review. Components or structural elements that support an intended function do not require aging management review if they are either active or subject to replacement based on a qualified life or specified time period.

2.1.5.2 Staff Evaluation

In accordance with 10 CFR 54.21, each LRA must contain an integrated plant assessment that identifies structures and components that are within the scope of license renewal and that are also subject to an aging management review. The integrated plant assessment must identify components that perform an intended function without moving parts or a change in configuration or properties (passive), as well as components that are not subject to periodic replacement based on a qualified life or specified time period (long lived). In addition, the integrated plant assessment must describe and justify Entergy's methodology for identifying passive and long-lived structures and components. Finally, the integrated plant assessment must demonstrate that Entergy will adequately manage the effects of aging on those structures and components so that the intended function or functions will be maintained under all design conditions imposed by the plant-specific current licensing basis for the period of extended operation.

The staff reviewed LRA Section 2.1.2, which describes Entergy's methodology for identifying the mechanical, structural, and electrical structures and components within the scope of license renewal that are subject to an aging management review. Entergy implemented a process for determining which structures and components were subject to an aging management review (in accordance with the requirements of 10 CFR 54.21(a)(1)). The staff determined that Entergy's screening process evaluated the component types and commodity groups included within the scope of license renewal to determine which ones were long lived and passive and, therefore, subject to an aging management review. The staff reviewed, on a sampling basis, the screening results reports for fire protection water system and associated structures. Entergy provided the staff with a detailed discussion of the processes it used for each engineering discipline and also provided administrative documentation describing its screening methodology.

<u>Mechanical</u>

The staff reviewed Entergy's methodology for mechanical component screening as described in LRA Section 2.1.2, implementing procedures, basis documents, and the mechanical scoping and screening reports. The staff determined that Entergy used the screening process described in the above documents along with the information contained in NEI 95-10, Appendix B, "Typical Structure, Component and Commodity Groupings and Active/Passive Determinations for the Integrated Plant Assessment," and the SRP-LR to identify the mechanical structures and components subject to an aging management review.

The staff determined that Entergy identified structures and components that met the passive criteria in accordance with the guidance contained in NEI 95-10. In addition, the staff determined that Entergy evaluated the identified passive commodities to determine that they were not subject to replacement based on a qualified life or specified time period (long lived) and that the remaining passive, long-lived components were subject to an aging management review.

The staff performed a sample review to determine whether Entergy adequately implemented its LRA screening methodology and procedures. The staff reviewed the fire water system screening report and basis documents, conducted discussions with Entergy, and verified proper implementation of the screening process.

Structural

The staff reviewed Entergy's methodology for structural component screening as described in LRA Section 2.1.2, implementing procedures, basis documents, and the structural scoping and screening reports. The staff determined that Entergy used the screening process described in the above documents along with the information contained in NEI 95-10, Appendix B and the SRP-LR to identify the structural structures and components subject to an aging management review.

The staff determined that Entergy identified structural components that met the passive criteria in accordance with NEI 95-10. In addition, the staff determined that Entergy evaluated the identified passive commodities to determine that they were not subject to replacement based on a qualified life or specified time period (long lived) and that the remaining passive, long-lived components were determined to be subject to an aging management review.

The staff performed a sample review to determine whether Entergy adequately implemented its LRA screening methodology and procedures. The staff reviewed the fire water system's associated structures screening report and basis documents, had discussions with Entergy, and verified proper implementation of the screening process.

Electrical

The staff reviewed Entergy's methodology for electrical component screening as described in LRA Section 2.1.2, implementing procedures, basis documents, and the electrical scoping and screening reports. The staff confirms that Entergy used the screening process described in the above documents along with the information contained in NEI 95-10, Appendix B and the SRP-LR to identify the electrical SSCs subject to an aging management review.

The staff determined that Entergy identified electrical commodity groups that met the passive criteria in accordance with NEI 95-10. In addition, the staff determined that Entergy evaluated the identified passive commodities to determine which ones were not subject to replacement based on a qualified life or specified time period (long lived) and that the remaining passive, long-lived components were determined to be subject to an aging management review.

The staff performed a sample review to determine whether Entergy adequately implemented its LRA screening methodology and procedures. During the scoping and screening methodology audit, the staff reviewed electrical screening reports and basis documents, had discussions with Entergy, and verified proper implementation of the screening process.

2.1.5.3 Conclusion

Based on its review of the LRA, the screening implementing procedures, discussions with Entergy personnel, and a sample review of screening results, the NRC staff concludes that Entergy's screening methodology is consistent with the guidance in the SRP-LR and identified those passive, long-lived components within the scope of license renewal that are subject to an aging management review. The staff concludes that Entergy's methodology is consistent with the requirements of 10 CFR 54.21(a)(1) and, therefore, is acceptable.

2.1.6 Summary of Evaluation Findings

On the basis of NRC staff's review of LRA Section 2.1, the supporting information in Entergy's scoping and screening implementing procedures and reports, the scoping and screening methodology audit, discussions with Entergy, and sample system reviews, the staff concludes that Entergy's scoping and screening methodology is consistent with the requirements of 10 CFR 54.4, "Scope," and 10 CFR 54.21(a)(1). The staff also concludes that Entergy's description and justification of its scoping and screening methodology are adequate to meet the requirements of 10 CFR 54.21(a)(1). From this review, the staff concludes that Entergy's methodology for identifying SSCs within the scope of license renewal and structures and components subject to an aging management review is acceptable.

2.2 Plant-Level Scoping Results

2.2.1 Introduction

In Section 2.1 of the RBS license renewal application, Entergy described its methodology for identifying systems, structures, and components within the scope of license renewal and subject to an aging management review. In Section 2.2 of the LRA, Entergy used the scoping methodology to determine which systems, structures, and components must be included within the scope of license renewal. The NRC staff reviewed Entergy's plant-level scoping results to determine whether Entergy properly identified the following:

- all systems and structures relied upon to mitigate design-basis events (as required by 10 CFR 54.4(a)(1))

- all systems and structures the failure of which could prevent satisfactory accomplishment of any safety-related functions (as required by 10 CFR 54.4(a)(2))

- all systems and structures relied on in safety analyses or plant evaluations to perform functions required by regulations referenced in 10 CFR 54.4(a)(3)

2.2.2 Summary of Technical Information in the Application

In LRA Table 2.2-1, Entergy lists plant mechanical systems within the scope of license renewal. In LRA Table 2.2-2, Entergy lists the structures that are within the scope of license renewal. In LRA Table 2.2-3, Entergy lists plant electrical and instrumentation and controls systems within the scope of license renewal. Based on the design-basis events considered in the plant's current licensing basis, other current licensing basis information relating to nonsafety-related systems and structures, and certain regulated events, Entergy identified plant-level systems and structures within the scope of license renewal as defined by 10 CFR 54.4.

2.2.3 Staff Evaluation

Section 2.1 of this safety evaluation report contains the NRC staff's review and evaluation of Entergy's scoping and screening methodology. To verify that Entergy properly implemented its methodology, the staff's review focused on the implementation results shown in

LRA Tables 2.2-1, 2.2-2, and 2.2-3 to confirm that Entergy did not omit any plant-level systems and structures within the scope of license renewal.

The staff determined that Entergy properly identified the systems and structures within the scope of license renewal in accordance with 10 CFR 54.4. The staff reviewed selected systems and structures that Entergy had not identified as within the scope of license renewal to verify whether these systems and structures have any intended functions requiring their inclusion within the scope of license renewal. The staff conducted its review of Entergy's implementation in accordance with the guidance in NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," Section 2.2, "Plant-Level Scoping Results."

The staff sampled the contents of the USAR based on the systems and structures listed in Tables 2.2-1, 2.2-2, and 2.2-3 of the LRA. Staff sought to determine if there were any systems or structures that may have intended functions within the scope of license renewal (as defined by 10 CFR 54.4) that Entergy had omitted from the scope of license renewal. The staff identifies no such omissions.

2.2.4 Conclusion

The NRC staff reviewed LRA Section 2.2 and the USAR supporting information to determine whether Entergy failed to identify any systems and structures within the scope of license renewal. The staff finds no such omissions. Based on its review, the staff concludes that there is reasonable assurance that Entergy has adequately identified (in accordance with 10 CFR 54.4) the systems and structures within the scope of license renewal.

2.3 Scoping and Screening Results: Mechanical Systems

This section documents the NRC staff's review of Entergy's scoping and screening results for mechanical systems. Specifically, this section discusses:

- reactor coolant systems
- engineered safety features
- auxiliary systems
- steam and power conversion systems

In accordance with the requirements of 10 CFR 54.21(a)(1), license renewal applicants must list passive, long-lived structures and components within the scope of license renewal that are subject to an aging management review. To verify that Entergy properly implemented the methodology it established to identify such passive, long-lived structures and components, the staff's review focused on Entergy's implementation results. This focus allows the staff to confirm that there were no omissions of mechanical system components that meet the scoping criteria and are subject to an aging management review.

The staff's evaluation of the information in the River Bend Station LRA was the same for all mechanical systems. The staff's objective is to determine whether Entergy identified, in accordance with 10 CFR 54.4, components and supporting structures for mechanical systems that appear to meet the license renewal scoping criteria. Similarly, the staff evaluated Entergy's screening results to verify that all passive, long-lived structures and components were subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

In its scoping evaluation, the staff reviewed the LRA, applicable sections of the USAR, license renewal boundary drawings, and other licensing basis documents, as appropriate, for each mechanical system within the scope of license renewal. The staff reviewed relevant licensing basis documents for each mechanical system to confirm that the LRA specified all intended functions defined by 10 CFR 54.4(a). The review then focused on identifying any components with intended functions defined by 10 CFR 54.4(a) that the applicant may have omitted from the scope of license renewal.

After reviewing Entergy's scoping results, the staff evaluated Entergy's screening results. For those structures and components with intended functions, the staff sought to determine whether:

(1) The functions are performed with moving parts or a change in configuration or properties.

(2) The structures and components are subject to replacement after a qualified life or specified time period, as described in 10 CFR 54.21(a)(1).

For structures and components that do not meet either of the above two criteria, the staff sought to confirm that Entergy had identified those structures and components as being subject to an aging management review, as required by 10 CFR 54.21(a)(1). The staff issued a request for additional information (RAI) to Entergy, to resolve any omissions or discrepancies that it identified.

2.3.1 Reactor Coolant Systems

LRA Section 2.3.1 identifies the reactor vessel (RV), internals, and reactor coolant system (RCS) structures and components subject to an aging management review for license renewal. It describes the supporting structures and components of the reactor vessel, internals, and reactor coolant system in the following LRA sections:

- LRA Section 2.3.1.1, "Reactor Pressure Vessel and Internals"
    - LRA Section 2.3.1.1.1, "Reactor Pressure Vessel and Appurtenances"
    - LRA Section 2.3.1.1.2, "Reactor Vessel Internals"
- LRA Section 2.3.1.2, "Reactor Coolant Pressure Boundary"
- LRA Section 2.3.1.3, "Nuclear Boiler Instrumentation"
- LRA Section 2.3.1.4, "Reactor Recirculation"
- LRA Section 2.3.1.5, "Remote Shutdown"
- LRA Section 2.3.1.6, "Reactor Protection"
- LRA Section 2.3.1.7, "Reactor Coolant Systems in Scope for 10 CFR 54.4(a)(2)"

The NRC staff reviewed LRA Section 2.3.1.1 through Section 2.3.1.7, and documents its findings in Section 2.3.1.1 through Section 2.3.1.7 of this safety evaluation report.

2.3.1.1 Reactor Pressure Vessel and Internals

2.3.1.1.1 Summary of Technical Information in the Application

This section discusses reactor pressure vessel and internals systems in LRA Section 2.3.1.1, "Reactor Pressure Vessel and Internals."

2.3.1.1.2 Staff Evaluation

The NRC staff reviewed LRA Section 2.3.1.1, applicable USAR sections, and license renewal boundary drawings using the evaluation methodology in safety evaluation report (SER) Section 2.3 and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems."

The NRC staff evaluated the reactor pressure vessel (RPV) and internals functions to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The NRC staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review in accordance with the requirements of 10 CFR 54.21(a)(1).

During its review, the NRC staff determined that in order to complete the review, the staff needed clarifications about the scoping assessment for portions of the standby liquid control (SLC) system. Specifically, the staff determined that in Entergy's response to Applicant Action Item (AAI) No. 4 of ERPI Report No. 1007279, "BWR Standby Liquid Control System/Core Plate ∆P Inspection and Flaw Evaluation Guidelines" (henceforth designated as BWRVIP-27-A). (See ADAMS Accession No. ML04170046 for the NRC verification letter of approval.) Entergy had used the report as a basis for claiming that the internal portions of the SLC line did not serve a license renewal intended function and therefore did not need to be included in the scope of license renewal in accordance with 10 CFR 54.4(a).

The design-basis information in Section 9.3.5 of the USAR states that the standby liquid control system (SLCS) is designed to meet the anticipated transient without scram requirements of 10 CFR 50.62, "Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants," and to shut down the reactor and keep the reactor from going critical again as it cools. Page 9.3–30 of the USAR also states that the borated liquid in the SLC lines "is piped into the reactor vessel and discharged near the bottom of the core, so it mixes with the cooling water rising through the core." Based on this USAR information, the NRC staff noted that the scope of the license renewal may need to include internal portions of the SLC line. Therefore, for the scoping basis and review of this applicant action item response, the NRC staff needed additional information. As a result, the NRC staff issued request for additional information RAI B.1.10-2, on February 8, 2018 (see ADAMS Accession No. ML18043A008). RAI B.1.10-2 addresses the issue of boron mixing in the core during SLC injection (see ADAMS Accession No. ML18087A188 for RAI B.1.10-2 as well as Entergy's response).

RAI B.1.10-2

In its response to RAI B.1.10-2, dated March 26, 2018, Entergy reiterated its position that the internal portions of the SLC lines do not need to be within the scope of the LRA, subject to an aging management review, or age managed because the internal portions of the lines do not serve a license renewal-intended, safe-shutdown function. Entergy stated that the NRC-approved basis in BWRVIP-27-A demonstrates that, upon initiation of the SLC system, adequate uniform mixing of the boron-10 (B-10) solution into the reactor core would occur even if the internal portions of SLC lines were to fail inside of the reactor. The NRC staff considered Entergy's response and also noted that USAR Section 9.3.5.3 (page 9.3-33a) indicates that at RBS, an additional 25% by weight B-10 was added into the required B-10 solution concentration in order to account for potential imperfect boron mixing during initiation of the SLC system.

Based on the results of (1) the NRC-approved report BWRVIP-27-A demonstrating adequate boron uniform mixing for conditions where the portions of SLC lines inside of the reactor were assumed to fail, and (2) the SLC design basis discussed at USAR page 9.3-33a (including the 25% by weight B-10 added to the required B-10 solution concentration to account for potential imperfect boron mixing during initiation of the SLC system), the NRC staff determined that Entergy adequately supported its position that the internal portions of the SLC line do not need to serve an intended function of providing uniform boron mixing in the core. Therefore, the NRC staff concludes that the internal portions of the SLC line do not need to be within the scope of the LRA, subject to an aging management review, or age managed; thus, NRC staff considers RAI B.1.10-2 to be satisfactorily resolved and closed.

2.3.1.1.3 Conclusion

Based on the NRC staff's evaluation above (SER Section 2.3.1.1.2) and its review of the LRA, USAR, license renewal boundary drawings, and RAI responses, the staff concludes that Entergy has appropriately identified the mechanical components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.1.2 Reactor Coolant Pressure Boundary

2.3.1.2.1 Summary of Technical Information in the Application

This section discusses reactor coolant pressure boundary systems in LRA Section 2.3.1.2, "Reactor Coolant Pressure Boundary."

2.3.1.2.2 Staff Evaluation

The NRC staff reviewed LRA Section 2.3.1.2, applicable sections of the USAR, and license renewal boundary drawings using the NRC staff's evaluation methodology in SER Section 2.3 and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems."

The NRC staff evaluated the reactor coolant pressure boundary functions to verify that Entergy has included within the scope of license renewal all components with intended functions described in 10 CFR 54.4(a). The NRC staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that it has included all passive and long-lived components subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

2.3.1.2.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.1.2.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the NRC staff concludes that Entergy has appropriately identified the mechanical components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.1.3 Nuclear Boiler Instrumentation

2.3.1.3.1 Summary of Technical Information in the Application

This section discusses nuclear boiler instrumentation systems in the LRA Section 2.3.1.3, "Nuclear Boiler Instrumentation."

2.3.1.3.2 Staff Evaluation

The NRC staff reviewed LRA Section 2.3.1.3, the applicable sections of the USAR, and license renewal boundary drawings using the NRC staff's evaluation methodology in SER Section 2.3 and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping And Screening Results: Mechanical Systems."

The NRC staff evaluated the nuclear boiler instrumentation functions to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The NRC staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

2.3.1.3.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.1.3.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the nuclear boiler instrumentation system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.1.4 Reactor Recirculation

2.3.1.4.1 Summary of Technical Information in the Application

This section discusses reactor recirculation systems in LRA Section 2.3.1.4, "Reactor Recirculation."

2.3.1.4.2 Staff Evaluation

The NRC staff reviewed LRA Section 2.3.1.4, and the applicable sections of the USAR and license renewal boundary drawings using the NRC evaluation methodology in SER Section 2.3 and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping And Screening Results: Mechanical Systems."

The NRC staff evaluated the reactor recirculation functions to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The NRC staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that it included all passive and long-lived components subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

2.3.1.4.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.1.4.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the reactor recirculation system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.1.5 Remote Shutdown

2.3.1.5.1 Summary of Technical Information in the Application

This section discusses remote shutdown systems in the LRA Section 2.3.1.5, "Remote Shutdown."

2.3.1.5.2 Staff Evaluation

The NRC staff reviewed LRA Section 2.3.1.5, applicable sections of the USAR, and license renewal boundary drawings using the evaluation methodology in SER Section 2.3 and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems."

The NRC staff evaluated the remote shutdown functions to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The NRC staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that it included all passive and long-lived components subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

2.3.1.5.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.1.5.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the remote shutdown system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.1.6 Reactor Protection

2.3.1.6.1 Summary of Technical Information in the Application

This section discusses reactor protection systems in LRA Section 2.3.1.6, "Reactor Protection."

2.3.1.6.2 Staff Evaluation

The NRC staff reviewed LRA Section 2.3.1.6, and the applicable sections of the USAR and license renewal boundary drawings using the evaluation methodology in SER Section 2.3 and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems."

The NRC staff evaluated the reactor protection functions to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The NRC staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that it included all passive and long-lived components subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

2.3.1.6.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.1.6.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the reactor protection system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.1.7 Reactor Coolant Systems

2.3.1.7.1 Summary of Technical Information in the Application

This section discusses reactor coolant systems in LRA Section 2.3.1.7, "Reactor Coolant Systems in Scope for 10 CFR 54.4(a)(2)."

2.3.1.7.2 Staff Evaluation

The NRC staff reviewed LRA Section 2.3.1.7, applicable sections of the USAR, and license renewal boundary drawings using the evaluation methodology in SER Section 2.3 and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems."

The NRC staff evaluated the reactor coolant systems functions to verify that Entergy has included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The NRC staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that it has included all passive and long-lived components subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

2.3.1.7.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.1.7.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the reactor coolant system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2 Engineered Safety Features

LRA Section 2.3.2 identifies the structures and components of the engineered safety features (ESFs) subject to an aging management review for license renewal. The license renewal application then goes on to describe the supporting structures and components of the engineered safety features in the following sections:

- LRA Section 2.3.2.1, “Pressure Relief”
- LRA Section 2.3.2.2, “High Pressure Core Spray”
- LRA Section 2.3.2.3, “Residual Heat Removal”
- LRA Section 2.3.2.4, “Low Pressure Core Spray”
- LRA Section 2.3.2.5, “Reactor Coolant Isolation Cooling”
- LRA Section 2.3.2.6, “Standby Gas Treatment”
- LRA Section 2.3.2.7, “Containment Penetrations”
- LRA Section 2.3.2.8, “ESF Systems in Scope for 10 CFR 54.4(a)(2)”

Sections 2.3.2.1 through 2.3.2.8 of this safety evaluation report, below, describe the NRC staff’s review and findings on LRA Sections 2.3.2.1 through 2.3.2.8.

2.3.2.1 Pressure Relief

2.3.2.1.1 Summary of Technical Information in the Application

This section discusses pressure relief systems in LRA Section 2.3.2.1, “Pressure Relief.”

2.3.2.1.2 Staff Evaluation

The NRC staff reviewed LRA Section 2.3.2.1, applicable sections of the USAR, and license renewal boundary drawings using the NRC evaluation methodology in SER Section 2.3 and the guidance in NUREG-1800, Revision 2, Section 2.3, “Scoping and Screening Results: Mechanical Systems.”.

The NRC staff evaluated the pressure relief functions to verify that Entergy has included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The NRC staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

2.3.2.1.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.2.1.2 above and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the pressure relief components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2.2 High-Pressure Core Spray

2.3.2.2.1 Summary of Technical Information in the Application

This section discusses high-pressure core spray systems in LRA Section 2.3.2.2, “High Pressure Core Spray.”

2.3.2.2.2 Staff Evaluation

The NRC staff reviewed LRA Section 2.3.2.2, applicable sections of the USAR, and license renewal boundary drawings using the NRC evaluation methodology in SER Section 2.3 and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems."

The NRC staff evaluated the high-pressure core spray functions to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The NRC staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that it included all passive and long-lived components subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

2.3.2.2.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.2.2.2 above and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the high-pressure core spray system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2.3 *Residual Heat Removal*

2.3.2.3.1 Summary of Technical Information in the Application

This section discusses residual heat removal systems in LRA Section 2.3.2.3, "Residual Heat Removal."

2.3.2.3.2 Staff Evaluation

The NRC staff reviewed LRA Section 2.3.2.3, applicable sections of the USAR, and license renewal boundary drawings using the NRC evaluation methodology in SER Section 2.3 and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems."

The NRC staff evaluated the residual heat removal functions to verify that Entergy included within the scope of license renewal all components with intended functions described in 10 CFR 54.4(a). The NRC staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that it included all passive and long-lived components subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

2.3.2.3.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.2.3.2 above and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the residual heat removal system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2.4 Low-Pressure Core Spray

2.3.2.4.1 Summary of Technical Information in the Application

This section discusses low-pressure core spray systems in the LRA Section 2.3.2.4, "Low Pressure Core Spray."

2.3.2.4.2 Staff Evaluation

The NRC staff reviewed LRA Section 2.3.2.4, applicable sections of the USAR, and license renewal boundary drawings using the NRC evaluation methodology in SER Section 2.3 and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems."

The NRC staff evaluated the low-pressure core spray functions to verify that Entergy included within the scope of license renewal all components with intended functions described in 10 CFR 54.4(a). The NRC staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that it included all passive and long-lived components subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

2.3.2.4.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.2.4.2 above and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the low-pressure core spray system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2.5 Reactor Core Isolation Cooling

2.3.2.5.1 Summary of Technical Information in the Application

This section discusses reactor core isolation cooling systems in the LRA Section 2.3.2.5, "Reactor Core Isolation Cooling."

2.3.2.5.2 Staff Evaluation

The NRC staff reviewed LRA Section 2.3.2.5, applicable sections of the USAR, and license renewal boundary drawings using the NRC evaluation methodology in SER Section 2.3 and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems."

The NRC staff evaluated the reactor core isolation cooling functions to verify that Entergy included within the scope of license renewal all components with intended functions described in 10 CFR 54.4(a). The NRC staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that it included all passive and long-lived components subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

2.3.2.5.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.2.5.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the reactor core isolation cooling system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2.6 Standby Gas Treatment

2.3.2.6.1 Summary of Technical Information in the Application

This section discusses standby gas treatment systems in the LRA Section 2.3.2.6, "Standby Gas Treatment."

2.3.2.6.2 Staff Evaluation

The staff evaluated the standby gas treatment system functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology in LRA Section 2.1, "Scoping and Screening Methodology," and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems," the staff reviewed LRA Section 2.3.2.6, LRA Table 2.3.2-6, and USAR Sections 6.2.3.2.1 and 6.5.1.

The staff identified two areas where it needed additional information to complete the review of Entergy's scoping and screening results, these are 1) clarification of system pressure boundary arrangements and aging management review applicability on instrument flow switch tubing, and 2) clarification of the location and environment of flexible connections to be subject to aging management review. To obtain this information, on February 12, 2018, the NRC staff issued two requests for additional information, RAI 2.3.2.6-1 and RAI 2.3.2.6-2, see ADAMS Accession No. ML18043A351. For Entergy's responses, dated March 14, 2018, see ADAMS Accession No. ML18073A068.

(1) RAI 2.3.2.6-1

In the first request for additional information (RAI 2.3.2.6-1, see ADAMS Accession No. ML18043A351), dated February 12, 2018, the staff requested clarification on the sensing lines connected to flow switches FS 2A (Coordinate. L-15) and FS 2B (Coordinate E-15), as displayed on the relevant LRA drawing (LRA-PID-27-15A). In particular, the staff asked Entergy the following question: are the sensing lines to these flow switches: (a) part of each standby gas treatment system filter train's pressure boundary and therefore, (b) subject to aging management review?

In its response to RAI 2.3.2.6-1 (ADAMS Accession No. ML18073A068), dated March 14, 2018, Entergy answered yes to both parts of the above question. Entergy explained that the plastic instrumentation tubing functions as a pressure boundary for the system and that the tubing is fabricated from low-density polyethylene (LDPE). Based on the RAI response, Entergy made changes to LRA Section 3.2.2.1.6, "Standby Gas Treatment System," to reflect the existence of low-density polyethylene in the standby gas treatment system.

In addition, Entergy revised LRA Table 3.3.2-6 to reflect:

- the aging effects of low-density polyethylene
- the aging management program (i.e., external surfaces monitoring) used to manage the aging effects of low-density polyethylene

The staff finds Entergy's response acceptable because it adds to the LRA a relevant material (i.e., low-density polyethylene) for the standby gas treatment system components and provides a comprehensive resolution for managing the aging effects of low-density polyethylene . Therefore, the response resolves the staff's concern's in RAI 2.3.2.6-1.

<u>(2) RAI 2.3.2.6-2</u>

In the second request for additional information (RAI 2.3.2.6-2, see ADAMS Accession No. ML18043A351), dated February 12, 2018, the staff observed that the component type "flex connection," as listed in both LRA Table 2.3.2-6 and LRA Table 3.3.2-6, was not displayed on the relevant LRA drawing (LRA-PID-27-15A). The staff noted that without knowing the physical location of the flex connection or connections, it could not verify the internal environment for this component type.

In its response to RAI 2.3.2.6-2 (ADAMS Accession No. ML18073A068), dated March 14, 2018, Entergy responded that flexible connections are installed between each fan and the fan's connected ductwork to prevent damage from excessive relative movement between the two component types (i.e., fan housing and ducting). Entergy stated that the flex connections are piece parts of the standby gas treatment system, even though these flex connections are not displayed on the LRA drawing (LRA-PID-27-15A). In agreement with LRA Table 3.3.2-6, Entergy stated that "The flexible connections are fiberglass and are exposed to an internal environment of indoor air."

The staff finds Entergy's response acceptable because it allows the staff to verify: (a) the material of fabrication of the standby gas treatment system flex connections and (b) the internal and external environments for this component type. The staff's concern described in RAI 2.3.2.6-2 is resolved.

2.3.2.6.3 <u>Conclusion</u>

Based on the staff's evaluation in SER Section 2.3.2.6.2 and on review of the LRA, USAR, license renewal boundary drawings, and Entergy's RAI responses, the staff concludes that Entergy has appropriately identified the standby gas treatment system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2.7 Containment Penetrations

2.3.2.7.1 Summary of Technical Information in the Application

This section discusses containment penetrations systems in LRA Section 2.3.2.7, "Containment Penetrations."

2.3.2.7.2 Staff Evaluation

The staff evaluated the system functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology in LRA Section 2.1, "Scoping and Screening Methodology," and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems," the staff reviewed the following:

- LRA Section 2.3.2.7
- LRA Table 2.3.2-7
- USAR Section 1.2.2.4.9 and Section 9.4
- USAR Table 6.2-40 and Table 6.2-51

The staff's review identified an area in which it needed additional information before it could complete the review of Entergy's scoping and screening results. To obtain this information, the NRC staff issued a request for additional information RAI 2.3.2.7-1, dated February 12, 2018, see ADAMS Accession No. ML18043A351. For Entergy's response, dated March 14, 2018, see ADAMS Accession No. ML18073A068.

RAI 2.3.2.7-1

In RAI 2.3.2.7-1 the staff observed that the displayed safety-related "blind flange" as described in Note 3 on the relevant LRA drawing (LRA-PID-34-04A) corresponds to the symbol for a "spectacle flange" contained on PID-00-02D. In RAI 2.3.2.7-1, the staff noted that LRA Table 2.3.2-7 does not list a component type of either "blind flange" or "spectacle flange." The staff asked Entergy to identify where the LRA addresses the aging management review for the "blind/spectacle flange" associated with the fuel handling system. The staff noted that this component serves as a primary containment isolation barrier during normal plant power operations.

In response to RAI 2.3.2.7-1, dated March 14, 2018, Entergy cited LRA Section 2.0, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results," which states, "The term 'piping' in component lists includes pipe and pipe fittings (such as elbows, flued heads and reducers)." Entergy stated that the subject "blind flange" is included in the component type "piping" in LRA Table 2.3.2-7.

The staff finds the response acceptable because Entergy clarified that all Containment Penetration components subject to aging are included within scope of aging management review. The staff's concern described in RAI 2.3.2.7-1 is resolved.

2.3.2.7.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.2.7.2 and on its review of the LRA, USAR, license renewal boundary drawings, and Entergy's RAI responses, the staff concludes that Entergy has appropriately identified the containment penetrations system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2.8 Engineered Safety Feature Systems

2.3.2.8.1 Summary of Technical Information in the Application

This section discusses engineered safety feature systems in LRA Section 2.3.2.8, "ESF Systems in Scope for 10 CFR 54.4(a)(2)."

2.3.2.8.2 Staff Evaluation

The NRC staff reviewed LRA Section 2.3.2.8, applicable sections of the USAR, and license renewal boundary drawings using the NRC staff's evaluation methodology in SER Section 2.3 and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems."

The NRC staff evaluated the engineered safety feature systems functions to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The NRC staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that it included all passive and long-lived components subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

2.3.2.8.3 Conclusion

Based on the results of the staff's evaluation discussed in SER Section 2.3.2.8.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the engineered safety features system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3 Auxiliary Systems

This section discusses systems within mechanical systems in the following sections of the RBS license renewal application:

- LRA Section 2.3.3.1, "Control Rod Drive Hydraulic"
- LRA Section 2.3.3.2, "Component Cooling Water"
- LRA Section 2.3.3.3, "Service Water"

- LRA Section 2.3.3.4, “Compressed Air”
- LRA Section 2.3.3.5, “Standby Liquid Control”
- LRA Section 2.3.3.6, “Main Steam Positive Leakage Control”
- LRA Section 2.3.3.7, “Fire Protection—Water”
- LRA Section 2.3.3.8, “Fire Protection—Halon”
- LRA Section 2.3.3.9, “Combustible Gas Control”
- LRA Section 2.3.3.10, “Standby Diesel Generator”
- LRA Section 2.3.3.11, “HPCS Diesel Generator”
- LRA Section 2.3.3.12, “Control Building HVAC”
- LRA Section 2.3.3.13, “Miscellaneous HVAC”
- LRA Section 2.3.3.14, “Chilled Water”
- LRA Section 2.3.3.15, “Fuel Pool Cooling and Cleanup”
- LRA Section 2.3.3.16, “Plant Drains”
- LRA Section 2.3.3.17, “Fuel Oil”
- LRA Section 2.3.3.18, “Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)”

2.3.3.1 Control Rod Drive Hydraulic

2.3.3.1.1 Summary of Technical Information in the Application

This section discusses control rod drive hydraulic systems in LRA Section 2.3.3.1, “Control Rod Drive Hydraulic.”

2.3.3.1.2 Staff Evaluation

The staff evaluated the control rod drive hydraulic system functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.1.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.1.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the control rod drive hydraulic components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.2 Component Cooling Water

2.3.3.2.1 Summary of Technical Information in the Application

This section discusses component cooling water systems in LRA Section 2.3.3.2, “Component Cooling Water.”

2.3.3.2.2 Staff Evaluation

The staff evaluated the component cooling water system functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.2.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.2.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the component cooling water system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.3 *Service Water*

2.3.3.3.1 Summary of Technical Information in the Application

This section discusses service water systems in LRA Section 2.3.3.3, "Service Water."

2.3.3.3.2 Staff Evaluation

The staff evaluated the service water system functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.3.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.3.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the service water components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.4 *Compressed Air*

2.3.3.4.1 Summary of Technical Information in the Application

This section discusses compressed air systems in LRA Section 2.3.3.4, "Compressed Air."

2.3.3.4.2 Staff Evaluation

The staff evaluated the compressed air system functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.4.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.4.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the compressed air components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.5 *Standby Liquid Control*

2.3.3.5.1 Summary of Technical Information in the Application

This section discusses SLC systems in LRA Section 2.3.3.5, "Standby Liquid Control."

2.3.3.5.2 Staff Evaluation

The staff evaluated the SLC functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.5.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.5.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the SLC components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.6 *Main Steam Positive Leakage Control*

2.3.3.6.1 Summary of Technical Information in the Application

This section discusses main steam positive leakage control systems in LRA Section 2.3.3.6, "Main Steam Positive Leakage Control."

2.3.3.6.2 Staff Evaluation

The staff evaluated the main steam positive leakage control functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.6.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.6.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the main steam positive leakage control components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.7 Fire Protection Water

2.3.3.7.1 Summary of Technical Information in the Application

This section discusses fire protection—water systems in LRA Section 2.3.3.7, "Fire Protection—Water."

2.3.3.7.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.7 and the relevant LRA drawings using the evaluation methodology in Section 2.3 of this SER and the guidance in SRP-LR, Section 2.3. The staff reviewed USAR Section 9.5.1, "Fire Protection System"; USAR Appendix 9A, "Fire Hazard Analysis"; and USAR Appendix 9B, "Fire Protection Program Comparison with Appendix R to 10 CFR Part 50," which describe the fire protection program at RBS and how it complies with the requirements of 10 CFR 50.48, "Fire Protection," and the guidelines of Appendix A to Branch Technical Position (BTP) Auxiliary and Power Conversion Systems Branch (APCSB) 9.5-1.

The staff also reviewed the following fire protection documents cited in the current licensing bases listed in RBS Operating License Condition 2.C (10):

- NUREG-0989, "Safety Evaluation Report related to the operation of River Bend Station," May 1984, ADAMS Accession No. ML091380411.

- NUREG-0989, Supplement 3, "Safety Evaluation Report Related to the Operation of River Bend Station," August 1985, ADAMS Accession No. ML091380410.

During its review, the staff evaluated the fire protection—water functions described in the LRA, USAR, and license renewal boundary drawings, to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that it included all passive or long-lived components subject to an aging management review, in accordance with 10 CFR 54.21(a)(1).

The staff's review identified areas in which it needed additional information to complete its review of Entergy's scoping and screening results. To obtain this information, on October 23, 2017, the staff issued two requests for additional information, APLB RAI 2.3.3.7-1 and APLB RAI 2.3.3.7-2, see ADAMS Accession No. ML17303A102. For Entergy's responses, dated November 16, 2017, see ADAMS Accession No. ML17303A102.

The staff noted that LRA boundary drawings listed below shows the following fire protection systems or components as out of scope:

LRA Drawing	Systems/Components	Location
LRA-PID-09-15A	Deep Well Submersible Pump Systems and Components	H21, K21
LRA-PID-015-01A	Hose Manifold with Valves	H4
LRA-PID-015-01B	STR 6A	K2

(1) RAI 2.3.3.7-1

By letter dated October 23, 2017 (see ADAMS ML17303A102), the staff issued the first request for additional information (APLB RAI 2.3.3.7-1) asking Entergy to verify whether the above fire protection systems/components are within the scope of license renewal in accordance with 10 CFR 54.4(a) and whether they are subject to an aging management review in accordance with 10 CFR 54.21(a)(1). The staff requested Entergy to justify if it had excluded the fire protection system/component from the scope of license renewal and deemed it not to be subject to an aging management review.

Entergy responded to APLB RAI 2.3.3.7-1 on November 16, 2017 (see ADAMS Accession No. ML17324B364). The staff finds that Entergy's response addressed and resolved each item in the RAI. Entergy's response states:

> Deep well submersible pumps and associated components are non-safety-related and are isolated from any safety-related equipment. Consequently, they do not perform an intended function in accordance with 10 CFR 54.4(a)(1) or (a)(2). The deep well submersible pumps are normally aligned to fill the makeup demineralizer raw water storage tank, but may be used as an alternate method for makeup water to the fire water storage tanks via a removable spool piece. Automatic makeup to the fire water storage tanks is provided by the shallow well pump. As described in Section 9.5.1.5 of NUREG-0989, Supplement 3, "Safety Evaluation Report related to the operation of River Bend Station," August 1985, the size of the fire water storage tanks and the fill method was found acceptable on the basis of the available water capacity and automatic makeup of the shallow well pump. Because the deep well pumps do not automatically fill the fire water storage tanks they are not credited with a fire protection function in accordance with 10 CFR 54.4(a)(3). The deep well submersible pumps do not perform an intended function in accordance with 10 CFR 54.4(a) and are not subject to aging management review.

The staff verified that deep well submersible pumps and associated components are nonsafety related and are not normally used for makeup water to the fire water storage tanks. The shallow well pump provides automatic makeup to the fire water storage tanks. The staff found that the deep well submersible pumps do not automatically fill the fire water storage tanks, and therefore they are not required to support any fire protection intended functions for license renewal.

Based on its review, the staff finds Entergy's response to this portion of APLB RAI 2.3.3.7-1 acceptable, because it resolves the staff's concerns regarding the scoping and screening of deep well submersible pump systems and components for the purpose of determining whether Entergy adequately identified the fire protection system components within the scope of license renewal. With respect to the hose manifold with valves, Entergy's response stated:

> The hose manifold with valves depicted on LRA-PID-015-01A provides a means for flow testing of the fire water pumps. The manifold and valves are non-safety-related, isolated from any safety-related equipment, and do not perform a function that demonstrates compliance with 10 CFR 50.48. Consequently, these components do not perform an intended function in accordance with 10 CFR 54.4(a) and are not subject to aging management review.

Entergy stated that the hose manifold valves shown in LRA-PID-015-01A are installed to provide flow testing of the fire water pumps and can be isolated from the system. Therefore, Entergy does not rely on these valves to perform a pressure boundary intended function, and the valves are not subject to an aging management review. The staff agrees with Entergy's exclusion of the valves from the scope of license renewal since these valves can be isolated and do not perform a 10 CFR 54.4(a)(1) or (3) function. Based on its review, the staff finds Entergy's response to this portion of APLB RAI 2.3.3.7-1 acceptable for the purpose of determining whether Entergy adequately identified the fire protection system components within the scope of license renewal. With respect to strainer STR-6A, Entergy's response stated:

> The RAI issue incorrectly references STR-6A. STR-6A is already subject to aging management review (STAMR) and is highlighted on LRA-PID-15-01B. Strainer STR-6B was excluded from license renewal on the basis that no downstream components perform a function that satisfies the requirements of 10 CFR 50.48. After further review, hose reels HR-50, HR-51, and HR-53 located downstream of STR-6B are required to be operable in accordance with Technical Specification 3.7.9.2. As a result, piping upstream of STR-6B and downstream piping components up to and including hose reels HR-50, HR-51, and HR-53 are included within the scope of license renewal in accordance with 10 CFR 54.4(a)(3) and subject to an aging management review in accordance with 10 CFR 54.21(a)(1). Including these components does not introduce new material-environment combinations or component types within the system or require other LRA changes.

The staff also reviewed Entergy's response to APLB RAI 2.3.3.7-1 in regards to the strainers STR-6A and STR-6B. Entergy stated that Strainer STR-6A is already subject to an aging management review; and that STR-6B is included within the scope of license renewal in accordance with 10 CFR 54.4(a)(3), and is subject to an aging management review in accordance with 10 CFR 54.21(a)(1). The staff finds Entergy's response to this portion of APLB RAI 2.3.3.7-1 acceptable for the purpose of determining whether Entergy adequately identified the fire protection system components within the scope of license renewal.

(2) RAI 2.3.3.7-2

In the second request for additional information (APLB RAI 2.3.3.7-2), dated October 23, 2017 (ADAMS Accession No. ML17303A102), the staff states that LRA Table 2.3.3-7 and Table 3.3.2-7, "Fire Protection – Water System Components of Aging Management Review," do not include the following fire protection components:

- fire hose stations, fire hose connections, hose racks
- standpipe risers
- fire protection water curtain systems
- automatic wet-chemical fire suppression system
- seismic support for standpipes system piping
- floor drains for removal of fire water

The staff asked Entergy to verify whether the fire protection components listed above are within the scope of license renewal in accordance with 10 CFR 54.4(a) and whether they are subject to an aging management review in accordance with 10 CFR 54.21(a)(1). The staff requested that if these components are excluded from the scope of license renewal and are not subject to an aging management review, that Entergy justify the exclusion.

In a letter dated November 16, 2017, Entergy provided the results of the scoping and screening process for the fire protection system component types listed above (see ADAMS Accession No. ML17324B364):

> Components stated in the issue are included in systems within the scope of license renewal in accordance with 10 CFR 54.4(a). Components within systems determined to be within scope of license renewal are screened to determine if they are subject to aging management review. Screening is performed under the rules of 10 CFR 54.21 (a)(1). Consequently, many components within systems included in the scope of license renewal are not subject to aging management review, such as the floor drains discussed in this response.
>
> Fire hose station is a generic term referring to a fire hose and associated rack, piping, and fittings. These components are addressed below.
>
> Fire hose connections on fire water piping are subject to aging management review in accordance with 10 CFR 54.21(a)(1) and included as piping in LRA Table 3.3.2-7, “Fire Protection - Water System”. Fire hose connections on fire hoses are integral to the fire hose. Fire hoses are not subject to aging management review because they are periodically inspected, hydro tested, and replaced as necessary.
>
> Hose racks are subject to aging management review in accordance with 10 CFR 54.21(a)(1) and included as fire hose reels in LRA Table 3.5.2-4, “Bulk Commodities”.
>
> Standpipe risers are subject to aging management review in accordance with 10 CFR 54.21 (a)(1) and included as piping in LRA Table 3.3.2 -7, “Fire Protection - Water System”.
>
> Fire protection water curtains as described in USAR Section 9A.2.5.1.2.5 consist of distribution piping and nozzles at elevation 70’-0” and 141’-0” that maintain safety system separation in the event of a fire. Water curtain distribution piping is subject to aging management review in accordance with 10 CFR 54.21(a)(1) and included as piping in LRA Table 3.3.2-7, “Fire Protection - Water System.” Water curtain nozzles are not included as a separate item in LRA Table 3.3.2-7 because they are exposed to air-indoor internal and external and are not subject to aging effects beyond those applicable to fire water piping with the same

environment. Consequently, the water curtain nozzles are included as piping in LRA Table 3.3.2-7, “Fire Protection - Water System”.

> The automatic wet-chemical fire suppression system provides fire suppression for the stove top in the main control room (MCR) kitchen. The RBS Fire Protection Program is compared to 10 CFR 50 Appendix R in USAR Appendix 9B. Neither MCR kitchen nor wet-chemical extinguisher in the MCR kitchen is addressed in USAR Appendix 9B. NUREG 0989 Supplement 3 “Safety Evaluation Report related to the operation of River Bend Station,” documents acceptability of the original RBS Fire Protection Program and conformance with the guidelines of Branch Technical Position (BTP) CMEB 9.5-1, Section III.G, III.J, and III.O of 10 CFR 50 Appendix R and General Design Criterion 3 prior to installation of the automatic wet-chemical fire suppression system. In addition, the wet chemical extinguisher is not required to be operable per the Technical Requirements Manual. Furthermore, the River Bend design includes alternate shutdown capability from the Division I Remote Shutdown Panel, independent of the MCR. Thus, the automatic wet-chemical fire suppression system is not subject to aging management review in accordance with 10 CFR 54.21(a)(1).

> Seismic supports for standpipe risers are subject to aging management review in accordance with 10 CFR 54.21 (a)(1) and included as support members; welds; bolted connections; support anchorage to building structure in LRA Table 3.5.2-4, “Bulk Commodities”.

> As discussed in LRA Section 2.3.3.16, “Plant Drains”, the fire hazards analysis does not credit floor drains in its evaluation of flooding from fire water system actuations. Therefore, the floor drains are not credited for compliance with the Commission's regulations for 10 CFR 50.48.

> Consequently floor drains for the removal of fire water are not subject to aging management review in accordance with 10 CFR 54.21(a)(1).

The staff finds that Entergy’s response to the APLB RAI 2.3.3.7-2 addresses and resolves each item in the RAI, as discussed in the following paragraphs.

Fire hose connections are addressed under the component categories type “piping” in LRA Table 3.3.2-7; hose racks are addressed under the component category type “fire hose reels” in LRA Table 3.5.2-4; standpipe risers are addressed under the component categories type “piping” in LRA Table 3.3.2-7; water curtain distribution piping and nozzles are included as component type “piping” in LRA Table 3.3.2-7; seismic supports for standpipe risers are included as “support members,” “welds,” “bolted connections,” and support anchorage to building structure in LRA Table 3.5.2-4.

With regard to the automatic wet-chemical fire suppression system, based on Entergy’s RAI response, the staff agrees that this system is not credited to demonstrate compliance with fire protection regulations in accordance with 10 CFR 50.48. Therefore, this system does not have any intended function for license renewal and is not within the scope of license renewal in accordance with 10 CFR 54.4(a) and 10 CFR 54.21(a)(1). The staff finds Entergy’s response to this portion of APLB RAI 2.3.3.7-2 acceptable for the purpose of determining whether Entergy adequately identified the fire protection system components within the scope of license renewal. The staff’s concern described in this RAI is resolved.

Entergy indicated that floor drains for the removal of fire water are not subject to an aging management review in accordance with 10 CFR 54.21(a)(1) because plant fire hazard analysis does not credit floor drains in its evaluation of flooding from fire water system actuations. The staff confirmed that floor drains for the removal of fire water in question were correctly excluded from the scope of license renewal and are not subject to an aging management review because they are credited in the RBS fire hazard analysis, therefore, the staff's concern regarding floor drains for the removal of fire water is resolved.

Based on its review, the staff finds Entergy's response to APLB RAI 2.3.3.7-2 acceptable because it provided clarification that the fire protection system and the components listed above (other than the automatic wet-chemical fire suppression system and floor drains) are within the scope of license renewal and subject to an aging management review as required by 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. The RBS fire hazard analysis did not credit an automatic wet-chemical fire suppression system or floor drains for the removal of fire water. The staff finds that Entergy appropriately omitted those items from the scope of license renewal.

2.3.3.7.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.7.2 and on its review of the LRA, USAR, license renewal boundary drawings, and RAI responses, the staff concludes that Entergy has appropriately identified the fire protection water system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.8 Fire Protection—Halon

2.3.3.8.1 Summary of Technical Information in the Application

This section discusses fire protection—halon systems in the LRA Section 2.3.3.8, "Fire Protection—Halon."

2.3.3.8.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.8 and the relevant LRA drawings using the evaluation methodology in the SER Section 2.3 and the guidance in SRP-LR Section 2.3. The staff reviewed USAR Section 9.5.1, "Fire Protection System"; USAR Appendix 9A, "Fire Hazard Analysis"; and USAR Appendix 9B, "Fire Protection Program Comparison with Appendix R to 10 CFR Part 50," which describe the fire protection program at RBS and how it complies with the requirements of 10 CFR 50.48, "Fire Protection," and the guidelines of Appendix A to BTP APCSB 9.5-1.

The staff also reviewed the following fire protection documents cited in the current licensing bases listed in the River Bend Station, Unit 1, Operating License Condition 2.C (10):

- NUREG-0989, "Safety Evaluation Report related to the operation of River Bend Station," May 1984, ADAMS Accession No. ML091380411.

- NUREG-0989, Supplement 3, "Safety Evaluation Report Related to the Operation of River Bend Station," August 1985, ADAMS Accession No. ML091380410.

During its review, the staff evaluated the system functions described in the LRA, USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as being within the scope of license renewal to verify that it has included all passive or long-lived components subject to an aging management review, in accordance with 10 CFR 54.21(a)(1).

The staff's review identified areas in which it needed additional information to complete the review of Entergy's scoping and screening results. In order to obtain this information, the NRC staff issued a request for additional information: APLB RAI 2.3.3.8-1, dated October 23, 2017, ADAMS Accession No. ML17303A102.

<u>APLB RAI 2.3.3.8-1</u>

In this request for additional information, the staff stated that LRA Table 2.3.3-8 and Table 3.3.2-8, "Fire Protection–Halon System Components of Aging Management Review," do not include the following fire protection components:

- Halon storage containers/cylinders

The staff asked Entergy to verify whether the fire protection components listed above are within the scope of license renewal in accordance with 10 CFR 54.4(a) and whether they are subject to an aging management review in accordance with 10 CFR 54.21(a)(1). The staff requested that if they are excluded from the scope of license renewal and are not subject to an aging management review, that Entergy justify the exclusion

In its response to APLB RAI 2.3.3.8-1 (dated November 16, 2017, ADAMS Accession No. ML17324B364), Entergy stated the following:

> Halon storage cylinders located in the power generation control complex (PGCC) are within the scope of license renewal in accordance with 10 CFR 54.4(a). Specifically, they perform a fire protection function in accordance with 10 CFR 54.4(a)(3). The halon storage cylinders are periodically monitored for low weight and pressure; however, they are replaced if they fail to meet the acceptance criteria for weight and pressure. Consequently, the steel halon storage cylinders in the power generation control complex are subject to aging management review in accordance with 10 CFR 54.21(a)(1). Halon storage cylinders in the permanent plant file vault and training center are not subject to aging management review in accordance with 10 CFR 54.21(a)(1) because they do not perform a function in accordance with 10 CFR 54.4(a). All other halon fire suppression systems are decommissioned or abandoned in place.
>
> The LRA is revised to indicate that halon storage cylinders are subject to aging management review and to provide aging management review results for the cylinders. Additions are underlined and deletions are lined through.

The staff finds Entergy's response to APLB RAI 2.3.3.8-1 acceptable because Entergy confirmed that the halon fire protection system cylinders in the power generation control complex (PGCC) are included within the scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an aging management review in accordance with 10 CFR 54.21(a)(1). In its response, Entergy provided revised LRA Table 2.3.3-8 and

Table 3.3.2-8 which clarified that the halon storage cylinders located in the power generation control complex system are within the scope of license renewal and subject to an aging management review. The staff's concern described in APLB RAI 2.3.3.8-1 is resolved.

2.3.3.8.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.8.2 and on its review of the LRA, USAR, license renewal boundary drawings, and Entergy's RAI responses, the staff concludes that Entergy has appropriately identified the fire protection halon system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.9 Combustible Gas Control

2.3.3.9.1 Summary of Technical Information in the Application

This section discusses combustible gas control systems in LRA Section 2.3.3.9, "Combustible Gas Control."

2.3.3.9.2 Staff Evaluation

The staff evaluated the combustible gas control system functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.9.3 Conclusion

Based on staff's evaluation in SER Section 2.3.3.9.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the combustible gas control system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.10 Standby Diesel Generator

2.3.3.10.1 Summary of Technical Information in the Application

This section discusses standby diesel generator systems in LRA Section 2.3.3.10, "Standby Diesel Generator."

2.3.3.10.2 Staff Evaluation

The staff evaluated the standby diesel generator system functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.10.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.10.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the standby diesel generator system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.11 *High-Pressure Core Spray Diesel Generator*

2.3.3.11.1 Summary of Technical Information in the Application

This section discusses high-pressure core spray (HCPS) diesel generator systems in LRA Section 2.3.3.11, "HPCS Diesel Generator."

2.3.3.11.2 Staff Evaluation

The staff evaluated the high-pressure core spray diesel generator system functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that it included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.11.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.11.2 and on its review of the LRA, USAR, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the high-pressure core spray diesel generator systems components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.12 *Control Building Heating, Ventilation, and Air Conditioning*

2.3.3.12.1 Summary of Technical Information in the Application

This section discusses control building heating, ventilation, and air conditioning (HVAC) systems in LRA Section 2.3.3.12, "Control Building HVAC."

2.3.3.12.2 Staff Evaluation

The staff evaluated the system functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy did not omit from the scope of license renewal any control building HVAC system components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy did not omit any passive and long-lived components subject to an aging management review in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology in LRA Section 2.1, "Scoping and Screening Methodology," and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems," the staff reviewed the following:

- LRA Section 2.3.3.12
- LRA Table 2.3.3-12
- USAR Section 1.2.2.10
- USAR Section 6.2.3.2.1
- USAR Section 7.6.1.4
- USAR Section 11.5
- USAR Section 12.3.3.3.1
- USAR Section 12.3.4; Table 3.2-1
- USAR Section 6.4
- USAR Section 6.5.1
- USAR Section 9.4.1
- USAR Section 9A.3.7.2

2.3.3.12.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.12.2 and on its review of the LRA, USAR, technical specifications, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the control building HVAC system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.13 Miscellaneous Heating, Ventilation, and Air Conditioning

2.3.3.13.1 Summary of Technical Information in the Application

This section discusses miscellaneous heating, ventilation, and air conditioning systems in LRA Section 2.3.3.13, "Miscellaneous HVAC."

2.3.3.13.2 Staff Evaluation

The staff evaluated the miscellaneous HVAC system functions described in the LRA, the USAR, Entergy's engineering reports, technical specifications, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology in LRA Section 2.1, "Scoping and Screening Methodology," and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems," the staff reviewed the following:

- LRA Section 2.3.3.13

- LRA Table 2.3.3-13
- USAR Section 6.2.2, Section 9.4.2, Section 9.4.3, Section 9.4.4, Section 9.4.5.2.2, Section 9.4.5.2.3, Section 9.4.6, Section 9.4.7, and Section 15.7.4

The staff identified an area in which it needed additional information to complete the review of Entergy's scoping and screening results. To obtain this information, staff issued request for additional information RAI 2.3.3.13-1 on February 12, 2018 (see ADAMS Accession No. ML18043A351). For Entergy's response see ADAMS Accession No. ML18073A068, dated March 14, 2018.

<u>RAI 2.3.3.13-1</u>

In RAI 2.3.3.13-1, the staff observed that the relevant LRA drawing (LRA-PID-22-07A) indicated that the four area heater housings associated with each of the A, B, and C diesel generator rooms were components not subject to aging management review. USAR Section 9.4.5.1 and Section 9.4.5.2.2 indicate that these system components are designed to maintain the integrity of plant equipment by maintaining minimum design temperature for these rooms during conditions of low outside ambient temperature. The staff posited that the area heater housings may satisfy the scoping requirements of 10 CFR 54.4(a)(2). The staff asked Energy to clarify whether the diesel generator room area heater housings are subject to aging management review.

Entergy responded that these heater housings are not subject to aging management review. Entergy stated in its RAI response, "The area unit heaters in the diesel generator building are not safety-related: they are not required to operate during emergency conditions when the diesels are operating." In its response, Entergy also explained that plant operating procedures require that the diesel building temperature be monitored, through operations rounds, once every 12 hours. Entergy cited a survey conducted for the years 2008–2014 which "confirmed that outside temperatures stay above 40°F for a duration that is within the requirements of the design specification." Based on this, Entergy concluded that the diesel building inside temperature would satisfy the environmental design criteria specification for the diesel generator rooms without the subject area heaters.

The staff finds Entergy's response acceptable because the response clearly established a technical basis for not requiring the area heater housings to have an aging management review under the scoping requirements of 10 CFR 54.4(a)(2). The staff's concern described in RAI 2.3.3.13-1 is resolved.

2.3.3.13.3 <u>Conclusion</u>

Based on the staff's evaluation in SER Section 2.3.3.13.2 and on its review of the LRA, USAR, Entergy's engineering reports, technical specifications, license renewal boundary drawings, and RAI responses, the staff concludes that Entergy has appropriately identified the miscellaneous HVAC system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.14 Chilled Water

2.3.3.14.1 Summary of Technical Information in the Application

This section discusses chilled water systems in LRA Section 2.3.3.14, “Chilled Water.”

2.3.3.14.2 Staff Evaluation

The staff evaluated the chilled water system functions described in the LRA, the USAR, Entergy’s engineering reports, and license renewal boundary drawings to verify that Entergy did not omit from the scope of license renewal any components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy did not omit any passive and long-lived components subject to an aging management review in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology in LRA Section 2.1, “Scoping and Screening Methodology,” and the guidance in NUREG-1800, Revision 2, Section 2.3, “Scoping and Screening Results: Mechanical Systems,” the staff reviewed LRA Section 2.3.3.14, LRA Table 2.3.3-14, and USAR Section 9.2.9 and Section 9.2.10.

2.3.3.14.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.14.2 and on its review of the LRA, USAR, Entergy’s engineering reports, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the chilled water systems components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.15 Fuel Pool Cooling and Cleanup

2.3.3.15.1 Summary of Technical Information in the Application

This section discusses fuel pool cooling and cleanup systems in LRA Section 2.3.3.15, “Fuel Pool Cooling and Cleanup.”

2.3.3.15.2 Staff Evaluation

The staff evaluated the fuel pool cooling and cleanup system functions described in the LRA, the USAR, Entergy’s engineering reports, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology in LRA Section 2.1, “Scoping and Screening Methodology,” and the guidance in NUREG-1800, Revision 2, Section 2.3, “Scoping and Screening Results: Mechanical Systems,” the staff reviewed: LRA Section 2.3.3.15, LRA Table 2.3.3-15, and USAR Section 9.1.3.

The staff's review identified two areas where it needed additional information before it could complete the review of Entergy's scoping and screening results. To obtain this information, the staff issued two requests for additional information: (1) RAI 2.3.3.15-1 and (2) RAI 2.3.3.15-2 (ADAMS Accession No. ML18043A351, dated February 12, 2018). For these two RAIs and Entergy's responses, see ADAMS Accession No. ML18073A068, dated March 14, 2018.

(1) RAI 2.3.3.15-1

In the first request for additional information (RAI 2.3.3.15-1), the staff observed that the relevant LRA drawing (LRA PID 34 02A) identified a total of 12 antisiphoning devices in the cask pool, lower transfer pool, fuel storage pool, and dryer storage pool. USAR Section 9.1.3.2.1, "Fuel Pool Cooling Subsystem," states that these devices "ensure that, in case of a pipe break, the pool water is not siphoned below a point approximately 10ft above the top of the fuel." In particular, during all storage conditions, these devices prevent spent fuel from becoming uncovered by water and exposed to the air. According to the notes on the LRA drawing (LRA-PID-34-02A), these antisiphoning devices consist of holes drilled in the suction and return piping contained in the subject pools. The staff noted these antisiphoning devices are passive devices that would not have an intended function of a pressure retention boundary. According to LRA Table 2.3.3-15, "Fuel Pool Cooling and Cleanup System Components Subject to Aging Management Review," to be subject to aging management review, piping components must have pressure boundary as the intended function. The staff asked Entergy to identify where the LRA addresses the aging management review for these antisiphoning devices.

In its response to the NRC staff's request, Entergy cited LRA Section 2.0, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results," which states, "The term 'piping' in component lists includes pipe and pipe fittings (such as elbows, flued heads and reducers)." As such, these antisiphoning devices (i.e., siphon breakers) are included in the aging management review and are represented in LRA Table 2.3.3-15 under the component type, "piping." Entergy did acknowledge that these antisiphoning devices have an additional intended function, namely, flow control. Based on its RAI response, Entergy changed LRA Table 2.3.3-15. For the component type, "piping," flow control is now listed as an additional intended function. In addition, in LRA Table 3.3.2-15, "Fuel Pool Cleaning and Cleanup System," Entergy made a similar change, It added flow control as one of the intended functions for piping to reflect the aging effects associated with the external and internal environments and the aging management program (i.e., water chemistry control—BWR) used to manage the aging effects.

The staff finds Entergy's response acceptable because Entergy comprehensively evaluated the perceived LRA deficiency and changed the LRA to address the staff's concern. The staff's concern described in RAI 2.3.3.15-1 is resolved.

(2) RAI 2.3.3.15-2

In the second request for additional information (RAI 2.3.3.15-2), the staff observed that the two flex hose components associated with the fuel storage pool as identified on the relevant LRA drawing (LRA-PID-34-02A) were not identified as being subject to aging management review. There were no other flex hoses displayed on the other LRA drawings identified in LRA Section 2.3.3.15. Since LRA Table 2.3.3-15 identified the component type flex hose as subject to aging management review, the staff requested clarification as to the exact location of the flex hose component or components identified in LRA Table 2.3.3-15.

Entergy responded that the two flex hose components depicted on the relevant LRA drawing (LRA-PID-34-02A) as not being subject to aging management review, are accurately displayed. In its response, Entergy states that the flex hose component type listed in LRA Table 2.3.3-15 refers to a "stainless steel instrumentation flex hose associated with PS-6A (LRA-PID-34-02A, location G-15), which senses discharge pressure for the P1A fuel pool cooling pump." Since this flex hose is already accurately displayed in LRA Table 3.3.2-15, no change to the LRA is required.

The staff finds the response acceptable because Entergy established that the perceived LRA deficiency is not an actual deficiency. The staff's concern described in RAI 2.3.3.15-2 is resolved.

2.3.3.15.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.15.2 and on its review of the LRA, USAR, Entergy's engineering reports, license renewal boundary drawings, and RAI responses, the staff concludes that Entergy has appropriately identified the fuel pool cooling and cleanup system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.16 Plant Drains

2.3.3.16.1 Summary of Technical Information in the Application

This section discusses plant drains systems in LRA Section 2.3.3.16, "Plant Drains."

2.3.3.16.2 Staff Evaluation

The staff evaluated the plant drain system functions described in the LRA, USAR, Entergy's engineering reports, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology in LRA Section 2.1, "Scoping and Screening Methodology," and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems," the staff reviewed:

- LRA Section 2.3.3.16
- LRA Table 2.3.3-16
- USAR Section 9.2.4, Section 9.3.3, and Section 9.3.7
- USAR Table 3.9A-10.

The staff identified two areas where it needed additional information to complete the review of Entergy's scoping and screening results. To obtain this information, the staff issued two requests for additional information: (1) RAI 2.3.3.16-1 and (2) RAI 2.3.3.16-3 on February 12, 2018 (ADAMS Accession No. ML18043A351). For these two RAIs and Entergy's responses, see ADAMS Accession No. ML18073A068, dated March 14, 2018.

(1) RAI 2.3.3.16-1

In the first request for additional information (RAI 2.3.3.16-1), the staff requested clarification regarding two vent pipes each from each crankcase of standby diesel generator EGS*EG1A(AR) and EGS*EG1B(BB). The venting of combustion fumes from the diesel generator crankcases is discussed in LRA Section 2.3.3.16. The relevant LRA drawing (i.e., LRA-PID-08-9B) identified these vent pipes as not subject to aging management review. The staff asked Entergy to justify why these vent pipes are not subject to aging management review.

Entergy responded to RAI 2.3.3.16-1 by stating that the subject diesel generator vent pipes do not have a license renewal intended function since the venting the crankcase is not necessary for the diesel to operate under emergency conditions. Entergy further states that:

> This is shown in USAR Section 8.3.1.1.4.1, which lists two sets of conditions under which the diesel will trip: one set for both normal and emergency conditions, and one set for normal conditions only. The trip for high crankcase pressure is only listed with the set for normal conditions and not as a required trip for emergency conditions. In fact, the non-emergency trips are bypassed on receipt of an emergency start signal.

The staff notes that the protection system of the standby diesel generators is described in USAR Section 8.3.1.1.4.1 which reads in part:

> 3. The standby diesel generator unit is tripped under the following conditions during normal operation only.
>
> Generator voltage controlled - inverse time phase overcurrent
>
> a. Generator reverse power
> b. Generator loss of field
> c. Extreme high jacket water temperature trip
> d. High bearing temperature trip
> e. Extreme low jacket water pressure trip
> f. High crankcase pressure trip
> g. Trip low turbo oil pressure
> h. Trip high vibration
> i. Trip high temperature lube oil
> j. Low lube oil pressure trip
> k. Generator ground overcurrent

Entergy noted that when the diesel engines are in operation, the room ventilation system performs the function of venting the standby diesel generator rooms. Entergy concluded that the loss of pressure boundary of the subject vent piping has no impact on emergency operation of the diesel engines, and it therefore has no safety function.

The staff finds Entergy's response acceptable because it adequately explains why the standby diesel generator vent piping is not subject to aging management review. The staff's concern described in RAI 2.3.3.16-1 is resolved.

(2) RAI 2.3.3.16-3

In the second request for additional information (RAI 2.3.3.16-3), the staff requested clarification on the instrument tubing to four pressure indicators (i.e., PI-12A/B/D/E) that were identified as being subject to aging management review on the relevant LRA drawing (LRA-PID-32-09P). In contrast, the staff noted that neither LRA Table 2.3.3-16, "Plant Drains System Components Subject to Aging Management Review," nor LRA Table 3.3.2-16 lists tubing as a component type subject to aging management review.

In response to RAI 2.3.3.16-3, Entergy acknowledged this deficiency by revising LRA Table 2.3.3-16 and LRA Table 3.3.2-16. In both tables, Entergy added under the column, "Component Type," tubing with an intended function of pressure boundary. In its response, Entergy stated the following:

> The tubing is stainless steel exposed to environments of waste water (internal) and indoor air (external). The Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages the aging effects in waste water; there are no aging effects to be managed for stainless steel in indoor air.

The staff finds Entergy's response acceptable because it revises LRA Table 2.3.3-16 to add tubing as a plant drain component subject to aging management review and assigns the correct intended function (i.e., pressure boundary). Furthermore, Entergy revised LRA Table 3.3.2-16 to provide for managing the aging effects of waste water in the tubing. The staff's concern described in RAI 2.3.3.16-3 is resolved.

2.3.3.16.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.16.2 and on its review of the LRA, USAR, Entergy's engineering reports, license renewal boundary drawings, and RAI responses, the staff concludes that Entergy has appropriately identified the plant drains system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.17 Fuel Oil

2.3.3.17.1 Summary of Technical Information in the Application

This section discusses fuel oil systems in LRA Section 2.3.3.17, "Fuel Oil."

2.3.3.17.2 Staff Evaluation

The staff evaluated the fuel oil system functions described in the LRA, the USAR, Entergy's engineering reports, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology in LRA Section 2.1, “Scoping and Screening Methodology,” and the guidance in NUREG-1800, Revision 2, Section 2.3, “Scoping and Screening Results: Mechanical Systems,” the staff reviewed LRA Section 2.3.3.17, LRA Table 2.3.3-17, and USAR Section 9.5.4.

The staff identified three areas where it needed additional information before it could complete its review of Entergy’s scoping and screening results. To obtain this information, the NRC staff issued three requests for additional information: (1) RAI 2.3.3.17-1, (2) RAI 2.3.3.17-2, and (3) RAI 2.3.3.17-3 on February 12, 2018 (ADAMS Accession No. ML18043A351). For these three RAIs and Entergy’s responses, see ADAMS Accession No. ML18073A068, dated March 14, 2018.

(1) RAI 2.3.3.17-1

In the first request for additional information (RAI 2.3.3.17-1) the staff requested clarification pertaining to the fuel oil tank fill station components as displayed on the relevant LRA drawing (LRA-PID-08-09A). In particular, the subject components are associated with high-pressure core spray diesel generator fuel oil storage tank for E22-EGS001 (Coordinate E-20) and the two standby diesel generator (SDG) fuel oil storage tanks for EGS*EG1A (Coordinate L-20) and for EGS*EG1B (Coordinate H-20). The staff noted that according to USAR Section 9.5.4.2 and Section 9.5.4.3, each fuel oil storage tank has its own individual tank truck fill station. Each truck fill station is located within the plant security fence and above the probable maximum flood elevation. USAR Section 9.5.4.3 states:

> The diesel generator fuel oil storage and transfer system is located in and adjacent to the Seismic Category I diesel generator building, which is protected from externally generated missiles. Storage tank fill connections, filters, and vents are located adjacent to each diesel generator room outside the building. Each fill and vent location is located in a concrete enclosure for tornado missile protection.

USAR Section 9.5.4.3 also states that fuel oil may be delivered to the site within 24 hours from several oil terminals in the RBS vicinity and that alternate land routes to the plant site “are available in order to maintain fuel oil deliveries even under adverse environmental conditions.”

Based on the USAR text, the staff noted that the “component type, yard, associated with the storage tank fill stations appear to satisfy the scoping requirements of 10 CFR 54.4(a)(2). The staff asked Entergy to identify where the LRA addresses the aging management review for these yard components or to justify why the yard components are not subject to aging management review.

In its response to the RAI, Entergy wrote that the standby diesel generator system design criteria states in part, “Each diesel generator fuel oil storage tank shall store sufficient fuel oil for continuous operation at its rated capacity for 7 days.” Based on this design criteria, Entergy concluded:

> Because the standby diesel generators are capable of performing their intended function for 7 days without refilling the storage tanks, the fill connections, filters, and vents which are located adjacent to the diesel generator room, outside the building, are nonsafety-related components and are not required to perform a function to support a safety function.

The staff finds Entergy's response acceptable because the yard components of the three fuel oil truck fill stations are not required to support the design criteria for the fuel oil storage and transfer system. In reaching this conclusion, the staff reviewed the license renewal applications and the associated staff SERs for six nuclear power plants that the NRC had approved previously. In the precedents reviewed, all plants credited a 7-day oil storage capacity for the emergency diesel generators and did not indicate that the fuel oil storage tank truck fill station components performed a 10 CFR 54.4(a)(2) support function. The staff's concern described in RAI 2.3.3.17-1 is resolved.

<u>(2) RAI 2.3.3.17-2</u>

In the second request for additional information (RAI 2.3.3.17-2), the staff requested clarification pertaining to the vent piping and flame arrestor associated with fuel oil waste oil tanks (i.e., TK3A and TK3B) for EGS*EG1A and EGS*EG1B. The relevant LRA drawing (i.e., LRA-PID_08-9A) identified these tank components as not being subject to aging management review. In contrast, LRA Table 2.3.3-18-12, "Standby Diesel Generator System Nonsafety-Related Components Affecting Safety-Related Systems Components Subject to Aging Management Review," identifies under the "Component Types" column, the remaining tank components as being subject to aging management review.

The staff noted that flame arrestors are passive mechanical devices installed on oil storage tanks vents that function to stop and extinguish any flame from propagating through the flammable vapor/air mixture during plant conditions. Since these fuel oil waste tanks are located in the vicinity of emergency diesel generators EGS*EG1A and EGS*EG1B, the staff posited that the vent piping and flame arrestor associated with fuel oil waste oil tanks (i.e., TK3A and TK3B) are nonsafety components whose failure could result in failure of nearby safety-related equipment per 10 CFR 54.4(a)(2). The staff asked Entergy to justify why these vent pipes are not subject to aging management review.

In its response to RAI 2.3.3.17-2, Entergy acknowledged the deficiency and revised LRA Section 3.3.2.1.18, "Auxiliary Systems in Scope for 10 CFR 54.4(a)(2) Environments," to include "Air—outdoor" as the environment associated with the flame arrestor.

In addition, Entergy revised the following two LRA tables:

1) LRA Table 2.3.3-18-12 to add under the column, "Component Type," flame arrestor with an intended function of pressure boundary as subject to aging management review

2) LRA Table 3.3.2-18-12 to add under the column, "Component Types," flame arrestor and piping, both with external and internal environments of "Air—outdoor"

The staff finds Entergy's response acceptable since it corrects an LRA deficiency by revising the appropriate section and tables in the LRA. In summary, Entergy provided a comprehensive resolution for managing the aging effects of both the flame arrestor and the vent piping associated with fuel oil waste oil tanks TK3A and TK3B. The staff's concern described in RAI 2.3.3.17-2 is resolved.

<u>(3) RAI 2.3.3.17-3</u>

In the third request for additional information (RAI 2.3.3.17-3), the staff inquired about the internal environment associated with the drain line piping and isolation valves off the bottoms of all three standby diesel generator fuel oil storage tanks (i.e., TK1A, TK1B, and TK1C) and off the bottoms of all three standby diesel generator fuel oil day tanks (i.e., TK2A, TK2B, and TK2C). The staff noted that both USAR Section 9.5.4.3, "Safety Evaluation," and Section 9.5.4.4, "Inspection and Testing Requirements," refer to periodic checking of the water levels within these six tanks. The staff noted that LRA Table 3.3.2-17, “Fuel Oil System Summary of Aging Management Evaluation,” did not identify the aging effects associated with waste water as an internal environment for any of the listed component type (i.e., piping, tank, or valve body). The staff requested that Entergy justify why the internal environment of waste water was not identified as a credible environment for the six tanks and each tank's associated drain line piping and isolation valves.

Entergy responded to RAI 2.3.3.17-3 by stating that the water in these six fuel oil tanks is considered a contaminant. If water accumulates in these tanks, plant personnel removes it every 31 days as required by RBS technical specifications.

The technical specification bases for RBS Surveillance Requirement (SR) 3.8.1.5 and Surveillance Requirement 3.8.3.5 state that removal of water from the fuel oil tanks once every 31 days eliminates the necessary environment for bacterial survival. The bases for Surveillance Requirement 3.8.1.5 and Surveillance Requirement 3.8.3.5 state, “There are numerous bacteria that can grow in fuel oil and cause fouling, but all must have a water environment in order to survive.”

These fuel oil tank monitoring activities are also considered part of the diesel fuel monitoring program. LRA Appendix B Section B.1.15 states the following:

> The Diesel Fuel Monitoring Program includes periodic inspections of low flow areas where contaminants may collect such as in the bottom of tanks. The fuel oil storage tanks are periodically sampled, drained, inspected, and cleaned. Internal tank inspections for signs of moisture, contaminants, and corrosion will be performed at least once during the 10-year period prior to the period of extended operation, and at least once every 10 years during the period of extended operation. Where degradation is observed, a wall thickness determination is made. Water, biological activity, and particulate concentrations are monitored and trended in accordance with the plant's technical specifications or at least quarterly.

Entergy noted that the aging effect requiring management associated with an internal environment of waste water is loss of material. Entergy further stated that although a fuel oil environment is not conducive to aging mechanisms that cause loss of material, LRA Table 3.3.2-17 conservatively identifies loss of material as the aging effect requiring management for the subject fuel oil system component types: piping, tank, and valve body. For all three of these component types, LRA Table 3.3.2-17 invokes Diesel Fuel Monitoring as the aging management program to manage the aging effect of loss of material.

Entergy stated that the Diesel Fuel Monitoring program, “will manage the effects of aging by ensuring that moisture and other contaminants are kept out of, or removed from, the internal fuel oil environment of system components.”

The staff finds Entergy’s response acceptable because Entergy has an established aging management program that will prevent the aging effect of loss of material from the subject fuel oil system component types (i.e., piping, tank, and valve body) due to any moisture or water contained in the fuel oil. The staff's concern described in RAI 2.3.3.17-3 is resolved.

2.3.3.17.3 <u>Conclusion</u>

Based on the staff's evaluation in SER Section 2.3.3.17.2 and on its review of the LRA, USAR, Entergy's engineering reports, license renewal boundary drawings, and RAI responses, the staff concludes that Entergy has appropriately identified the fuel oil system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.18 Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

2.3.3.18.1 <u>Summary of Technical Information in the Application</u>

This section discusses auxiliary systems in LRA Section 2.3.3.18, "Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)."

2.3.3.18.2 <u>Staff Evaluation</u>

The staff evaluated the auxiliary system functions described in the LRA, the USAR, Entergy's engineering reports, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology in LRA Section 2.1, "Scoping and Screening Methodology," and the guidance in NUREG-1800, Revision 2, Section 2.3, "Scoping and Screening Results: Mechanical Systems," the staff reviewed the following:

- LRA Section 2.3.3.18
- LRA Table 2.3.3-18-2
- LRA Table 2.3.3-18-7
- LRA Table 2.3.3-18-19
- LRA Table 2.3.3-18-21
- LRA Table 2.3.3-18-22
- LRA Table 2.3.3-18-24
- LRA Table 2.3.3-18-25

The staff also reviewed the listed USAR sections outlined in Section 2.3.3.18, "Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)," page 2.3-182.

The staff identified two areas in which it needed additional information to complete the review of Entergy's scoping and screening results. To obtain this information, the staff issued two requests for additional information: (1) RAI 2.3.3.18-1 and (2) RAI 2.3.3.18-2 on February 12, 2018 (ADAMS Accession No. ML18043A351). For these two RAIs and Entergy's responses see ADAMS Accession No. ML18073A068, dated March 14, 2018.

(1) RAI 2.3.3.18 1: Leak Detection

In the first request for additional information (RAI 2.3.3.18-1), the staff inquired about two component types: (1) Hose 2 (i.e., "Flexible Connection/Coupling" on PID-00-02D) within pipe line (E31) 750-609-4 and (2) ED1403 (i.e., "(HUD) Floor Drain" on PID-00-02D) displayed on the same LRA drawing (LRA-PID-32--09C). These and other similar component types are displayed on the LRA drawing as being subject to aging management review. However, neither LRA Table 2.3.3-18-7 nor LRA Table 2.3.3-16, "Plant Drains System Components Subject to Aging Management Review," list flex hose as a component type subject to aging management review. Similarly, neither LRA Table 2.3.3-16 nor LRA Table 2.3.3-18-23, "Drains - Floor and Equipment System, Nonsafety-Related Components Affecting Safety-Related Systems, Components Subject to Aging Management Review," list (HUD) floor drain under the "Component Type" column. The staff asked Entergy to identify where the LRA addresses the aging management review for the flex hose and (HUD) floor drain component types or justify why these two component types are not listed in either LRA Table 2.3.3-18-7 or LRA Table 2.3.3-16.

In its response to RAI 2.3.3.18-1, Entergy stated that hoses (e.g., "Hose 2") are included with the component type item flex hose in LRA Table 2.3.3-18-23 and LRA Table 3.3.2-18-23, "Drains - Floor and Equipment System, Nonsafety-Related Components Affecting Safety-Related Systems, Summary of Aging Management Evaluation," because they are nonsafety-related components affecting safety-related components. The floor drain hubs (e.g., ED1403) collect water from the sources shown on the LRA drawing (LRA-PID-32-09C) and deliver it through drainage piping to the drywell equipment drain sump. The drain hubs and associated piping are included in the component type item piping in LRA Table 2.3.3-18-23 and LRA Table 3.3.2-18-23 because they are nonsafety-related components affecting safety-related components.

The staff finds Entergy's response acceptable because it establishes that a perceived LRA deficiency is not an actual deficiency. The staff's concern described in RAI 2.3.3.18-1 is resolved.

(2) RAI 2.3.3.18-2: Suppression Pool Cleanup

In the second request for additional information (RAI 2.3.3.18-2), the staff noted that the relevant LRA drawing (LRA-PID-27-08A) displays the following instrumentation as components subject to aging management review:

- RTD with thermowell
- PT pressure transmitter with tubing
- FE flow element
- PDT with tubing
- CE conductivity element with tubing

The staff compared this LRA drawing to LRA Table 2.3.3-18-25, "Suppression Pool Cleanup System Nonsafety-Related Components Affecting Safety-Related Systems Components Subject to Aging Management Review," and noted that the "Component Type" column in this table does not list thermowell, tubing, or flow element as component types subject to aging management review. The staff asked Entergy to identify where the LRA addresses the aging management review for these three component types.

In its response to RAI 2.3.3.18-2, Entergy acknowledged the deficiency in LRA Table 2.3.3-18-25, for omitting thermowell, tubing, or flow element in the "Component Type" column. Entergy also noted that LRA Table 3.3.2-18-25, "Suppression Pool Cleanup System Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation," incorrectly invokes the Water Chemistry Control—Closed Treated Water Systems program as the aging management program for the suppression pool cleanup system. Entergy stated that in fact, the Water Chemistry Control—BWR program is the program applicable to the suppression pool cleanup system.

To correct these deficiencies, Entergy made the following revisions:

1) LRA Table 2.3.3-18-25 was revised to include under the "Component Type" column: conductivity element, flow element, thermowell, and tubing. Each of these four component types were then correctly assigned pressure boundary as the intended function.

2) LRA Table 3.3.2-18-25 was revised holistically to manage the aging effects of the conductivity element, flow element, thermowell, and tubing component types. Also, where appropriate, Entergy revised the table throughout to replace the aging management program of "Water Chemistry Control—Closed Treated Water Systems Program" with the "Water Chemistry Control—BWR Program."

The staff finds the RAI response acceptable since Entergy revised both LRA Table 2.3.3-18-25 and LRA Table 3.3.2-18-25 to remove the deficiencies identified in the RAI. The staff's concern described in RAI 2.3.3.18-2 is resolved.

2.3.3.18.3 <u>Conclusion</u>

Based on the staff's evaluation in SER Section 2.3.3.18.2 and on its review of the LRA, USAR, Entergy's engineering reports, license renewal boundary drawings, and RAI responses, the staff concludes that Entergy has appropriately identified the auxiliary system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.4 Steam and Power Conversion Systems

2.3.4.1 Condensate Makeup, Storage, and Transfer

2.3.4.1.1 <u>Summary of Technical Information in the Application</u>

This section discusses condensate makeup, storage, and transfer systems in LRA Section 2.3.4.1, "Condensate Makeup, Storage and Transfer."

2.3.4.1.2 <u>Staff Evaluation</u>

The staff evaluated the condensate makeup, storage, and transfer system functions described in the LRA, the USAR, Entergy engineering reports, and license renewal boundary drawings to verify that Entergy did not omit from the scope of license renewal any components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy did not omit any passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology in LRA Section 2.1, “Scoping and Screening Methodology,” and the guidance in NUREG-1800, Revision 2, Section 2.3, “Scoping and Screening Results: Mechanical Systems,” the staff reviewed LRA Section 2.3.4.1, LRA Table 2.3.4-1, and USAR Section 9.2.6.

2.3.4.1.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.4.1.2 and on its review of the LRA, USAR, Entergy’s engineering reports, system design criteria, and license renewal boundary drawings, the staff concludes that Entergy has appropriately identified the condensate makeup, storage, and transfer system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.2 Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

2.3.4.2.1 Summary of Technical Information in the Application

This section addresses steam and power conversion systems as discussed in LRA Section 2.3.4.2, “Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2).” The systems include:

- condensate makeup, storage, and transfer
- feedwater
- main steam
- auxiliary condensate

2.3.4.2.2 Staff Evaluation

The staff evaluated the steam and power conversion system functions described in the LRA, the USAR, Entergy’s engineering reports, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology in LRA Section 2.1, “Scoping and Screening Methodology,” and the guidance in NUREG-1800, Revision 2, Section 2.3, “Scoping and Screening Results: Mechanical Systems,” the staff reviewed LRA Section 2.3.4.2, LRA Table 2.3.4-2-1, LRA Table 2.3.4-2-2, LRA Table 2.3.4-2-3, and LRA Table 2.3.4-2-4. The staff also reviewed the listed USAR Sections 9.2.6 and the listed RBS USAR sections outlined in Section 2.3.4.2, “Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2),” page 2.3-224.

Condensate Makeup, Storage, and Transfer (CNS)

The staff identified an area pertaining to the condensate makeup, storage, and transfer system in which it required additional information to complete the review of Entergy's scoping and screening results for steam and power conversion systems in-scope for 10 CFR 54.4(a)(2). In order to obtain this information, the NRC staff issued a request for additional information: RAI 2.3.4.2-1 on February 12, 2018 (ADAMS Accession No. ML18043A351). For this RAI as well as Entergy's response see ADAMS Accession No. ML18073A068, dated March 14, 2018.

RAI 2.3.4.2-1

In RAI 2.3.4.2-1, the staff requested clarification of an "Environment" listed in LRA Table 3.4.2-2-1, "Condensate Makeup, Storage and Transfer System Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation." The staff observed that the relevant LRA drawing (LRA-PID-04-03C) displays the component type, filter housing (i.e., CNS-FLT-21), with related component type, tubing, to differential pressure indicator CNS-PDI21 as being subject to aging management review. In contrast, LRA Table 3.4.2-2-1 lists an internal environment of "lube oil" for the filter housing component type but not for the associated tubing component type or for the associated drain piping and drain valve body. An explanation for the use of an internal environment of "lube oil" could not be found in either USAR Section 9.2.6 or in the relevant Entergy System Design Criteria (SDC-104/106/608, Revision. 1). The staff asked Entergy to resolve the internal environment inconsistencies for the filter housing, tubing, drain piping, and drain valve body that are apparent in LRA Table 3.4.2-2-1.

In Entergy's response to RAI 2.3.4.2-1, Entergy acknowledged the LRA deficiency by stating that the correct internal environment for the filter housing component type is "Treated Water (int)." Accordingly, Entergy revised LRA Section 3.4.2.1.2, "Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)." This revision consisted of two parts:

1) "Environments" was changed to remove "Lube Oil" as an environment associated with the steam and power conversion systems in scope for 10 CFR 54.4(a)(2).

2) "Aging Management Programs" was changed to remove "Oil Analysis" as a program associated with the steam and power conversion systems in scope for 10 CFR 54.4(a)(2).

In addition, Entergy also revised two LRA tables:

1) LRA Table 3.4.1, "Summary of Aging Management Programs for the Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801," was revised to reflect that there are no stainless steel components exposed to lube oil in the steam and power conversion systems in the scope of license renewal.

2) LRA Table 3.4.2-2-1 was revised to reflect the correct internal environment of "Treated Water (int)" for the filter housing component type and the correct aging management program of "Water Chemistry Control—BWR."

In summary, Entergy provided a comprehensive resolution to RAI 2.3.4.2-1 by correcting the deficiencies noted in the RAI.

The staff finds Entergy's response acceptable since it corrects an LRA deficiency by revising the appropriate sections and tables in the LRA. The staff's concern described in RAI 2.3.4.2-1 is resolved.

2.3.4.2.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.4.2.2 and on its review of the LRA, USAR, Entergy's engineering reports, system design criteria, license renewal boundary drawings, and RAI responses, the staff concludes that Entergy has appropriately identified the steam and power conversion system components within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.5 Conclusion

On the basis of its review of the license renewal application, USAR, Entergy's engineering reports, system design criteria, license renewal boundary drawings, and RAI responses, the staff concludes that Entergy has appropriately identified the mechanical components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also finds that Entergy has adequately identified the system components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.4 Scoping and Screening Results: Structures

This section documents the staff's review of Entergy's scoping and screening results for structures.

In accordance with the requirements of 10 CFR 54.21(a)(1), applicants must list those passive, long-lived structures and components within the scope of license renewal that are subject to an aging management review. To verify that applicants properly implement their stated methodology for identifying such structures and components, the NRC staff's review focuses on the applicant's implementation results. This focus allows the staff to confirm that the applicant did not omit structures and components that meet the scoping criteria and that are subject to an aging management review.

The staff's evaluation of the information in the RBS license renewal application was the same for all structures. The staff's objective was to determine whether Entergy identified, in accordance with 10 CFR 54.4, all components and supporting structures for structures that appear to meet the license renewal scoping criteria. Similarly, the staff evaluated Entergy's screening results to verify that Entergy identified all passive, long-lived structures and components that are subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

In its scoping evaluation, the staff reviewed the applicable LRA sections, focusing on components that Entergy had not identified as within the scope of license renewal. For each structure, the staff reviewed relevant licensing basis documents, including the final safety analysis report. In doing so, staff sought to determine whether Entergy omitted from the scope of license renewal any components with intended functions described in 10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the LRA specified all intended functions described in 10 CFR 54.4(a). The staff requested additional information from Entergy to resolve any omissions or discrepancies identified.

After reviewing Entergy's scoping results, the NRC staff evaluated Entergy's screening results. For those structures and components with intended functions, the staff sought to determine whether (1) the functions are performed with moving parts or a change in configuration or properties or (2) the structures and components are subject to replacement after a qualified life or specified time period, as described in 10 CFR 54.21(a)(1). For those structures and components that do not meet either of the above two criteria, the staff sought to confirm that these structures and components are subject to an aging management review, as required by 10 CFR 54.21(a)(1). The staff requested additional information from Entergy to resolve any omissions or discrepancies identified.

This section discusses systems, structures, and components within the following RBS structural systems:

- reactor building
- water control structures
- turbine building, auxiliary building, and yard structures
- bulk commodities

2.4.1 Reactor Building

2.4.1.1 Summary of Technical Information in the Application

This section discusses reactor building structures in LRA Section 2.4.1, "Reactor Building,"

- steel containment vessel,
- containment internal structure,
- shield building.

2.4.1.2 Staff Evaluation

The staff evaluated the structural functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all structures with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those structures that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived structural components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.1.3 Conclusion

Based on the staff's evaluation in SER Section 2.4.1.2 and on its review of the LRA and USAR, the staff concludes that Entergy has appropriately identified the reactor building structures within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the reactor building structural components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.4.2 Water Control Structures

2.4.2.1 Summary of Technical Information in the Application

This section discusses water control structures in LRA Section 2.4.2, "Water Control Structures," including the following structures:

- standby service water (SSW) cooling tower, pumphouse, and basin
- service water cooling system cooling tower
- service water pumps foundation
- service water cooling heat exchanger foundation
- service water pump surge tank and chemical injection facility foundation
- service water cooling electrical switchgear building and transformers foundations

2.4.2.2 Staff Evaluation

The staff evaluated the structural functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all structures with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those structures that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived structural components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.2.3 Conclusion

Based on the staff's evaluation in SER Section 2.4.2.2 and on its review of the LRA and USAR, the staff concludes that Entergy has appropriately identified the water control structures within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the water control structural components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.4.3 Turbine Building, Auxiliary Building, and Yard Structures

2.4.3.1 Summary of Technical Information in the Application

This section discusses turbine building, auxiliary building, and yard structures in LRA Section 2.4.3, "Turbine Building, Auxiliary Building, and Yard Structures," including the following structures:

- auxiliary building
- auxiliary control building
- circulating water switchgear house No. 1
- condensate storage tank foundation
- control building
- control house 230 kV switchyard
- diesel generator building
- electrical tunnels and piping tunnels
- fire protection storage tanks foundations
- fire pump house
- fuel building

- manholes, handholes, and duct banks
- motor generator building
- normal switchgear building
- radioactive waste building
- transformer and switchyard support structures and foundations
- turbine building complex

2.4.3.2 Staff Evaluation

The staff evaluated the structural functions described in the LRA, the USAR, and license renewal boundary drawings to verify that Entergy included within the scope of license renewal all structures with intended functions as described in 10 CFR 54.4(a). The staff then reviewed those structures that Entergy identified as within the scope of license renewal to verify that Entergy included all passive and long-lived structural components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.3.3 Conclusion

Based on the staff's evaluation in SER Section 2.4.3.2 and on its review of the LRA and USAR, the staff concludes that Entergy has appropriately identified the turbine building, auxiliary building, and yard structures within the scope of license renewal as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the turbine building, auxiliary building, and yard structural components subject to an aging management review in accordance with the requirements in 10 CFR 54.21(a)(1).

2.4.4 Bulk Commodities

2.4.4.1 Summary of Technical Information in the Application

This section discusses bulk commodities in LRA Section 2.4.4, "Bulk Commodities."

LRA Section 2.4.4 describes bulk commodities. These are the structural components or commodities that perform or support intended functions of in-scope SSCs. Bulk commodities unique to a specific structure are included in the review for that structure (LRA Sections 2.4.1 through 2.4.3). Bulk commodities common to RBS in-scope SSCs (e.g., concrete embedments and anchors, bolted connections, component supports, cable trays, compressible joints and seals, conduit, decking, doors, electrical panels and enclosures, hatches/plugs, instrument panels and racks, miscellaneous steel, racks, piping and equipment supports, tube track supports) are addressed in this section.

Insulation may have the specific intended functions of (1) maintaining local area temperatures within limits or (2) maintaining integrity such that falling insulation does not damage safety-related equipment.

LRA Table 2.4-4 identifies bulk commodities' component types, within the scope of license renewal and subject to an aging management review, as well as their intended functions.

2.4.4.2 Staff Evaluation

The staff evaluated the bulk commodity functions described in the LRA and the USAR to verify that Entergy included within the scope of license renewal all components with intended functions delineated in 10 CFR 54.4(a). The staff then reviewed those components that Entergy identified as within the scope of license renewal to verify that the applicant has included all passive and long-lived components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1).

During its review, the staff identified areas in which it needed additional information to complete the review of Entergy's scoping and screening results for bulk commodities. In order to obtain this information, on October 23, 2017, the staff issued a request for additional information APLB RAI 2.4.4-2 as described below. Entergy responded to the staff's RAI as discussed below.

<u>RAI 2.4.4-2</u>

By letter dated October 23, 2017, the NRC staff issued APLB RAI 2.4.4-2 (ADAMS Accession No. ML17303A102) stating that LRA Table 2.4-4 does not include the following types of fire barriers or fire protection features:

- fire damper housing
- fire retardant coating (fireproofing material) for structural steel members
- smoke and heat vent housings

The staff asked Entergy to verify whether the fire barriers or fire protection features listed above are within the scope of license renewal in accordance with 10 CFR 54.4(a) and whether they are subject to an aging management review in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and are not subject to an aging management review, the staff requested that Entergy justify their exclusion.

In a response dated November 16, 2017 (ADAMS Accession No. ML17324B364), Entergy provided the results of the scoping and screening for the fire barrier commodity types listed above. Entergy stated:

> "Fire damper housing" and "smoke and heat vent housings" are within the scope of River Bend Station Unit 1 (RBS) license renewal in accordance with 10 CFR 54.4(a) and are subject to aging management review (AMR) in accordance with 10 CFR 54.21(a)(1). As indicated in RBS license renewal application (LRA) Section 2,3.3.13, certain fire dampers are subject to an AMR as they support an intended function in accordance with 10 CFR 54.4(a)(3) for fire protection. Where fire dampers are mounted in a wall, the housings are evaluated as structural commodities. Where fire dampers are installed in ductwork subject to an AMR, they are included in the evaluation of the related heating, ventilation and air conditioning (HVAC) system. The in-wall fire damper housings are included in the structural aging management reviews as miscellaneous steel as part of component type "Fire protection components - miscellaneous steel including framing steel, curbs, vents and louvers, radiant energy shields, tray covers." This item is included in RBS LRA Table 2.4-4. Where fire damper housings are in duct work, they are covered in the HVAC systems as the component type "damper housing' as shown in LRA Table 2.3.3-13.

> Fire retardant coating (fireproofing material) for structural steel members is included in the structural aging management reviews under "Other Materials" as part of component type "Fire wrap." Fire wrap is included in RBS LRA Table 2.4-4. LRA Section 3.5.2.1.4 has been revised to include "Cementitious material, e.g., Pyrocrete," as a material for the component type "Fire wrap."
> LRA Table 3.5.2-4 has been revised to add "Cementitious material, e.g., Pyrocrete" as a material for the component type "Fire wrap."
>
> Smoke and heat vent housings are included in structural aging management reviews as "vents and louvers" as part of component type "Fire protection components – miscellaneous steel including framing steel, curbs, vents and louvers, radiant energy shields, tray covers." As discussed above, this item is included in RBS LRA Table 2.4-4.

In reviewing Entergy's response to the RAI, the staff determined that Entergy addressed and resolved each item in the RAI, as discussed in the following paragraphs.

Entergy confirmed that the fire damper and smoke and heat vent housings are included within the scope of license renewal and are subject to an aging management review. Where fire damper housings are embedded in walls, they are considered to be structural components and are included in LRA Table 2.4-4, items for "Fire protection components - miscellaneous steel including framing steel, curbs, vents and louvers, radiant energy shields, tray covers." Entergy indicated that where fire damper housings are located in duct work; they are covered in the HVAC systems as the component type "damper housing" as shown in LRA Table 2.3.3-13.

Fire retardant coating is included in LRA Table 2.4-4, as "Other Materials" under component type "Fire wrap." Entergy further stated that it revised LRA Section 3.5.2.1.4 to include "Cementitious material, e.g., Pyrocrete," as a material for the component type "Fire wrap." Correspondingly, Entergy also revised LRA Table 3.5.2-4 to add "Cementitious material, e.g., Pyrocrete," as a material for the component type "Fire wrap."

Smoke and heat vent housings are included in the structural aging management review as "vents and louvers," as part of component type "Fire protection components – miscellaneous steel including framing steel, curbs, vents and louvers, radiant energy shields, tray covers." This item is included in LRA Table 2.4-4.

Based on its review, the staff finds Entergy's response to APLB RAI 2.4.4-2 acceptable because it provided clarification that the fire barriers and fire protection system components listed above are within the scope of license renewal and subject to an aging management review as required by 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively. The staff's concern described in APLB RAI 2.4.4-2 is resolved.

2.4.4.3 Conclusion

Based on its evaluation and on its review of the LRA, USAR, license renewal boundary drawings, and Entergy's RAI response, the staff concludes that Entergy has appropriately identified the bulk commodity components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that Entergy has adequately identified the bulk commodity components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.4.5 Conclusion

On the basis of its review of the LRA, USAR, and RAI responses, the staff concludes that Entergy has appropriately identified the structures within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also finds that Entergy has adequately identified the structural components subject to an aging management review in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.5 Scoping and Screening Results: Electrical and Instrumentation and Controls Systems

This section documents the NRC staff's review of Entergy's scoping and screening results for identifying electrical and instrumentation and controls systems within the scope of license renewal.

In accordance with the requirements of 10 CFR 54.21(a)(1), license renewal applicants must list passive, long-lived structures and components within the scope of license renewal that are subject to an aging management review. To verify that applicants properly implement their stated methodology for identifying such passive, long-lived structures and components, the staff's review focuses on the applicant's implementation results. This focus allows the staff to confirm that applications do not omit electrical and instrumentation and controls system components that meet the scoping criteria and are subject to an aging management review.

The staff's evaluation of the information in the River Bend Station LRA was the same for all electrical and instrumentation and controls systems. The staff's objective was to determine whether Entergy identified, in accordance with 10 CFR 54.4, all components and supporting structures for electrical and instrumentation and controls systems that appear to meet the license renewal scoping criteria. Similarly, the staff evaluated Entergy's screening results to verify that Entergy identified all passive, long-lived electrical and instrumentation and controls structures and components subject to an aging management review in accordance with 10 CFR 54.21(a)(1).

In its scoping evaluation, the staff reviewed the applicable LRA sections, focusing on components that Entergy did not identify as within the scope of license renewal. The staff also reviewed relevant licensing basis documents, including the USAR, for each electrical and instrumentation and controls system to determine whether Entergy omitted from the scope of license renewal any components with intended functions as described in 10 CFR 54.4(a). Finally, the staff also reviewed the licensing basis documents to determine whether the LRA included electrical and instrumentation and controls systems, structures, and components with the intended functions as described in 10 CFR 54.4(a).

After reviewing Entergy's scoping results, the staff evaluated Entergy's screening results. For those structures and components with the intended functions described in 10 CFR 54.4(a), the staff sought to determine whether (1) the functions are performed with moving parts or a change in configuration or properties or (2) the structures and components are subject to replacement after a qualified life or specified time period, as described in 10 CFR 54.21(a)(1). For those structures and components that do not meet either of these criteria, the staff sought to confirm that these structures and components were subject to an aging management review, as required by 10 CFR 54.21(a)(1).

2.5.1 Summary of Technical Information in the Application

This section discusses electrical and instrumentation and control systems in LRA Section 2.5, "Scoping and Screening Results: Electrical and Instrumentation and Control Systems."

In LRA Section 2.5, Entergy identified the following list of passive component and commodity groups that are subject to an aging management review:

- component commodity group—high-voltage insulators
  - high-voltage insulators
- component commodity group—cables and connections, bus, electrical portions of electrical and instrumentation and controls penetration assemblies (this group includes fuse holders outside of cabinets of active electrical components)
  - cable connections (metallic parts)
  - electrical cables and connections not subject to the environmental qualification requirements of 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants"
  - electrical cables and connections used in instrumentation circuits that are not subject to 10 CFR 50.49 environmental qualification requirements
  - fuse holders—insulation material
  - fuse holders—metallic clamp
  - inaccessible power (≥ 400 V) cables (e.g., installed underground in conduit, duct bank, or direct buried) not subject to 10 CFR 50.49 environmental qualification requirements
  - metal enclosed bus—bus connections
  - metal enclosed bus—enclosures assemblies (elastomers, external surfaces)
  - metal enclosed bus—insulators
  - switchyard bus and connections
  - transmission conductors and connections

In addition to the list above, Entergy noted the following: all RBS electrical and instrumentation and controls penetration assemblies are in the environmental qualification program (10 CFR 50.49). RBS electrical and instrumentation and controls penetration assemblies in the environmental qualification program are not subject to an aging management review since the components are subject to replacement based on qualified life.

2.5.2 Staff Evaluation

The staff's review of the license renewal application for this section relates to scoping and screening of electrical and instrumentation and controls system components subject to an aging management review in accordance with 10 CFR 54.4 and 10 CFR 54.21.

Section 54.4(a) of 10 CFR defines the plant systems, structures, and components (SSCs) that fall within the scope of license renewal. Section 54.4(b) of 10 CFR goes on to state that the intended functions of these SSCs must be shown to fulfill 10 CFR 54.21, "Contents of Application—Technical Information." In accordance with the requirements of 10 CFR 54.21(a)(1), license renewal applicants must identify and list passive, long-lived SSCs within the scope of the license renewal and subject to an aging management review. NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), Section 2.1, "Scoping and Screening Methodology," and NEI 95-10, Revision 6, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54—The License Renewal Rule," respectively provide additional NRC and industry guidance on scoping and screening for license renewal.

The staff used the SRP-LR and NEI 95-10 guidance to evaluate Entergy's methodology for scoping and screening the electrical and instrumentation and controls structures and components that fall within the scope of license renewal. SRP-LR Section 2.1.2.1, "Scoping," states that an applicant's scoping methodology should be consistent with the process in NEI 95-10 Section 3.0, "Identify the SSCs within the Scope of License Renewal and Their Intended Functions." If an applicant's scoping methodology is not consistent with NEI 95-10 Section 3.0, the applicant should provide a justification that offers a reasonable basis for the inconsistency. The staff reviewed Entergy's LRA scoping methodology and results for electrical and instrumentation and controls system components using the scoping methodology described in SRP-LR Section 2.5, "Scoping and Screening Results: Electrical and Instrumentation and Controls Systems," and NEI 95-10. The staff finds that the scoping methodology in Entergy's LRA is consistent with the guidance in the SRP-LR and NEI 95-10.

The staff evaluated the system functions described in the LRA, the USAR, and license renewal boundary drawings to verify whether Entergy includes within the scope of license renewal all components with intended functions as described in 10 CFR 54.4(a). In LRA Section 2.1.1, "Scoping Methodology," Entergy explains that all plant electrical and instrumentation and controls systems, and electrical and instrumentation and controls components in mechanical systems fall within the scope of the license renewal. In addition, Entergy evaluated the switchyard equipment for station blackout-intended functions and describes it in LRA Section 2.1.1. Entergy further states in LRA Section 2.1.1.3.5, "Commission's Regulations for Station Blackout (10 CFR 50.63)," that the electrical equipment that supports the requirements of 10 CFR 50.63 is included within the scope of license renewal. The NRC staff finds that Entergy's inclusion within the scope of license renewal of the plant (1) electrical and instrumentation and controls systems, (2) electrical and instrumentation and controls components in mechanical systems, and (3) electrical equipment that supports the requirements of 10 CFR 50.63 satisfies the requirements in 10 CFR 54.4(a).

The staff then reviewed those components that Entergy identified as within the scope of license renewal satisfying the requirements in 10 CFR 54.4(a), to verify whether the application included all passive and long-lived electrical and instrumentation and controls components subject to an aging management review in accordance with the requirements of 10 CFR 54.21(a)(1). The staff also sought to verify whether Entergy omitted any passive and long-lived electrical and instrumentation and controls components subject to an aging management review, in accordance with the requirements of 10 CFR 54.21(a)(1)

Entergy grouped the electrical and instrumentation and controls components that it had identified as within the scope of license renewal into two component commodity groups. Entergy applied the screening criteria in 10 CFR 54.21(a)(1)(i) and 10 CFR 54.21(a)(1)(ii) to each of the components in the two groups to (1) identify those components that perform their intended functions without moving parts or without a change in configuration or properties and to (2) remove the components that are subject to replacement based on a qualified life or specified time period.

As a result of the staff's review of the list of components subject to the aging management review, the staff finds that the electrical components identified by Entergy as being subject to the aging management review were consistent with the guidance in the SRP-LR. The staff also finds that Entergy included all electrical and instrumentation and controls components subject to an aging management review in accordance with the requirements of 10 CFR 54.21(a)(1), because the listed electrical and instrumentation and controls components meet the criteria in 10 CFR 54.21(a)(1)(i) or 10 CFR 54.21(a)(1)(ii).

The regulations at 10 CFR 54.4(a)(3) require that all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations in 10 CFR 50.63, "Loss of All Alternating Current Power" (also known as the Station Blackout Rule), be included within the scope of license renewal. The Station Blackout Rule requires nuclear power plants to have the capability to withstand and recover from a station blackout of a specified length of time. In addition, the staff noted that the guidance provided on April 1, 2002, in "Staff Guidance on Scoping of Equipment Relied on to Meet the Requirements of the Station Blackout Rule (10 CFR 50.63) for License Renewal (10 CFR 54.4(a)(3))" (ADAMS Accession No. ML020920464), states the following:

> For purposes of the license renewal rule, the staff has determined that the plant system portion of the offsite power system that is used to connect the plant to the offsite power source should be included within the scope of the rule. This path typically includes switchyard circuit breakers that connect to the offsite system power transformers (startup transformers), the transformers themselves, the intervening overhead or underground circuits between circuit breaker and transformer and onsite electrical system, and the associated control circuits and structures. Ensuring that the appropriate offsite power system long-lived passive structures and components that are part of this circuit path are subject to an AMR will assure that the bases underlying the SBO requirements are maintained over the period of extended license.

LRA drawing LRA-EE-0001 highlights the components in the station blackout recovery path that are subject to an aging management review. This includes the complete circuit between the onsite electrical distribution systems to the offsite electrical distribution system. The LRA states that the station blackout recovery path extends from the onsite electrical distribution system to the 230 kV switchyard and site transformer yard. It also states that the recovery path includes the Fancy Point Switchyard and the 230 kV electrical distribution systems. In the LRA, Entergy stated that the RBS preferred (offsite) plant power is provided by two physically and electrically independent 230 kV lines originating in the 230 kV bays of the Fancy Point Substation or Switchyard and terminating at RBS Transformer Yard 1 and Yard 2A. The first source from the offsite switchyard powers two preferred station service transformers (1RTX-XSR1C and

1RTX-XSR1E) in Transformer Yard 1. The second source from the offsite switchyard powers two other preferred station service transformers (1RTX-XSR1D and 1RTX-XSR1F) in Transformer Yard 2A. The station service transformers supply 4160 V and 480 V buses.

LRA Section 2.5 states the following:

> In addition, LRA Section 2.5 also states that passive components in the station blackout recovery path are subject to an aging management review. The staff reviewed Entergy's scoping analysis and concludes that the scoping is consistent with the guidance in the staff guidance letter issued on April 1, 2002, which is incorporated into the SRP-LR at Section 2.5.2.1.1. The staff found that Entergy's inclusion of the passive, long-lived offsite and onsite SSCs in the station blackout recovery path in the aging management review meets the requirements in 10 CFR 54.4(a)(3) as it pertains to compliance with 10 CFR 50.63.

The staff notes that Entergy did not include fuse holders with metallic clamps (not part of active equipment), in the electrical commodities subject to an aging management review because—based on a review of plant documents, drawings, the USAR, a functional location list, procedures and the RBS equipment database—Entergy concluded that the metallic clamps portion of RBS fuse holders were either installed in active equipment, or did not perform a license renewal-intended function. Based on the staff's review of this information, the staff finds that the exclusion of fuse holders with metallic clamps (not part of active equipment), from the electrical commodities subject to an AMR is acceptable.

Entergy did not include metal enclosed bus (MEB) in the electrical commodities subject to an aging management review because—based on its review of plant documents, drawings, the USAR, a functional location list, procedures, and RBS equipment database—Entergy concluded that metal enclosed buses did not perform a license renewal intended function. Based on the staff's review of this information, the staff finds that the exclusion of metal enclosed buses from the electrical commodities subject to an aging management review is acceptable.

Finally, Entergy did not include uninsulated ground conductors in the electrical commodity groups subject to an aging management review because uninsulated ground conductors are not safety related and do not perform a license renewal-intended function at RBS. Entergy further determined that failure of uninsulated ground conductors would not adversely affect the intended safety functions based on industry and plant-specific operating experience. The staff reviewed the USAR and finds that uninsulated ground conductors are not credited in the RBS design basis. Therefore, the staff concludes that the exclusion of uninsulated ground conductors from the electrical commodity groups subject to an aging management review is acceptable.

2.5.3 Conclusion

The staff reviewed the LRA, the USAR, and NEI guidance to determine whether Entergy failed to identify any electrical and instrumentation and controls SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's evaluated whether Entergy failed to identify any components subject to an aging management review. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that Entergy has adequately identified the electrical and instrumentation and controls systems and components within the scope of license renewal, as required by 10 CFR 54.4(a), as well as those subject to an aging management review, as required by 10 CFR 54.21(a)(1).

2.6 Conclusion for Scoping and Screening

The staff reviewed the information in LRA Section 2, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results," and determines that Entergy's scoping and screening methodology is consistent with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a)(1). In addition, Entergy's treatment of safety-related and nonsafety-related SSCs within the scope of license renewal and on structures and components subject to an aging management review is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

On the basis of its review, the staff concludes that Entergy has adequately identified SSCs within the scope of license renewal, as required by 10 CFR 54.4(a). In addition, for SSCs within the scope of license renewal, Entergy has also adequately identified structures and components subject to an aging management review, as required by 10 CFR 54.21(a)(1).

With regard to these matters, the staff concludes that there is reasonable assurance that if the NRC issues a renewed RBS operating license, Entergy will continue to conduct the activities authorized by the renewed license in accordance with the current licensing basis. The staff also concludes that any changes made to the current licensing basis, in order to comply with 10 CFR 54.29(a), are in accordance with the Atomic Energy Act of 1954, as amended and NRC regulations.

3 AGING MANAGEMENT REVIEW RESULTS

This section of the safety evaluation report contains the U.S. Nuclear Regulatory Commission staff's evaluation of Entergy Operations, Inc.'s and Entergy Louisiana, LLC's (collectively, Entergy's or the applicant's) aging management programs and aging management reviews for River Bend Station, Unit 1.

Entergy (the applicant) describes these aging management programs and aging management reviews in its license renewal application for River Bend Station, Unit 1 (RBS). Appendix B of the license renewal application (LRA Appendix B), lists the 43 aging management programs that Entergy will rely on to manage or monitor the aging of passive, long-lived structures and components. LRA Section 3 provides the results of Entergy's aging management reviews for those systems and components identified in LRA Section 2 as within the scope of license renewal and subject to an aging management review.

The staff evaluated Entergy's aging management reviews for the following six system components or component groups: (3.1) the reactor vessel, reactor vessel internals, and reactor coolant system components and component groups, (3.2) the engineered safety features system components and component groups. (3.3) the auxiliary systems components and component groups, (3.4) the steam and power conversion system components and component groups, (3.5) the structure and components supports and component groups, and (3.6) the electrical and instrumentation and control system components and component groups.

3.0 Applicant's Use of the Generic Aging Lessons-Learned Report

In preparing its license renewal application for River Bend Station, Unit 1, Entergy credits NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report," (the Gall Report) dated December 2010. The NRC staff reviews license renewal applications in accordance with Title 10 of the *Code of Federal Regulations* Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants" (10 CFR Part 54); NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants"; and the GALL Report. In addition to its review of Entergy's license renewal application, the staff conducted onsite and offsite audits of selected River Bend Station, Unit 1 (RBS) aging management programs. The offsite audit, conducted at NRC headquarters, took place from October 16, 2017 to November 8, 2017. The onsite audit at RBS took place during the week of November 6, 2017. The NRC staff designs its onsite audits to maximize efficiency in the LRA review. Because the applicant can respond to questions and the staff can readily evaluate these responses, an onsite audit reduces the need for formal correspondence between the staff and the applicant and results in greater review efficiency.

3.0.1 Format of the License Renewal Application

Entergy structured its license renewal application in accordance with Regulatory Guide (RG) 1.188, Revision 1, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses"; NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants"; and Nuclear Energy Institute (NEI) 95-10, Revision 6, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54—The License Renewal Rule." The organization of Section 3, "Aging Management Review Results," of Entergy's license renewal application (LRA Section 3), parallels that of Chapter 3 of NUREG-1800, Revision 2, "Standard Review Plan for Review of

License Renewal Applications for Nuclear Power Plants" (SRP-LR). LRA Section 3 presents aging management review results in the following two table types:

(1) Table 1s: The numbering format for this table type is Table 3.x.1—where 3 indicates the LRA section number, x indicates the subsection number from the GALL Report, and 1 indicates that the table type is Table 1.

(2) Table 2s: The numbering format for this table type is Table 3.x.2-y—where 3 indicates the LRA section number, x indicates the subsection number from the GALL Report, 2 indicates that this table is Table 2 type, and y indicates the system table number.

In its Table 1s, Entergy summarizes the portions of the application that it considers to be consistent with NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report," (the GALL Report). In its Table 2s, Entergy identifies the linkage between the scoping and screening results in LRA Section 2, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results," and the aging management reviews in LRA Section 3.

3.0.2 Staff's Review Process

The NRC staff conducted three types of evaluations of Entergy's aging management reviews and aging management programs:

(1) For items that Entergy states are consistent with the NRC staff's GALL Report, the staff conducted either an audit or a technical review to determine consistency.

(2) For items that Entergy states are consistent with the GALL Report with exceptions, enhancements, or both, the staff conducted either an audit or a technical review of the item to determine consistency. In addition, the staff conducted a technical review of Entergy's technical justifications for the exceptions or the adequacy of the enhancements.

    The NRC staff's SRP-LR states that an applicant may take one or more exceptions to specific GALL Report aging management program elements; however, the applicant should describe and justify any exception to the GALL Report aging management program. Therefore, the staff considers exceptions as being portions of the GALL Report aging management program that the applicant does not intend to implement.

    In some cases, an applicant may choose an existing plant program that does not meet all the program elements defined in the GALL aging management program. However, the applicant may make a commitment to augment or enhance the existing program to satisfy the GALL Report aging management program recommendations prior to the period of extended operation. Enhancements include, but are not limited to, activities needed to ensure consistency with the GALL Report recommendations. Enhancements may expand, but not reduce, the scope of an aging management program.

(3) For other items, the staff conducted a technical review to verify conformance with 10 CFR Part 54 requirements for the contents of the license renewal application. Specifically, 10 CFR 54.21(a)(3) requires the application to "demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be

maintained consistent with the CLB [current licensing basis] for the period of extended operation."

The staff uses its audits and technical reviews of Entergy's aging management programs and aging management reviews to determine whether over the period of extended operation Entergy can adequately manage the aging effects on structures and components in a way that maintains their intended functions consistent with the plant's current licensing basis. This is required by 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

3.0.2.1 Review of Aging Management Programs

For aging management programs for which Entergy claims consistency with the GALL Report aging management programs, the staff conducted either an audit or a technical review to verify the claim of consistency. For each aging management program with one or more exceptions, the staff evaluated each exception to determine whether the exception was acceptable and whether the modified aging management program would adequately manage the aging effect. For aging management programs not evaluated in the GALL Report, the staff performed a full review to determine the adequacy of these programs. The staff evaluated the aging management programs against the following 10 program elements, which are defined in Appendix A, "Branch Technical Positions," of the NRC staff's Standard Review Plan for License Renewal (SRP-LR):

1) scope of program
2) preventive actions
3) parameters monitored or inspected
4) detection of aging effects
5) monitoring and trending
6) acceptance criteria
7) corrective actions
8) confirmation process
9) administrative controls
10) operating experience

Section 3.03 of this safety evaluation report documents the staff's audit results of these program elements. The staff's baseline review includes Program Elements 1 through 6 and Program Element 10, above. The staff reviews other program elements on a program-by-program basis. Section 3.0.4 of this report evaluates Entergy's quality assurance (QA) program. This evaluation of the quality assurance program includes the staff's assessment of Program Elements 7, 8, and 9 (i.e., corrective actions, confirmation process, and administrative controls, respectively). The staff also reviews Program Element 7 as part of the staff's evaluation of some aging management programs. Section 3.0.5 of this report evaluates Program Element 10 (operating experience).

3.0.2.2 Review of Aging Management Review Results

Each LRA Table 2 contains information concerning whether or not Entergy's LRA aging management reviews align with the GALL Report's aging management reviews. For a given aging management review in a Table 2, the staff reviewed the intended function, material, environment, aging effect requiring management, and aging management program combination for a particular RBS system component type. Item numbers in column seven of the LRA, "NUREG-1801 Vol. 2 Item," correlate to a combination as identified in the GALL Report. A blank in column seven indicates that Entergy did not identify an appropriate correlation in the GALL Report. The staff also conducted a technical review of combinations not consistent with the GALL Report. The next column, "Table 1 Item," refers to a number indicating the correlating row in Table 1.

For component groups evaluated in the GALL Report for which Entergy claims consistency and for which the GALL Report does not recommend further evaluation, the staff's review determines whether the GALL Report evaluation bounds the plant-specific components of these GALL Report component groups.

For each aging management review item, Entergy notes how the information in the tables aligns with the information in the GALL Report. The staff audited those aging management reviews with Note A through Note E indicating how the aging management review is consistent with the GALL Report.

Note A indicates that the applicant's aging management review item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the aging management program is consistent with the GALL Report aging management program. The staff audited these items to verify consistency with the GALL Report and to verify the validity of the aging management review for the site-specific conditions.

Note B indicates that the applicant's aging management review item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the applicant's aging management program takes some exceptions to the GALL Report aging management program. The staff audited these items to verify consistency with the GALL Report and to verify that the identified exceptions to the GALL Report aging management program have been reviewed and accepted. The staff also determined whether Entergy's aging management program is consistent with the GALL Report aging management program, and whether the aging management review is valid for the site-specific conditions.

Note C indicates that the component for the applicant's aging management review item, although different from the GALL Report item, is consistent with the GALL Report for material, environment, and aging effect. In addition, the aging management program is consistent with the GALL Report aging management program. This note indicates that Entergy did not find a listing of some system components in the GALL Report; however, Entergy identified in the GALL Report a different component with the same material, environment, aging effect, and aging management program as the component under review. The staff audited these items to verify consistency with the GALL Report. The staff also determined whether the aging management review item of the different component is applicable to the component under review and whether the aging management review is valid for the site-specific conditions.

Note D indicates that the component for the applicant's aging management review item, although different from the GALL Report item, is consistent with the GALL Report for material, environment, and aging effect. In addition, the aging management program takes some exceptions to the GALL Report aging management program. The staff audited these items to verify consistency with the GALL Report. The staff verified whether the aging management review item of the different component is applicable to the component under review, and whether the identified exceptions to the GALL Report aging management programs have been reviewed and accepted. The staff also determined whether Entergy's aging management program is consistent with the GALL Report aging management program and whether the aging management review is valid for the site-specific conditions.

Note E indicates that the applicant's aging management review item is consistent with the GALL Report for material, environment, and aging effect, but credits a different aging management program. The staff audited these items to verify consistency with the GALL Report. The staff also determined whether the credited aging management program would manage the aging effect consistently with the GALL Report aging management program and whether the aging management review is valid for the site-specific conditions. Note E may also indicate further evaluation is needed for the material, environment, and aging effect combination.

The applicant also indicated, through Note F through Note J that the combination of component type, material, environment, and aging effect requiring management does not correspond to any item in the GALL Report. The staff reviewed additional details of the aging management review results for material, environment, aging effect requiring management, and aging management program combinations that are not consistent with or are not addressed in the GALL Report.

Note F indicates that the material for the applicant's aging management review item component is not evaluated in the GALL Report.

Note G indicates that the environment for the applicant's aging management review item component and material is not evaluated in the GALL Report.

Note H indicates that the aging effect for the applicant's aging management review item component, material, and environment combination is not evaluated in the GALL Report.

Note I indicates that the aging effect identified in the GALL Report for the item component, material, and environment combination is not applicable.

Note J indicates that neither the component nor the material and environment combination for the item is evaluated in the GALL Report.

3.0.2.3 Updated Safety Analysis Report Supplement

Consistent with the SRP-LR for the aging management reviews and aging management programs that it reviewed, the staff also reviewed Entergy's updated safety analysis report (USAR) supplement, which summarizes RBS programs and activities for managing aging effects for the period of extended operation, as required by 10 CFR 54.21(d).

3.0.2.4 Documentation and Documents Reviewed

In its review, the staff used the LRA, LRA supplements, the SRP-LR, and the GALL Report.

During the NRC staff's onsite audit at River Bend Station, the staff examined Entergy's justifications to verify that its activities and programs will adequately manage the effects of aging on structures and components. The staff also conducted detailed discussions and interviews with Entergy license renewal project personnel and others with technical expertise relevant to aging management.

The information within this box describes the staff's methodology to reviewing Entergy's aging management reviews. This review applies to the staff's review of LRA Section 3.1 to LRA Section 3.6.

The staff reviewed LRA Section 3.1 to Section 3.6 to determine whether Entergy has demonstrated that it will adequately manage the effects of aging for systems, structures, and components within the scope of license renewal and subject to an aging management review, in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted a review of Entergy's aging management reviews to verify Entergy's claim that certain aging management reviews are consistent with the GALL Report or are not applicable. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA is applicable and that Entergy identified the appropriate GALL Report aging management reviews. Aging management reviews that the staff confirmed are consistent with the GALL Report are noted as such in SER Table 3.1-1 to Table 3.6-1; therefore, no further discussion is required. Aging management reviews that the staff confirmed are not applicable or that require no aging management are noted in SER Table 3.1-1 to Table 3.6-1 and discussed in SER Section 3.X.2.1.1 (X denotes the specific LRA aging management review section). SER Sections 3.X.2.1.2 document (1) the staff's evaluation of aging management reviews that Entergy claims are consistent with the GALL Report, but for which Entergy uses a different aging management program than the program recommended in the GALL Report, and (2) aging management reviews for which the staff requested additional information.

During its review, the staff also selected aging management reviews consistent with the GALL Report and for which further evaluation is recommended. The staff confirms that Entergy's further evaluations are consistent with the SRP-LR Section 3.X.2.2 acceptance criteria. SER Section 3.X.2.2 documents the staff's evaluations.

The staff also conducted a technical review of the remaining aging management reviews not consistent with or not addressed in the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed are appropriate for the material–environment combinations specified. SER Section 3.X.2.3 documents the staff's evaluations.

For structures, systems, and components which Entergy claims are not applicable or require no aging management, the staff reviewed the aging management review items and RBS operating experience to verify Entergy's claims.

3.0.3 Aging Management Programs

SER Table 3.0.3-1 below presents the aging management programs that Entergy credits for monitoring and managing the aging of passive, long-lived structures and components at RBS. Entergy lists these programs in LRA Appendix B. For each RBS aging management program listed, the table below identifies the GALL Report aging management program with which Entergy claims consistency as well as the SER section that documents the NRC staff's evaluation of the program.

Table 3.0-1 Aging Management Programs

RBS Aging Management Program	LRA Section(s)	New or Existing Aging Management Program	GALL Report Comparison	Corresponding Aging Management Program in the GALL Report	Corresponding Section in this Safety Evaluation Report
Aboveground Metallic Tanks	A.1.1, B.1.1	New	Consistent	GALL Report AMP XI.M29, "Aboveground Metallic Tanks," as modified by LR-ISG-2012-02	3.0.3.1.1
Bolting Integrity	A.1.2 B.1.2	Existing	Consistent with exceptions and enhancements	GALL Report AMP XI.M18, "Bolting Integrity"	3.0.3.2.1
Neutron Absorbing Material Monitoring	A.1.3, B.1.3	New	Consistent	GALL Report AMP XI.M40, "Monitoring of Neutron-Absorbing Materials Other than Boraflex"	3.0.3.2.2
Buried and Underground Piping and Tanks Inspection	A.1.4 B.1.4	New	Consistent	GALL Report AMP XI.M41, "Buried and Underground Piping and Tanks"	3.0.3.1.2
BWR CRD Return Line Nozzle	A.1.5, B.1.5	Existing	Consistent with enhancement	GALL Report AMP XI.M6, "BWR Control Rod Drive Return Line Nozzle"	3.0.3.1.3
BWR Feedwater Nozzle	A.1.6, B.1.6	Existing	Consistent	GALL Report AMP XI.M5, "BWR Feedwater Nozzle"	3.0.3.1.4
BWR Penetrations	A.1.7, B.1.7	Existing	Consistent	GALL Report AMP XI.M8, "BWR Penetrations"	3.0.3.1.5
BWR Stress Corrosion Cracking	A.1.8, B.1.8	Existing	Consistent	GALL Report AMP XI.M7, "BWR Stress Corrosion Cracking"	3.0.3.1.6
BWR Vessel ID Attachment Welds	A.1.9, B.1.9	Existing	Consistent	GALL Report AMP XI.M4, "BWR Vessel ID Attachment Welds"	3.0.3.1.7

RBS Aging Management Program	LRA Section(s)	New or Existing Aging Management Program	GALL Report Comparison	Corresponding Aging Management Program in the GALL Report	Corresponding Section in this Safety Evaluation Report
BWR Vessel Internals	A.1.10, B.1.10	Existing	Consistent with enhancements	GALL Report AMP XI.M9, "BWR Vessel Internals"	3.0.3.2.3
Coating Integrity	A.1.11, B.1.11	New	Consistent	GALL Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," as issued in LR-ISG-2013-01	3.0.3.1.8
Compressed Air Monitoring	A.1.12, B.1.12	Existing	Consistent with exceptions and enhancements	GALL Report AMP XI.M24, "Compressed Air Monitoring"	3.0.3.2.4
Containment Inservice Inspection—IWE	A.1.13, B.1.13	Existing	Consistent with enhancement	GALL Report AMP XI.S1, "ASME Section XI, Subsection IWE"	3.0.3.2.14
Containment Leak Rate	A.1.14, B.1.14	Existing	Consistent with exceptions	GALL Report AMP XI.S4, "10 CFR 50, Appendix J"	3.0.3.2.15
Diesel Fuel Monitoring	A.1.15, B.1.15	Existing	Consistent with enhancements	GALL Report AMP XI.M30, "Fuel Oil Chemistry"	3.0.3.2.5
Environmental Qualification (EQ) of Electric Components	A.1.16, B.1.16	Existing	Consistent	GALL Report AMP X.E1, "Environmental Qualification (EQ) of Electric Components"	3.0.3.1.18
External Surfaces Monitoring	A.1.17, B.1.17	Existing	Consistent with enhancements	GALL Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components"	3.0.3.2.6
Fatigue Monitoring	A.1.18, B.1.18	Existing	Consistent with enhancements	GALL Report AMP X.M1, "Fatigue Monitoring"	3.0.3.2.7
Fire Protection	A.1.19, B.1.19	Existing	Consistent	GALL Report AMP XI.M26, "Fire Protection"	3.0.3.1.9
Fire Water System	A.1.20, B.1.20	Existing	Consistent with exception and enhancements	GALL Report AMP XI.M27, "Fire Water System," as modified by LR-ISG-2012-02	3.0.3.2.8
Flow-Accelerated Corrosion	A.1.21, B.1.21	Existing	Consistent with exception and enhancement	GALL Report AMP XI.M17, "Flow-Accelerated Corrosion"	3.0.3.2.9

RBS Aging Management Program	LRA Section(s)	New or Existing Aging Management Program	GALL Report Comparison	Corresponding Aging Management Program in the GALL Report	Corresponding Section in this Safety Evaluation Report
Inservice Inspection	A.1.22, B.1.22	Existing	Consistent	GALL Report AMP XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD”	3.0.3.1.10
Inservice Inspection—IWF	A.1.23, B.1.23	Existing	Consistent with enhancements	GALL Report AMP XI.S3, “ASME Section XI, Subsection IWF”	3.0.3.2.16
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	A.1.24, B.1.24	Existing	Consistent with enhancements	GALL Report AMP XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems”	3.0.3.2.10
Internal Surfaces in Miscellaneous Piping and Ducting Components	A.1.25, B.1.25	New	Consistent	GALL Report AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”	3.0.3.1.11
Masonry Wall	A.1.26, B.1.26	Existing	Consistent with enhancements	GALL Report AMP XI.S5, “Masonry Walls”	3.0.3.2.17
Non-EQ Electrical Cable Connections	B.1.27, A.1.27	New	Consistent	GALL Report AMP XI.E6, “Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements”	3.0.3.1.19
Non-EQ Inaccessible Power Cables (≥ 400 V)	A.1.28, B.1.28	New	Consistent	GALL Report AMP XI.E3, “Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements”	3.0.3.1.20
Non-EQ Insulated Cables and Connections	A.1.29, B.1.29,	New	Consistent	GALL Report AMP XI.E1, “Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements”	3.0.3.1.21

RBS Aging Management Program	LRA Section(s)	New or Existing Aging Management Program	GALL Report Comparison	Corresponding Aging Management Program in the GALL Report	Corresponding Section in this Safety Evaluation Report
Non-EQ Sensitive Instrumentation Circuits Test Review	A.1.30, B.1.30	New	Consistent	GALL Report AMP XI.E2, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits"	3.0.3.1.22
Oil Analysis	A.1.31, B.1.31	Existing	Consistent	GALL Report AMP XI.M39, "Lubricating Oil Analysis"	3.0.3.1.12
One-Time Inspection	A.1.32, B.1.32	New	Consistent	GALL Report AMP XI.M32, "One-Time Inspection	3.0.3.1.13
One-Time Inspection—Small-Bore Piping	A.1.33, B.1.33	New	Consistent	GALL Report AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping"	3.0.3.1.14
Periodic Surveillance and Preventive Maintenance	A.1.34, B.1.34	Existing	Plant-Specific	N/A	3.0.3.3.1
Protective Coating Monitoring and Maintenance	A.1.35, B.1.35	Existing	Consistent	GALL Report AMP XI.S8, "Protective Coating Monitoring and Maintenance"	3.0.3.1.23
Reactor Head Closure Studs	A.1.36, B.1.36	Existing	Consistent with exception and enhancement	GALL Report AMP XI.M3, "Reactor Head Closure Stud Bolting"	3.0.3.2.11
Reactor Vessel Surveillance	A.1.37, B.1.37	Existing	Consistent with an exception	GALL Report AMP XI.M31, "Reactor Vessel Surveillance"	3.0.3.2.12
RG 1.127, Inspection Of Water-Control Structures Associated With Nuclear Power Plants	A.1.38, B.1.38	Existing	Consistent with enhancements	GALL Report AMP XI.S7, "RG 1.127, Inspection Of Water-Control Structures Associated With Nuclear Power Plants"	3.0.3.2.18
Selective Leaching	A.1.39 B.1.39	New	Consistent	GALL Report AMP XI.M33, "Selective Leaching"	3.0.3.1.15

RBS Aging Management Program	LRA Section(s)	New or Existing Aging Management Program	GALL Report Comparison	Corresponding Aging Management Program in the GALL Report	Corresponding Section in this Safety Evaluation Report
Service Water Integrity	A.1.40 B.1.40	Existing	Consistent with enhancement	GALL Report AMP XI.M20, “Open-Cycle Cooling Water System”	3.0.3.1.16
Structures Monitoring	A.1.41, B.1.41	Existing	Consistent with enhancements	GALL Report AMP XI.S6, “Structures Monitoring”	3.0.3.2.19
Water Chemistry Control—BWR	A.1.42 B.1.42	Existing	Consistent	GALL Report AMP XI.M2, “Water Chemistry”	3.0.3.1.17
Water Chemistry Control—Closed Treated Water Systems	A.1.43, B.1.43	Existing	Consistent with enhancements	GALL Report AMP XI.M21A, “Closed Treated Water Systems”	3.0.3.2.13

3.0.3.1 Aging Management Programs Consistent with the GALL Report

3.0.3.1.1 Aboveground Metallic Tanks

LRA Section B.1.1 describes the new Aboveground Metallic Tanks aging management program as consistent with GALL Report AMP XI.M29, “Aboveground Metallic Tanks,” as modified by LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion under Insulation.” Entergy amended this LRA section by letter dated February 7, 2018.

Staff Evaluation

During its audit, the staff reviewed Entergy’s claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (scope of program, preventative actions, parameters monitored or inspected, detection of aging effects, monitoring and testing, and acceptance criteria, respectively) of Entergy’s program to the corresponding program elements of GALL Report AMP XI.M29, as modified by LR-ISG-2012-02.

For Program Element 1 (scope of program) and Program Elements 3, 4, 5, and 6 (parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively), the LRA contains sufficient information. However, for Program Element 2 (preventive actions), the staff needed additional information. Accordingly, on January 9, 2018, the staff issued Request for Additional Information (RAI) B.1.1-1, see ADAMS Accession No. ML18009A909. Entergy responded to the staff’s RAI on February 7, 2018, see ADAMS Accession No. ML18087A164.

The staff finds Entergy’s response to RAI B.1.1-1 and corresponding changes to LRA Section A.1.1 and LRA Section B.1.1 acceptable because (a) visual inspections on a refueling outage interval are capable of detecting degradation in the vapor barrier seal interface at the tank to concrete foundation, (b) the location of potential ultrasonic data points (e.g., perimeter of the tank adjacent to a curb that can allow accumulation of water against the side of the tank) and the number and spacing of the data points can adequately detect potential loss of material, and (c) use of scanning techniques, evaluated for the ability to detect loss of material due to pitting and crevice corrosion, with followup inspections at discrete locations potentially less than minimum design thickness can adequately detect potential loss of material.

Based on the NRC staff's audit and Entergy's response to RAI B.1.1-1, the staff finds that Program Elements 1 through 6 (for which Entergy claims consistency with the GALL Report) are consistent with the corresponding program elements of GALL Report AMP XI.M29, as modified by LR-ISG-2012-02. The staff finds that the aging management program is adequate for managing the applicable aging effects.

<u>Operating Experience</u>

LRA Section B.1.1 summarizes Entergy's operating experience related to the Aboveground Metallic Tanks aging management program. In the LRA, Entergy states that it reviewed plant-specific operating experience for tank inspections and did not identify any occurrences of loss of material for the condensate storage tank.

The staff evaluated operating experience information through reviewing the license renewal application and conducting the audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, the applicant's LRA aging management program can adequately manage the associated aging effects. The staff identified operating experience for which it needed additional information, and therefore issued a request for additional information (RAI B.1.1-1) on January 9, 2018. (See above for staff's evaluation of Entergy's RAI B.1.1-1 response and corresponding changes to the LRA.)

Based on the NRC staff's audit, the RBS license renewal application, and Entergy's response to RAI B.1.1-1, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Aboveground Metallic Tanks aging management program was evaluated.

<u>Updated Safety Analysis Report Supplement</u>

LRA Section A.1.1 provides the USAR supplement for the Aboveground Metallic Tanks aging management program. The staff reviewed this USAR supplement description of the program against the NRC staff's recommended description for this type of program (described in SRP-LR Table 3.0-1, as modified by LR-ISG-2012-02). The staff notes that Entergy did not address periodic inspections of the concrete-tank interface. As a result, the staff found that the licensing basis for this program for the period of extended operation may not be adequate if Entergy does not incorporate this information in its USAR supplement. To address this, the staff issued RAI B.1.1 2, dated January 9, 2018 (see ADAMS Accession No. ML18009A909). Entergy responded on February 7, 2018 (see ADAMS Accession No. ML18087A164).

The staff finds Entergy's response to the RAI B.1.1-2 and corresponding changes to the USAR supplement acceptable because Entergy revised the supplement to address periodic visual inspections at the concrete-tank interface. Therefore, the USAR supplement for the Aboveground Metallic Tanks program is consistent with the corresponding program description in SRP-LR Table 3.0-1, as modified by LR-ISG-2012-02.

The staff also notes that Entergy committed to implementing the new Aboveground Metallic Tanks program prior to February 28, 2025.

The staff finds that the USAR supplement, as amended by Entergy in its letter dated February 7, 2018, contains an adequate summary description of the Aboveground Metallic Tanks aging management program.

Conclusion

On the basis of the NRC staff's audit and review of Entergy's RAI responses and Aboveground Metallic Tanks aging management program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that over the period of extended operation it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that the supplement adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.2 Buried and Underground Piping and Tanks Inspection

LRA Section B.1.4 describes the new Buried and Underground Piping and Tanks Inspection program as consistent with GALL Report AMP XI.M41, "Buried and Underground Piping and Tanks," as modified by LR-ISG-2015-01, "Changes to Buried and Underground Piping and Tanks Recommendations." Entergy amended this LRA section by letters dated January 24, 2018; April 4, 2018; and May 10, 2018.

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 7 of Entergy's program (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria, and corrective actions, respectively) to the corresponding program elements of GALL Report AMP XI.M41, as modified by LR-ISG-2015-01.

During the course of its review, the staff issued RAI B.1.4-1 on December 13, 2017 (see ADAMS Accession No. ML17347B432). A public telephone conference call was held on March 6, 2018 to discuss Entergy's response to RAI B.1.4-1, and a summary of the call was generated (see ADAMS Accession No ML18078A755). Entergy responded to the RAI on January 24, 2018, with a supplemental response on April 2, 2018 (see ADAMS Accession Nos. ML18025B750 and ML18094A137, respectively).

The staff evaluated Entergy's responses to RAI B.1.4-1 and notes the following:

(a) In-scope buried steel piping is specified to be coated with coal tar epoxy or cycloaliphatic amine epoxy.

(b) Site documentation is not adequate to demonstrate that soil at the site is noncorrosive to steel; therefore, Preventive Action Category F will be used in determining the number of inspections for portions of the in-scope buried steel piping where the cathodic protection system is not meeting performance goals or where the piping is not protected by a cathodic protection system unless all the requirements for transitioning to another preventive action category are met.

(c) In-scope stainless steel piping is specified to be coated with coal tar epoxy or silicone-based coatings.

The staff finds Entergy's RAI responses and corresponding changes to the aging management program and USAR supplement acceptable in part because (a) coal tar epoxy coatings are consistent with the recommended coating types in GALL Report AMP XI.M41, (b) although cycloaliphatic amine epoxies are not consistent with the recommended coating types in GALL Report AMP XI.M41, based on the staff's review of *ASM Handbook Volume 5B, "Protective Organic Coatings,"* (2015), which states that cycloaliphatic epoxies are used as chemically resistant tank linings, the staff concludes that this coating type are capable of restricting moisture penetration and electrically isolating the base metal, and is therefore acceptable as coatings for buried components, and (c) Entergy's approach to use Preventive Action Category F for in-scope buried steel piping where the cathodic protection system is not meeting performance goals, unless all the requirements for moving to another preventive action category are met, is consistent with GALL Report AMP XI.M41, as modified by LR-ISG-2015-01.

However, in its supplemental response to RAI B.1.4-1, dated April 4, 2018 (see ADAMS Accession No. ML18094A137), Entergy stated that silicone-based heat-resistant coatings (i.e., Thuralox® 70, Carboline 4674) could be applied to buried stainless steel piping in lieu of coal tar epoxy. Based on the staff's review of *Encyclopedia of Chemical Processing and Design: Volume 50*, the staff noted that these types of coatings are not recommended for immersion service and the coatings are softer than most organic coatings. The staff needed additional information regarding how these coatings meet the intent of Program Element 2 (preventive actions) of GALL Report AMP XI.M41, which resulted in a further public telephone conference call on April 25, 2018 (see ADAMS Accession No. ML18124A190). During the call, Entergy stated that it understood the staff's concerns, and it then revised its April 4, 2018 response by a letter dated May 10, 2018 (see ADAMS Accession No. ML18130A935).

The staff finds Entergy's revised response and changes to the aging management program and updated USAR supplement acceptable for the following reasons: (A) Entergy will conduct two inspections of stainless steel piping in each 10-year period during the period of extended operation (unless the soil is demonstrated as noncorrosive and the backfill is in accordance with the recommendations of LR-ISG-2015-01). In contrast, GALL Report AMP XI.M41 recommends only one inspection in each 10-year period. (B) Entergy will perform the additional inspection on buried stainless steel piping with the silicone-based, heat-resistant coating. This resolves the staff's concerns in RAI B.1.4-1.

For Program Element 2 (preventive actions) and Program Element 4 (detection of aging effects), the staff needed additional information, and therefore issued a request for additional information (RAI B.1.4-2), dated December 13, 2017 (see ADAMS Accession No. ML17347B432). The summary of the public telephone conference call on March 6, 2018 to discuss Entergy's response to RAI B.1.4-2 is documented in ADAMS Accession No. ML18078A755. Entergy's responses dated January 24, 2018 and April 4, 2018 are documented in ADAMS Accession Nos. ML18025B750 and ML18094A137, respectively.

The staff evaluated Entergy's response to RAI B.1.4-2 and noted the following: (a) Entergy's criterion for determining piping inspection locations will include in-scope piping protected by cathodic protection that is located in areas exceeding the limiting critical potential of -1200 mV, and (b) the number of times and the magnitude by which the criterion is exceeded at specific locations are evaluated when determining inspection locations. The staff finds Entergy's response and changes to the aging management program and USAR supplement acceptable because: (a) the -1200 mV criterion is consistent with GALL Report AMP XI.M41, and (b) exceeding the limiting critical potential in one or more surveys will be considered when determining piping inspection locations.

For Program Element 3 (parameters monitored or inspected), the staff needed additional information, and therefore issued a request for additional information (RAI B.1.4-3), dated December 13, 2017 (see ADAMS Accession No. ML17347B432). Entergy's response, dated December 24, 2017, is documented in ADAMS Accession No. ML18025B750.

The staff evaluated Entergy's response to RAI B.1.4-3 and noted that Entergy will visually inspect steel piping for evidence of cracking when exposed during inspections. During its audit, the staff noted that visual inspections of buried and underground piping and tanks are: (a) performed with sufficient illumination and resolution to assess the component for indications of cracking, (b) conducted by personnel having an annual eye examination and visual acuity specified in CEP-NDE-100, "Administration and Control of NDE," or ASME Code Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," IWA-2321, "Vision Tests," and (c) conducted by personnel who are VT-1 qualified. The staff finds Entergy's response and changes to the aging management program and USAR supplement acceptable because examinations conducted by qualified personnel with adequate lighting and resolution can be sufficiently rigorous to assess for the impact of cracks on the pressure boundary function of steel piping.

Based on its audit and review of Entergy's responses to RAI B.1.4-1, RAI B.1.4-2, and RAI B.1.4-3, the staff finds that Program Elements 1 through 7, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M41, as modified by LR-ISG-2015-01. The staff finds that the new Buried and Underground Piping and Tanks Inspection aging management program is adequate to manage the applicable aging effects at RBS.

Operating Experience

LRA Section B.1.4 summarizes operating experience related to the Buried and Underground Piping and Tanks Inspection program. Entergy states that the Buried and Underground Piping and Tanks Inspection program provides reasonable assurance that it will manage the effects of aging at RBS such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting the audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine whether (a) any previously unknown or recurring aging effects were identified and (b) in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff did not identify any operating experience that would indicate Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Buried and Underground Piping and Tanks inspection program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.4, as amended by letters dated January 24, 2018; April 4, 2018; and May 10, 2018, provides the USAR supplement for the Buried and Underground Piping and Tanks Inspection program. The staff reviewed this USAR supplement description of the program and finds that it is consistent with the recommended description in SRP-LR Table 3.0-1, as modified by LR-ISG-2015-01. The staff also notes that Entergy committed to implement the new Buried and Underground Piping and Tanks Inspection program for managing the effects of aging for applicable components either (1) prior to February 28, 2025, or (2) at the end of the last refueling outage prior to August 29, 2025, whichever is later.

The staff finds that the USAR supplement provides an adequate summary description of the program.

Conclusion

On the basis of its audit and review of Entergy's RAI responses and Buried and Underground Piping and Tanks Inspection program, the staff concludes that those program elements, for which Entergy claimed consistency with the GALL Report, are consistent. The staff concludes that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for the new Buried and Underground Piping and Tanks Inspection aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.3 BWR CRD Return Line Nozzle

LRA Section B.1.5 describes the existing BWR (boiling-water reactor) CRD (control rod drive) Return Line Nozzle aging management program as consistent with GALL Report AMP XI.M6, "BWR Control Rod Drive Return Line Nozzle." Entergy amended this LRA section by letter dated January 24, 2018.

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's BWR CRD Return Line Nozzle aging management program to the corresponding program elements of GALL Report AMP XI.M6.

Based on its audit, the staff finds Program Elements 2 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report XI.M6.

For Program Element 1 (scope of program), the staff needed additional information and issued request for additional information RAI B.1.5-1, dated December 13, 2017 (see ADAMS

Accession No. ML17347B424). Entergy's response, dated January 24, 2018, is documented in ADAMS Accession No. ML18025B544.

As part of its response to RAI B.1.5-1, Entergy revised LRA Sections B.1.5 (program description) and LRA Section A.1.5 (the USAR supplement) to reflect that the program scope includes the nozzle-to-safe-end weld of the control rod drive return line nozzle. Entergy's response also identified a new program enhancement that the safe-end-to-cap weld of the control rod drive return line nozzle is volumetrically examined (1) once prior to the period of extended operation and (2) once every 10 years during the period of extended operation.

The staff finds Entergy's response and corresponding revisions to LRA Section A.1.5 and LRA Section B.1.5 acceptable because the revisions correctly reflect the inclusion of the nozzle-to-safe-end weld in the program scope, consistent with GALL Report AMP XI.M6. In addition, the staff finds Entergy's response acceptable because the volumetric examinations specified in the program enhancement for the safe-end-to-cap weld can confirm the component integrity through timely detection and monitoring for potential cracking during the period of extended operation, consistent with GALL Report AMP XI.M6.

Enhancement. LRA Section B.1.5, as supplemented by a letter dated January 24, 2018, includes an enhancement to Program Element 4 (detection of aging effects) to volumetrically examine the safe-end-to-cap weld once prior to the period of extended operation and once every 10 years during the period of extended operation. As discussed above, the staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M6. The staff finds the enhancement acceptable because when it is implemented, the volumetric inspections can confirm the integrity of the nozzle-to-safe-end weld through timely detection and monitoring for potential cracking, consistent with GALL Report AMP XI.M6.

Operating Experience

LRA Section B.1.5 summarizes operating experience related to the BWR CRD Return Line Nozzle program. In the LRA, Entergy states that it reviewed the plant-specific operating experience and found no conditions involving degradation of the N10 control rod drive nozzle. Entergy also states that the absence of adverse site-specific operating experience provides further evidence that the program has been effective.

The staff evaluated operating experience information through reviewing the license renewal application and conducting the audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience indicating that Entergy should modify its proposed program.

Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the BWR CRD Return Line Nozzle aging management program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.5 provides the USAR supplement for the BWR CRD Return Line Nozzle program. The staff reviewed this USAR supplement description of the program against the recommended description for this type of program as described in SRP-LR Table 3.0-1. The staff noted that the USAR supplement may not adequately describe the program scope as to whether the program includes the nozzle-to-safe-end weld in its scope.

The staff noted that the licensing basis for this program for the period of extended operation may not be adequate if Entergy does not incorporate this information in its USAR supplement. To address this, the staff issued request for additional information RAI B.1.5-1, dated December 13, 2017 (see ADAMS Accession No. ML17347B424). Entergy's response, dated January 24, 2018, is documented in ADAMS Accession No. ML18025B544. The staff finds Entergy's response acceptable because the corresponding revisions to the LRA correctly clarify that the program scope includes the nozzle-to-safe-end weld, consistent with GALL Report AMP XI.M6. Therefore, the USAR supplement for the BWR CRD Return Line Nozzle program is consistent with the corresponding program description in SRP-LR Table 3.0-1.

The staff also notes that Entergy committed to implementing the program enhancement either (1) prior to February 28, 2025 or (2) at the end of the last refueling outage prior to August 29, 2025, whichever is later. The staff notes that this schedule ensures that the enhancement is implemented prior to the period of extended operation that begins on August 30, 2025.

The staff finds that the USAR supplement, as amended by letter dated January 24, 2018, contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's RAI responses and BWR CRD Return Line Nozzle program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Also, the staff reviewed the enhancement and confirmed that its implementation as described in the USAR evaluation section will make the program adequate to manage the applicable aging effects. Entergy has demonstrated that it will adequately manage the effects of aging so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for the BWR CRD Return Line Nozzle aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.4 BWR Feedwater Nozzle

LRA Section B.1.6 describes Entergy's existing BWR (boiling-water reactor) Feedwater Nozzle aging management program as consistent with GALL Report AMP XI.M5, "BWR Feedwater Nozzle."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M5.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claimed consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M5. The staff finds the BWR Feedwater Nozzle aging management program adequate for managing the applicable aging effects.

Operating Experience

LRA Section B.1.6 summarizes RBS operating experience related to the BWR Feedwater Nozzle aging management program. In the LRA, Entergy states that during the refueling outage for Cycle 4 in 1992, the N4A feedwater nozzle-to-safe-end weld was reexamined for the previously detected indication and that the weld was cut out and replaced with a weld that is not susceptible to intergranular stress corrosion cracking. Entergy also stated that during the 2011 refueling outage for Cycle 16, it performed ultrasonic testing (UT) examinations on three N4 feedwater nozzle-to-safe end welds and found no indications that required evaluation in accordance with ASME Code Section XI.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff did not identify any operating experience indicating that Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the BWR feedwater nozzle was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.6 provides the USAR supplement for the BWR Feedwater Nozzle aging management program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

On the basis of its audit and review of Entergy's BWR Feedwater Nozzle aging management program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for the BWR Feedwater Nozzle aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.5 BWR Penetrations

LRA Section B.1.7 describes the existing BWR Penetrations aging management program as consistent with GALL Report AMP XI.M8, “BWR Penetrations.”

Staff Evaluation

During its audit, the staff reviewed Entergy’s claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy’s program to the corresponding program elements of GALL Report AMP XI.M8.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M8. The staff finds that the BWR Penetrations aging management program is adequate for managing the applicable aging effects.

Operating Experience

LRA Section B.1.7 summarizes RBS operating experience related to the BWR Penetrations aging management program. In the LRA, Entergy states that the BWR Penetrations program will effectively ensure that Entergy maintains the component intended functions consistent with the current licensing basis during the period of continued operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting the audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy’s LRA aging management program will adequately manage the associated aging effects.

The staff did not identify any operating experience indicating Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the BWR Penetrations aging management program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.7 provides the USAR supplement for the BWR Penetrations aging management program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC recommended description in SRP-LR Table 3.0-1. The staff also notes that Energy committed to ongoing implementation of the existing BWR Penetrations aging management program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's BWR Penetrations aging management program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.6 BWR Stress Corrosion Cracking

LRA Section B.1.8 describes the existing BWR Stress Corrosion Cracking aging management program as consistent with GALL Report AMP XI.M7, "BWR Stress Corrosion Cracking."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M7.

Based on the NRC staff's audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M7. The staff finds that this aging management program is adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.8 summarizes RBS operating experience related to the BWR Stress Corrosion Cracking aging management program. In the LRA, Entergy states that for this program, it has identified no plant-specific aging management program issues at RBS. Entergy also states that it reviewed all owners acceptance reports regarding inservice inspection since the 2006 refueling outage and identified no items in the program scope that are related to flaws or relevant conditions requiring evaluation in accordance with ASME Code, Section XI.

The staff evaluated operating experience information through reviewing the license renewal application and conducting the audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff did not identify any operating experience indicating that Entergy should modify its proposed program. Based on the NRC staff's audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the BWR Stress Corrosion Cracking program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.8 provides the USAR supplement for the BWR Stress Corrosion Cracking program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

On the basis of the NRC staff's audit and review of Entergy's BWR Stress Corrosion Cracking program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that, over the period of extended operations, it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.7 BWR Vessel ID Attachment Welds

LRA Section B.1.9 describes the existing BWR Vessel ID (inside diameter) Attachment Welds program as consistent with GALL Report AMP XI.M4, "BWR Vessel ID Attachment Welds." Entergy amended this LRA section by letter dated March 26, 2018 (see ADAMS Accession No. ML18087A188).

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M4. Based on its audit of this aging management program, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M4, "BWR Vessel ID Attachment Welds" program.

Review of License Renewal Applicant Action Items

In the staff's safety evaluation (ADAMS Accession No. ML010180493) for Topical Report BWRVIP-48-A, the staff issued the following license renewal applicant action items (AAIs) on the report:

(1) AAI 1—The staff requested BWR license renewal applicants to verify that the reactor vessel internal (RVI) components at the plant are bounded by conditions evaluated for the components in the applicable BWRVIP (Boiling-Water Reactor Vessel and Internals Project) reports. The applicant action item also included criteria for identifying and controlling commitments used to implement the applicable BWRVIP report methodologies under the BWR Vessel Internals program and criteria for the reporting to the NRC of any deviations taken to applicable BWRVIP report guidance provisions.

(2) AAI 2—The staff requested that the USAR supplement for the BWR Vessel Internals program should provide an adequate summary of the BWRVIP reports that are relied upon for aging management of the reactor vessel internal components at the facility.

(3) AAI 3—The staff requested that license renewal applicants of BWR facilities should include in their LRA any new technical specifications (TS) or TS changes that are needed to manage the effects of aging in the reactor vessel internal components of the facility.

Response to AAI 1: Entergy states that the BWRVIP reports have been reviewed and design conditions for reactor vessel internal components at RBS have been verified to be bounded by conditions assumed and analyzed for the components in the applicable BWRVIP reports. Additionally, Entergy states that it commits to implementation of programs described, as necessary, in the BWRVIP reports to manage the effects of aging during the period of extended operation and that the commitments are administratively controlled in accordance with the requirements of 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." Entergy states that any deviation taken to the criteria in a given NRC-approved BWRVIP report will be reported to the NRC.

The staff reviewed the design bases reported for the reactor pressure vessel (RPV) identification attachment welds and reactor vessel internal components in the USAR and confirmed that the conditions assumed for the components in the applicable BWRVIP reports are bounding for the design of the components at RBS. The staff also noted that the aspects of the program that commit to the implementation of the applicable BWRVIP reports and for reporting deviations taken to the reports to the NRC are within the staff's approved protocols for implementing NEI 03-08-based programs, which includes the BWR Vessel ID Attachment Welds program as defined in LRA Section B.1.9. Therefore, the staff finds Entergy's response to AAI 1 acceptable.

Response to AAI 2: Entergy states that the USAR supplement for the BWR Vessel Internals program is given in Appendix A of the LRA and that the section provides an adequate summary of the BWRVIP reports and aging management activities that are relied upon for aging management of the reactor vessel internal components during the period of extended operation. The staff verified that the LRA includes a USAR supplement summary description (LRA Section A.1.9) for the BWR Vessel ID Attachment Welds program and that the summary description adequately explains how the applicable BWRVIP reports will be used to manage aging in the reactor vessel interior attachments (including welds and brackets) at RBS.

The staff evaluates the adequacy of LRA Section A.1.9 later in this safety evaluation report and finds it to be adequate. Therefore, the staff finds Entergy's response to AAI 2 acceptable.

Response to AAI 3: Entergy states that it did not identify any new technical specification requirements or technical specification changes that would be needed to manage the effects of aging based on the BWRVIP reports that will be implemented during the period of extended operations.

The staff reviewed the RBS operating license and technical specifications and did not identify the need for any new technical specification requirements or technical specification changes to manage the effects of aging attributed to the reactor vessel interior attachments (including welds and brackets) at the facility during the period of extended operation. Therefore, the staff concludes that the applicant does not need to identify and evaluate in the LRA any technical specification changes related to these components, new or otherwise, pursuant to the requirements in 10 CFR 54.22. Based on this review, the staff finds Entergy's response to AAI 3 acceptable.

Operating Experience

LRA Section B.1.9 summarizes operating experience related to the BWR Vessel ID Attachment Welds program. In the LRA, Entergy states that inspections and subsequent evaluations and corrective actions performed in accordance with the aging management program demonstrate that the BWR Vessel ID Attachment Welds program has been effective. Entergy states that continued application of proven methods provides reasonable assurance that it will manage the effects of aging such that the components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff identified operating experience for which it needed additional information and therefore issued two requests for additional information, RAI B.1.9-1 and RAI B.1.9-2, on February 8, 2018 (see ADAMS Accession No. ML18043A008). Entergy's response on March 26, 2018 is documented in ADAMS Accession No. ML18087A188.

The staff evaluated Entergy's response to RAI B.1.9-1 and noted that Entergy addressed operating experience related to the plant's feedwater sparger brackets in two condition reports (for the condition reports—refer to the audit report reference list for AMP B.1.9) that indicated Entergy was performing inspections of the feedwater sparger end brackets and their pins using the guidelines in General Electric Company (GE) Services Information Letter (SIL) 658, "Feedwater Sparger End Bracket Degradation," issued July 2008. The staff observed that Entergy did not specify (a) whether further inspections of the feedwater sparger brackets in accordance with GE SIL 658 are within the scope of the aging management program, or (b) whether it would continue to perform these types of inspections during the period of extended operation.

In its response to RAI B.1.9-1, Entergy clarified that the feedwater sparger brackets and pins do not serve a license renewal intended function, as defined in 10 CFR 54.4, and therefore that the inspections of these components are not within the scope of the BWR Vessel ID Attachment Welds program. The staff finds Entergy's response acceptable because it is consistent with the basis in LRA Section 2.3.1.1.2 that indicates the feedwater spargers do not serve a license renewal intended function, as defined in 10 CFR 54.4, and are not subject to an aging management review (AMR) in accordance with 10 CFR 54.21(a)(1). This resolves the staff's issue in RAI B.1.9-1. Based on this clarification, any decision to continue future inspections of these components in accordance with GE SIL 658 may be made by Entergy based on its programmatic activities for reviewing and implementing GE-Hitachi SIL recommended activities.

During the staff's audit of the aging management program and its evaluation of Entergy's response to RAI B.1.9-2, the staff noted that Entergy reported some occurrence of wear in feedwater sparger bracket pins in 2008 and summarized the year 2008 inspection results in a site-specific inspection history report for the reactor internal components. However, Entergy's Program Element 10 (operating experience) discussions for the aging management program state that the inspections of the brackets did not result in the identification of any relevant flaw indications in the feedwater brackets. The staff therefore issued RAI B.1.9-2 on February 8, 2018 (see ADAMS Accession No. ML18043A008) to address the gap in the reported operating experience results associated with the 2008 inspections of the feedwater brackets and their bracket pins.

In its response to RAI B.1.9-2, Entergy clarified that the wear-related operating experience detected in 2008 was associated with the feedwater sparger brackets and pins that are not welded to the reactor pressure vessel. Instead, these brackets and pins are pinned to the reactor pressure vessel. Entergy also clarified that since theses brackets and pins are outside the scope of the BWR Vessel Internals program, the wear-related operating experience noted in the components does not need to be included as operating experience that is assessed by the BWR Vessel Internals program. The staff finds Entergy's response acceptable because it is consistent with the basis in LRA Section 2.3.1.1.2 that indicates the feedwater spargers do not service a license renewal-intended function as defined in 10 CFR 54.4, are not subject to an aging management review in accordance with 10 CFR 54.21(a)(1), and do not need to be age managed in accordance with 10 CFR 54.21(a)(3). The staff's issue raised in RAI B.1.9-2 is resolved.

Based on the NRC staff's audit, review of the application, and review of Entergy's responses to RAI B.1.9-1 and RAI B.1.9-2, the staff finds that the conditions and operating experience at the plant are bounded by those for which the BWR Vessel ID Attachment Welds program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.9, "BWR Vessel ID Attachment Welds," provides the USAR supplement summary description for the BWR Vessel ID Attachment Welds program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0 1. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's BWR Vessel ID Attachment Welds program and RAI responses, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. The staff also concludes that Entergy has demonstrated it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.8 Coating Integrity

LRA Section B.1.11 describes the new Coating Integrity program as consistent with GALL Report AMP XI.M42, "Internal Coatings/Linings for In-scope Piping, Piping Components, Heat Exchangers, and Tanks," as issued in LR-ISG-2013-01, "Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-scope Piping, Piping Components, Heat Exchangers and Tanks." Entergy amended this LRA section by letter dated December 12, 2017.

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 7 of Entergy's program (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria, and corrective actions, respectively) to the corresponding program elements of GALL Report AMP XI.M42, as issued in LR-ISG-2013-01. For Program Element 1 (scope of program) the staff needed additional information, and therefore issued request for additional information RAI B.1.11-1, dated November 16, 2017 (see ADAMS Accession No. ML17320B099). Entergy's response, dated December 12, 2017, is documented in ADAMS Accession No. ML17347B473.

The staff finds Entergy's response to RAI B.1.11-1 and the corresponding changes to the Coating Integrity program and USAR supplement acceptable because Entergy added raw water as an applicable environment to the program and USAR supplement. As a result, the Table 2s are consistent with the aging management program and current licensing basis.

During the audit, the staff reviewed a report, which documented the basis for excluding six in-scope components from the scope of the Coating Integrity program based on loss of coating integrity not being an aging effect requiring management. The staff found the basis for excluding three of these components acceptable because the components are nonsafety related and the plant configuration is such that:

- For the spent fuel pool purification system demineralizer: (a) safety-related equipment is not located in the room and therefore through-wall leakage will not result in spray or flooding of safety-related equipment, and (b) there is a retention element and strainer at the outlet of the demineralizer that would capture potential coating debris.
- For the water tight cubicle floor drain isolation valve: (a) the only safety-related equipment in the area are two service pipe lines that would not be adversely impacted by periodic external exposure to water if a through-wall leak of the valve were to occur such that the pipe lines would not meet their intended function, and (b) potential coating debris will be confined to a valve pit, which will travel to a drain tank and be processed by the nonsafety-related liquid radwaste system.
- For a portion of normal service water line piping located in the yard area: (a) there are no safety-related components in the yard area that would be impacted by lining failure (i.e., through-wall leakage), and (b) the pipe is sealed by a blind flange at one end and by an internally welded plate at the other end, such that maintenance activities would be required to open the pipe.

For the remaining three components, the staff needed additional information and therefore issued requests for additional information: RAI B.1.11-2, dated November 16, 2017, and followup RAI B.1.11-2a, dated January 9, 2018 (see ADAMS Accession Nos. ML17320B099 and ML18009A909, respectively). Entergy's responses, dated December 12, 2017 and February 26, 2018, are documented in ADAMS Accession Nos. ML17347B473 and ML18064A161, respectively.

In its response to RAI B.1.11-2 and followup RAI B.1.11-2a, Entergy revised LRA Table 3.3.2-18-19, "Reactor Water Cleanup System, Nonsafety-Related Components Affecting Safety-Related Systems," and LRA Table 3.3.2-18-21, "Radwaste – Liquid System, Nonsafety-Related Components Affecting Safety-Related Systems," to include managing loss of coating integrity and loss of material for carbon steel internally coated piping and piping components exposed to treated water and waste water. As a result of these changes, loss of coating integrity and loss of material will be managed consistent with GALL Report AMP XI.M42 for the three locations with internal coatings cited in RAI B.1.11-2. The staff finds Entergy's response and changes to the cited LRA tables acceptable because Entergy identified the scope of components for which loss of coating integrity or loss of material will be managed, and the Coating Integrity program is consistent with GALL Report AMP XI.M42.

Based on the NRC staff's audit and Entergy's responses to RAI B.1.11-1, RAI B.1.11-2, and RAI B.1.11-2a, the staff finds that Program Elements 1 through 7, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M42. The staff finds that this aging management program is adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.11 summarizes operating experience related to the Coating Integrity program. In the LRA, Entergy states that the Coating Integrity program, as a result of being consistent with GALL Report AMP XI.M42, is based on industry operating experience that demonstrates that this program will effectively manage aging effects requiring management. Entergy states that the use of proven program activities provides reasonable assurance that Entergy will manage the effects of aging such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff identified operating experience for which it needed additional information, and therefore issued request for additional information, RAI B.1.11-3, on November 16, 2017 (see ADAMS Accession No. ML17320B099). Entergy responded on December 12, 2017 (see ADAMS Accession No. ML17347B473).

In its response to RAI B.1.11-3, Entergy cited a heat exchanger channel head exposed to treated water in LRA Table 3.3.2-14, "Chilled Water System." The staff finds Entergy's response acceptable because: (a) the source of the coating debris has been identified, (b) the component is within the scope of the Coating Integrity program, (c) a followup inspection in 2014 did not reveal any coating debris, and (d) a baseline inspection of the component will be conducted prior to the period of extended operation consistent with GALL Report AMP XI.M42.

Based on the NRC staff's audit, review of the license renewal application, and Entergy's response to RAI B.1.11-3, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Coating Integrity program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.11, as amended by a letter dated December 12, 2017, provides the USAR supplement for the Coating Integrity program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1, as modified by LR-ISG-2013-01. The staff also notes that Entergy committed to implement the new Coating Integrity aging management program to manage the effects of aging for applicable components either (1) prior to February 28, 2025, or (2) at the end of the last refueling outage prior to August 29, 2025, whichever is later.

The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's RAI response and its Coating Integrity program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.9 Fire Protection

LRA Section B 1.19 describes the existing RBS Fire Protection aging management program as consistent with GALL Report AMP XI.M26, "Fire Protection."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M26.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M26. The staff finds that this aging management program is adequate to manage the applicable aging effects.

Operating Experience

LRA Section B 1.19 summarizes RBS operating experience related to the Fire Protection program. In the LRA, Entergy states that the identification of degradation and initiation of corrective action prior to loss of intended function, along with identification of program deficiencies and subsequent corrective actions, demonstrate that the Fire Protection program has been effective. Entergy states that the continued application of proven inspection methods provides reasonable assurance that Entergy will manage the effects of aging such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience indicating Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Fire Protection program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.19 provides the USAR supplement for the Fire Protection program. The staff reviewed this supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to ongoing implementation of the existing Fire Protection program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Fire Protection program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging so that it maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.10 Inservice Inspection

LRA Section B.1.22, as updated by letter dated August 2, 2018 (License Renewal Application Annual Update, ADAMS Accession No. ML18214A162), describes the existing RBS Inservice Inspection aging management program as consistent with GALL Report AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M1.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M1. The staff finds that the Inservice Inspection aging management program is adequate for managing the applicable aging effects.

Operating Experience

LRA Section B.1.22 summarizes RBS operating experience related to the Inservice Inspection program. In the LRA, Entergy states that the Inservice Inspection program will effectively ensure that it will maintain the component intended functions consistent with the current licensing basis during the period of continued operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program will adequately manage the associated aging effects.

The staff did not identify any operating experience indicating Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Inservice Inspection program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.22 provides the USAR supplement for the Inservice Inspection program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to ongoing implementation of the existing Inservice Inspection program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Inservice Inspection program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for the Inservice Inspection aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.11 Internal Surfaces in Miscellaneous Piping and Ducting Components

LRA Section B.1.25 describes the new Internal Surfaces in Miscellaneous Piping and Ducting Components program as consistent with GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," as modified by LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion under Insulation." Entergy amended this LRA section by letter dated May 10, 2018.

Staff Evaluation.

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M38, as modified by LR-ISG-2012-02.

For Program Element 3 (parameters monitored or inspected), the staff needed additional information and therefore issued a request for additional information, RAI B.1.25-1, dated February 8, 2018 (see ADAMS Accession No. ML18043A008). The summary of the public telephone conference call on April 10, 2018, to discuss Entergy's initial response is documented in ADAMS Accession No. ML18120A135. Entergy's responses, dated March 26, 2018 and May 10, 2018, are documented in ADAMS Accession Nos. ML18087A188 and ML18130A935, respectively.

The staff finds that Entergy's responses and corresponding changes to LRA Section A.1.25, Section A.1.34, Section B.1.25, and Section B.1.34, and LRA Table 3.3.2-3, Table 3.3.2-7, Table 3.3.2-9, Table 3.3.2-10, Table 3.3.2-11, Table 3.3.2-12, Table 3.3.2-13, and Table 3.3.2-16 are acceptable because the Periodic Surveillance and Preventive Maintenance program now specifies performing visual inspections of applicable components to detect evidence of heat transfer reduction and cracking. Entergy will also perform surface examinations to inspect for cracking, when appropriate. In addition, the deletion of heat transfer reduction as an aging effect being managed by the new Internal Surfaces in Miscellaneous Piping and Ducting Components program will make the program consistent with GALL Report AMP XI.M38, as modified by LR-ISG-2012-02. The changes to the aging management review items in the cited LRA tables appropriately reflect the use of different aging management programs to manage the associated aging effects. SER Section 3.0.3.3.1 documents the staff's evaluation of the Periodic Surveillance and Preventive Maintenance program.

Based on its audit and review of Entergy's responses to RAI B.1.25-1, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M38, as modified by LR-ISG-2012-02. The staff finds that the new Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program can adequately manage the applicable aging effects.

Operating Experience.

LRA Section B.1.25 summarizes operating experience related to the new Internal Surfaces in Miscellaneous Piping and Ducting Components program. Entergy states that the program provides reasonable assurance that it will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting the audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff did not identify any operating experience that would indicate that Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Internal Surfaces in Miscellaneous Piping and Ducting Components program was evaluated.

Updated Safety Analysis Report Supplement

As amended by letter dated May 10, 2018, LRA Section A.1.25 provides the USAR supplement for the Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the recommended description in SRP-LR Table 3.0-1, as modified by LR-ISG-2012-02. The staff also notes that Entergy committed to implement the new Internal Surfaces in Miscellaneous Piping and Ducting Components program for managing the effects of aging for applicable components 6 months prior to the beginning of the period of extended operation. The staff finds that the information in the USAR supplement provides an adequate summary description of the program.

Conclusion.

On the basis of its audit and review of Entergy's RAI responses and its Internal Surfaces in Miscellaneous Piping and Ducting Components aging management program, the staff concludes that those program elements, for which Entergy claimed consistency with the GALL Report, are consistent. The staff concludes that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.12 Oil Analysis

LRA Section B.1.31 describes the existing RBS Oil Analysis aging management program as consistent with GALL Report AMP XI.M39, "Lubricating Oil Analysis."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M39.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M39. The staff finds that this aging management program is adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.31 summarizes operating experience related to the Oil Analysis program. In the LRA, Entergy states that the plant-specific operating experience provides objective evidence that the Oil Analysis program will effectively ensure that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report,

dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA Oil Analysis aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience indicating that Entergy should modify its proposed program.

Updated Safety Analysis Report Supplement

LRA Section A.1.31 provides the USAR supplement for the Oil Analysis program. The staff reviewed this supplement's description of the program and noted that it is consistent with the NRC recommended description in SRP-LR Table 3.0-1.

Conclusion

Based on the NRC staff's audit and review of Entergy's Oil Analysis program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for the Oil Analysis aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.13 One-Time Inspection

LRA Section B.1.32 describes the new One-Time Inspection program as consistent with GALL Report AMP XI.M30, "One-Time Inspection." Entergy amended this section of the LRA by letter dated May 10, 2018 (see ADAMS Accession No. ML18130A935).

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M32.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M32. The staff finds that the aging management program is adequate to manage the applicable aging effects.

Operating Experience.

LRA Section B.1.32 summarizes operating experience related to the One-Time Inspection program. Entergy stated that the One-Time Inspection program will be consistent with the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects requiring management. Entergy stated that the use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting the audit. As discussed in the audit report, the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience indicating that Entergy should consider modifying its proposed program.

Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the One-Time Inspection program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.32, as modified by letter dated May 10, 2018, provides the USAR supplement for the One-Time Inspection program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. During its evaluation of responses to RAI B.1.17-1 and RAI B.1.43-2, the staff noted that Entergy provided additional inspection activities in the revised USAR supplement.

The staff also noted that Entergy will perform the inspections within the 10 years prior to the beginning of the period of extended operation and committed to implementing the One-Time Inspection program either (1) prior to February 28, 2025, or (2) at the end of the last refueling outage prior to August 29, 2025, whichever is later. The staff finds that the information in the USAR supplement provides an adequate summary description of the program.

Conclusion

3.0.3.1.14 On the basis of its audit and review of Entergy's One-Time Inspection program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. The staff concludes that Entergy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).One-Time Inspection—Small-Bore Piping

LRA Section B.1.33 describes Entergy's new One-Time Inspection—Small-Bore Piping aging management program as consistent with GALL Report AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping." Entergy amended this LRA section by letter dated February 6, 2018.

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M35.

Based on its audit, the staff finds that Program Elements 1 and 2, and Program Elements 4 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M35.

For Program Element 3 (parameters monitored or inspected), the staff needed additional information to determine whether it was consistent with the corresponding program element in the GALL Report aging management program. As a result, the staff issued request for additional information, RAI B.1.33-1, dated December 27, 2017 (see ADAMS Accession No. ML17361A396). Entergy's response, dated February 6, 2018, is documented in ADAMS Accession No. ML18038B475.

Specifically, the staff observed that LRA Section B.1.33 does not provide the total population of welds for each weld type or the total number of these welds that will be included in the volumetric examinations. GALL Report AMP XI.M35 states that "[t]his inspection should be performed at a sufficient number of locations to ensure an adequate sample." It was not clear to the staff how Entergy will select and inspect the inspection sample and locations to ensure that it will adequately manage the effect of aging.

Accordingly, by letter dated December 27, 2017, the staff issued RAI B.1.33-1 requesting Entergy to provide the population of in-scope ASME Code Class 1 small-bore piping welds for each weld type (e.g., butt welds and socket welds) and describe the inspection sample size for each weld type.

In its response dated February 6, 2018, Entergy states that there are 381 in-scope small-bore piping butt welds and 64 in-scope small-bore piping socket welds. Entergy states that, based on the GALL guidance, it will volumetrically examine 10 butt welds and 2 socket welds.

The staff notes that Entergy's response provides specific information on the total number of small-bore piping weld populations for butt welds and socket welds. The staff also notes that Entergy has demonstrated the consistency of its sampling methodology with the GALL Report guidance. The staff finds Energy's response acceptable because, based on Entergy's plant-specific operating experience (more than 30 years of operation at the time of application for license renewal and no incidence of failures observed for its ASME Class 1 small-bore piping), the inspection sample sizes are consistent with the guidance provided in GALL AMP XI.M35. GALL AMP XI.M35 recommends that the inspection plan should include 3 percent of the weld population or a maximum of 10 welds for each weld type. The staff's concern described in RAI B.1.33-1 is resolved.

Operating Experience

LRA Section B.1.33 summarizes RBS operating experience related to the One-Time Inspection—Small-Bore Piping program. In the LRA, Entergy states that the One-Time Inspection—Small-Bore Piping program will effectively ensure that the intended functions of the ASME Class 1 small-bore piping are maintained consistent with the current licensing basis during the period of continued operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report,

dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff did not identify any operating experience indicating Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the One-Time Inspection—Small-Bore Piping program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.33 provides the USAR supplement for the One-Time Inspection—Small-Bore Piping program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP LR Table 3.0 1. The staff also notes that Entergy committed to ongoing implementation of the new One-Time Inspection—Small-Bore Piping program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's One-Time Inspection—Small-Bore Piping program, as amended by letter dated February 6, 2018, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging so that it will maintain the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.15 Selective Leaching

LRA Section B.1.39 describes the new Selective Leaching aging management program as consistent with GALL Report AMP XI.M33, "Selective Leaching," as modified by LR-ISG-2011-03, "Changes to the Generic Lessons Learned (GALL) Report Revision 2 Aging Management Program XI.M41, 'Buried and Underground Piping and Tanks,'" and LR-ISG-2015-01, "Changes to Buried and Underground Piping and Tank Recommendations." Entergy amended this LRA section by letter dated January 24, 2018.

Staff Evaluation.

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M33.

For Program Element 1 (scope of program), the staff needed additional information. During the audit, the staff identified and discussed this need with Entergy and documented this discussion in the aging management program audit report, dated January 29, 2018 (see ADAMS Accession No. ML17346A732). On January 14, 2018 Entergy responded to the staff's question in the audit report, providing additional information concerning this item. See Entergy's response at ADAMS Accession No. ML18025B544.

The staff finds Entergy's response and corresponding changes to the Selective Leaching program and USAR supplement acceptable. As part of its response, Entergy added waste water as an applicable environment to the program and USAR supplement. As a result, the Table 2s are consistent with the aging management program and the current licensing basis.

For Program Element 4 (detection of aging effects), the staff needed additional information and therefore issued request for additional information, RAI B.1.39-2, on February 7, 2018 (see ADAMS Accession No. ML18038B470). Entergy responded on March 8, 2018 (see ADAMS Accession No. ML18067A437.

In its response to RAI B.1.39-2, Entergy specifies that in-scope buried gray cast iron piping should be coated with coal tar epoxy or cycloaliphatic amine epoxy. The staff finds this response acceptable because, as documented in the staff's evaluation of RAI B.1.4-1 in SER Section 3.0.3.1.2, these coatings meet the intent of Program Element 2 (preventive actions) of GALL Report AMP XI.M41, as modified by LR-ISG-2015-01. Therefore, no changes to Program Element 4 (detection of aging effects) are necessary to address selective leaching inspections of the external surfaces of buried components where coatings were not specified to be applied.

Based on the NRC staff's audit and Entergy's response to RAI B.1.39-2, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M33.

Operating Experience

LRA Section B.1.39 summarizes operating experience related to the Selective Leaching program. In the LRA, Entergy states that the Selective Leaching program provides reasonable assurance that Entergy will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience indicating Entergy should modify its proposed program.

Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Selective Leaching program was evaluated.

Updated Safety Analysis Report Supplement

As amended by letter dated January 24, 2018, LRA Section A.1.39 provides the USAR supplement for the Selective Leaching program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to implement the new Selective Leaching program for managing the effects of aging for applicable components either (1) prior to February 28, 2025, or (2) at the end of the last refueling outage prior to August 29, 2025, whichever is later. The staff finds that the USAR supplement, as amended by the letter dated January 24, 2018, contains an adequate summary description of the Selective Leaching program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Selective Leaching program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.16 Service Water Integrity

LRA Section B.1.40, as amended by letter dated March 8, 2018, describes the existing Service Water Integrity program as consistent, with an enhancement, with GALL Report AMP XI.M20, "Open-Cycle Cooling Water System," as modified by LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion under Insulation."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M20.

For Program Elements 1, 2, 3, and 4, the staff needed additional information and therefore on February 7, 2018, the staff issued five requests for additional information: RAI B.1.40-1, RAI B.1.40-2, RAI B.1.40-3, RAI B.1.40-4, and RAI B.1.40-5 (see ADAMS Accession No. ML18038B470). Entergy submitted a response dated March 8, 2018 (see ADAMS Accession No. ML18067A437). The staff had followup concerns. Entergy submitted draft responses which the NRC added to the docket for public access. These are documented in ADAMS Accession Nos. ML18115A061 (April 25, 2018), ML18122A124 (May 2, 2018), and ML18122A231 (May 2, 2018). On May 3, 2018, a public telephone conference call was held to discuss Entergy's draft responses. For a summary of this phone conference, see ADAMS Accession No. ML18143B396. Entergy submitted its final response, dated May 10, 2018 (see ADAMS Accession No. ML18130A935).

Regarding RAI B.1.40-1, the staff finds Entergy's response and changes to the LRA Table 3.3-1 and Table 3.3.2-3, and LRA Section A.1.40 and Section B.1.40 acceptable because the aging management review items associated with the standby service water system piping exposed to raw water now appropriately reflect the Service Water Integrity program as managing the associated aging effects. The staff also finds that the enhancement to periodically, visually inspect the submerged piping in the standby service water cooling towers provides activities that can adequately manage the effects of aging.

Regarding RAI B.1.40-2, the staff noted that the hybrid operation of the normal service water system functions as a closed treated water system, where substantial amounts of raw water and air are periodically introduced during surveillance activities. The staff also noted this operating condition is not bounded by the operating conditions for which the GALL Report aging management program was evaluated. However, the staff finds Entergy's final RAI response and changes to LRA Tables 3.3-1, 3.3.2-10, 3.3.2-11, and 3.3.2-14 and LRA Sections A.1.34 and B.1.34 are acceptable because the addition of inspections conducted through the Periodic Surveillance and Preventive Maintenance program for fouling and flow blockage in the diesel generator and chilled water heat exchangers can identify and manage the aging effects caused by outage-related surveillance activities, which introduce raw water and air into system.

Regarding RAI B.1.40-3, the staff finds Entergy's response and changes to LRA Table 3.3.2-3 and LRA Sections A.1.40 and B.1.40 are acceptable because the aging management review items associated with the standby service water spray nozzles now appropriately include flow distribution as an intended function. Also, the periodic inspections of these nozzles through the Service Water Integrity program can adequately manage the applicable effects of aging.

Regarding RAI B.1.40-4, the staff finds Entergy's response and changes to LRA Sections A.1.40 and B.1.40 are acceptable because the enhancement to periodically measure wall thicknesses of the horizontal distribution piping in the standby service water cooling towers, which has a standing air-to-water interface, provides activities that can adequately manage the effects of aging.

Regarding RAI B.1.40-5, the staff finds Entergy's final response and changes to LRA Table 3.5.2-2, and LRA Sections A.1.41 and B.1.41 are acceptable because the aging management review items associated with the cooling tower fill material for the standby service water and service water cooling systems now include fouling and address plant-specific operating experiences. The staff also finds the enhancement to the Structures Monitoring program acceptable because periodically inspecting the fill material to detect signs of fouling, with an acceptance criteria as an absence of fouling, provides activities that can adequately manage the effects of aging.

Enhancement. LRA Section B.1.40, as modified by letter dated March 8, 2018, includes an enhancement to Program Element 4 (detection of aging) to inspect the safety-related carbon steel piping in the standby service water cooling tower exposed to raw water. This enhancement resulted from RAI B.1.40-1 and RAI B.1.40-4, discussed above. As noted above, staff finds the enhancement acceptable because when it is implemented, the periodic, visual inspections of the submerged piping and the periodic wall thickness measurements of the horizontal distribution piping in the standby service water cooling towers provide activities that can adequately manage the effects of aging.

Based on its audit, and its review of Entergy's responses to RAIs B.1.40-1, B.1.40-2, B.1.40-3, B.1.40-4, and B.1.40-5, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M20. In addition, the staff reviewed the enhancement associated with Program Element 4 (detection of aging) and finds that, when implemented, it will make the aging management program adequate to manage the applicable aging effects

Operating Experience

LRA Section B.1.40 summarizes operating experience related to the Service Water Integrity program. Entergy stated that the operating experience provides objective evidence that the Service Water Integrity program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting the audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff identified operating experience that indicated that Entergy should consider modifying its proposed program. This is addressed above in the discussion for RAI B.1.40-2. The staff finds Entergy's proposal to periodically inspect heat exchanger tubes for fouling and flow blockage through the Periodic Surveillance and Preventive Maintenance program provides reasonable assurance that the effects of aging due to the hybrid operation of the service water system will by adequately managed.

Updated Safety Analysis Report Supplement

LRA Section A.1.40, as amended by letter dated March 8, 2018, provides the USAR supplement for the Service Water Integrity program. The staff notes that Entergy committed to enhance the program prior to February 28, 2025. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

Conclusion

On the basis of its audit and review of Entergy's RAI responses and its Service Water Integrity program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. The staff concludes that Entergy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.17 Water Chemistry Control—BWR

LRA Section B.1.42 describes the existing Water Chemistry Control—BWR aging management program as consistent with GALL Report AMP XI.M2, "Water Chemistry."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M2.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M2. The staff finds that the Water Chemistry Control—BWR aging management program is adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.42 summarizes operating experience related to the Water Chemistry Control—BWR program. In the LRA, Entergy states that the Water Chemistry Control—BWR program will effectively ensure that component intended functions are maintained by periodic monitoring and control of corrosive impurities listed in the BWRVIP-190, "BWR Water Chemistry Guidelines."

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience indicating Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Water Chemistry Control—BWR program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.42 provides the USAR supplement for the Water Chemistry Control—BWR program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to ongoing implementation of the existing Water Chemistry Control—BWR program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Water Chemistry Control—BWR program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains that the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for the Water Chemistry Control—BWR aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.18 Environmental Qualification (EQ) of Electric Components

LRA Section B.1.16 describes the Environmental Qualification (EQ) of Electric Components aging management program as consistent with GALL Report AMP X.E1 "Environmental Qualification (EQ) of Electric Components."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP X.E1.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP X.E1. Consistent with the GALL Report AMP X.E1, Entergy's program addresses environmental qualification reanalysis and the associated component reanalysis attributes of analytical methods, data collection, reduction methods, underlying assumptions, acceptance criteria, and corrective actions.

The staff finds that this aging management program is adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.16 summarizes RBS operating experience related to the Environmental Qualification (EQ) of Electric Components program. In the LRA, Entergy states that program audits as well as identification and resolution of environmental qualification issues demonstrate that the Environmental Qualification (EQ) of Electric Components program has been effective. Entergy further stated that the continued use of proven program activities provides reasonable assurance that Entergy will manage the effects of aging such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff did not identify any operating experience indicating Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the environmental qualification of electric components aging management program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.16 provides the USAR supplement for the Environmental Qualification (EQ) of Electric Components program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the recommended description in SRP-LR Table 4.4-2. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Environmental Qualification (EQ) of Electric Components aging management program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.19 Non-EQ Electrical Cable Connections

LRA Section B.1.27 describes the Non-EQ (Non-Environmental Qualification) Electrical Cable Connections program as consistent with GALL Report AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.E6.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.E6. The staff finds that this aging management program is adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.27 summarizes operating experience related to the Non-EQ Electrical Cable Connections program. In the LRA, Entergy states that the RBS program will be consistent with the program description in the GALL Report, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects requiring management. Entergy states that the use of proven program activities provides reasonable assurance that Entergy will manage the effects of aging such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report,

dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff did not identify any operating experience indicating Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Non-EQ Electrical Cable Connections program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.27 provides the USAR supplement for the Non-EQ Electrical Cable Connections program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Non-EQ Electrical Cable Connections program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.20 Non-EQ Inaccessible Power Cables (≥ 400V)

LRA Section B.1.28 describes the new Non-EQ (Non-Environmental Qualification) Inaccessible Power Cables (≥ 400 V) program as consistent with GALL Report AMP XI.E3, "Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 7 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria, and corrective actions, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.E3.

During the review of Program Element 2 (preventive actions), the staff identified an inconsistency between Entergy's program and the GALL Report AMP XI.E3. Entergy's proposed preventive actions program element (as described in RBS-EP-15-00009, "Aging Management Program Evaluation Results,") did not include the provisions in GALL Report AMP XI.E3 that call for increased and operational verification of dewatering devices prior to any known or predicted heavy rain or storms. Therefore, on January 22, 2018, the staff issued arequest for additional information, RAI B.1.28-1 (see ADAMS Accession No. ML18022A941) to obtain clarification on this inconsistency, among others. Entergy responded on February 20, 2018 (see ADAMS Accession No. ML18051A531).

As part of its response to RAI B.1.28-1, Entergy revised the LRA Section B.1.28 program description to include the provisions for operational verification of dewatering devices prior to known or predicted heavy rain or flooding events. The staff finds Entergy's response acceptable because the revisions to the LRA make it consistent with GALL Report AMP XI.E3.

During the review of Program Element 7 (corrective actions), the staff identified a discrepancy between Entergy's submittal and the GALL Report AMP XI.E3. Entergy's proposed corrective actions element (as described in RBS-EP-15-00009, "Aging Management Program Evaluation Results,") did not include certain provisions in the GALL Report aging management program. GALL Report AMP XI.E3 entails a statement for evaluation to consider the significance of the test or inspection results, the operability of the component, the reportability of the event, the extent of concern, the potential root causes for not meeting the test or inspection acceptance criteria, the corrective actions required, and the likelihood of occurrence. On January 22, 2018, the staff issued RAI B1.28-1 to clarify inconsistencies between LRA AMP B.1.28, "Non-EQ Inaccessible Power Cables (≥ 400 V) and GALL Report AMP XI.E3 in terms of operational verification of dewatering devices, significance of testing and inspection results, event reporting, event frequency, root causes, corrective actions, and acceptance criteria, among others. Entergy responded on February 20, 2018, (see ADAMS Accession No. ML18051A531).

In its response to RAI B.1.28-1, Entergy stated that it will perform engineering evaluations as part of the corrective actions program under the RBS quality assurance (QA) program (10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants") and not the Non-EQ Inaccessible Power Cables (≥ 400 V) program. The staff finds Entergy's response satisfactory since it complies with the requirements of 10 CFR Part 50, Appendix B as it pertains to addressing corrective actions and is consistent with GALL Report AMP XI.E3.

Based on its audit and Entergy's response to RAI B.1.28-1, the staff finds that Program Elements 1 through 7, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.E3. The staff finds that this LRA aging management program is adequate to manage the applicable aging effects.

<u>Operating Experience</u>

LRA Section B.1.28 summarizes RBS operating experience related to the Non-EQ Inaccessible Power Cables (≥ 400 V) program. In the LRA, Entergy states that the Non-EQ Inaccessible Power Cables (≥ 400 V) program provides reasonable assurance that it will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis throughout the period of extended operation.

The staff evaluated operating experience information through review of the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff did not identify any operating experience indicating Entergy should modify its proposed program.

Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Non-EQ Inaccessible Power Cables (≥ 400 V) program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.28 provides the USAR supplement for the Non-EQ Inaccessible Power Cables (≥ 400 V) program.

The staff reviewed this USAR supplement description of the program against the NRC staff's recommended description for this type of program as described in SRP-LR Table 3.0 1. The staff notes that the USAR supplement does not mention operational verification of dewatering devices prior to any known or predicted heavy rain or storms. The licensing basis for this program for the period of extended operation might not be adequate if Entergy does not incorporate this information in its USAR supplement. Therefore, on January 22, 2018, the staff issued RAI B1.28-1 to obtain clarification on this inconsistency, among others (see ADAMS Accession No. ML18022A941). Entergy's response, dated February 20, 2018, is documented in ADAMS Accession No. ML 18051A531.

As part of its response to RAI B.1.28-1, Entergy revised the USAR supplement (LRA A.1.28) to include operational verification of dewatering devices prior to any known or predicted heavy rain or storms. The staff finds Entergy's response and corresponding changes to the USAR supplement acceptable because changes made to the description of the program in the USAR supplement are consistent with SRP-LR Table 3.0-1. Therefore, the USAR supplement for the Non-EQ Inaccessible Power Cables (≥ 400 V) program is consistent with the corresponding program description in SRP-LR Table 3.0 1.

The staff also notes that Entergy committed to implement the new Non-EQ Inaccessible Power Cables (≥ 400 V) program for managing the effects of aging for applicable components either (1) prior to February 28, 2025, or (2) at the end of the last refueling outage prior to August 29, 2025, whichever is later.

The staff finds that the USAR supplement, as amended by Entergy's RAI B.1.28-1 response, contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Non-EQ Inaccessible Power Cables (≥ 400 V) program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.21 Non-EQ Insulated Cables and Connections

LRA Section B.1.29 describes the Non-EQ (Non-Environmental Qualification) Insulated Cables and Connections aging management program as consistent with GALL Report AMP XI.E1, "Insulated Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.E1.

During the review of Program Element 3 (parameters monitored or inspected), the staff identified an inconsistency between Entergy's submittal and the GALL Report AMP XI.E1. The parameters monitored or inspected program element of GALL Report AMP XI.E1 recommends inspecting all accessible electrical cables and connections installed in adverse localized environments. Entergy's proposed Program Element 3 (as described in RBS-EP-15-00009, "Aging Management Program Evaluation Results—Electrical,") states that samples of accessible cable will represent, with reasonable assurance, all cables and connection in adverse localized environments. Entergy's sample inspection of accessible cables and connections was inconsistent with GALL Report AMP XI.E1, which recommends inspecting all accessible cables and connections in adverse localized environments. Therefore, the staff issued RAI B.1.29-1 to clarify this inconsistency.

Entergy responded to RAI B.1.29-1 on February 20, 2018. As part of its response to RAI B.1.29-1, documented in ADAMS Accession No. ML18051A531, Entergy revised LRA Section B.1.29 to clarify that the program inspection includes all accessible cables and connections in adverse localized environments. Entergy states that the condition of accessible cables will represent, with reasonable assurance, all cables and connections in the adverse localized environments. The staff finds Entergy's response and corresponding revisions to the LRA Section B.1.29 acceptable because the inspection will include all accessible cable and connections installed in adverse localized environments. This change will make Entergy's LRA Section B.1.29 program consistent with GALL Report AMP XI.E1.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.E1. The staff finds that this LRA aging management program is adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.29 summarizes RBS operating experience related to the Non-EQ Insulated Cables and Connections program. In the LRA, Entergy states that the RBS program will be consistent with the program description in the GALL Report, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects requiring management. Entergy further states that the use of proven program activities provides reasonable assurance that Entergy will manage the effects of aging such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff did not identify any operating experience that would indicate that Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Non-EQ Insulated Cables and Connections program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.29 provides the USAR supplement for the Non-EQ Insulated Cables and Connections program. The staff reviewed this USAR supplement description of the program against the NRC staff's recommended description of this type of program as described in SRP Table 3.0-1. Staff notes that Entergy's USAR supplement description of sampling of accessible cables and connections in adverse localized environments is not consistent with the description of the program in SRP-LR. Table 3.0-1 of SRP-LR states that the program consists of all accessible electrical cables and connections installed in adverse localized environments to be visually inspected. The licensing basis for this program for the period of extended operation may not be adequate if Entergy does not incorporate this information in its USAR supplement. To address this possibility, on January 22, 2018, the staff issued a request for additional information, RAI B.1.29-1 (see ADAMS Accession No. ML18022A941). For Entergy's response, dated February 20, 2018, see ADAMS Accession No. ML18051A531.

As part of its response to RAI B.1.29-1, Entergy changed LRA Section A.1.29 to remove the term "sample." With this change, the program inspection includes all accessible cables and connections in localized adverse environments. The condition of accessible cables and connections will represent, with reasonable assurance, all cables and connections in the adverse localized environments. The staff finds Entergy's response to RAI B.1.29-1 and corresponding changes to the USAR supplement acceptable because the program inspection will include all accessible cables and connections installed in adverse localized environments. Therefore, the USAR supplement for the Non-EQ Insulated Cables and Connections program is consistent with the corresponding program description in SRP-LR Table 3.0-1.

The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Non-EQ Insulated Cables and Connections program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by

10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.22 Non-EQ Sensitive Instrumentation Circuits Test Review

LRA Section B.1.30 describes the Non-EQ Sensitive Instrumentation Circuits Test Review aging management program as consistent with GALL Report AMP XI.E2, "Insulated Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.E2.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.E2. The staff finds that this aging management program is adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.30 summarizes RBS operating experience related to the Non-EQ Sensitive Instrumentation Circuits Test Review program. In the LRA, Entergy states that the RBS program will be consistent with the program description in the GALL Report, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects requiring management. Entergy states that the use of proven program activities provides reasonable assurance that Entergy will manage the effects of aging such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff did not identify any operating experience indicating Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Non-EQ Sensitive Instrumentation Circuits Test Review program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.30 provides the USAR supplement for the Non-EQ Sensitive Instrumentation Circuits Test Review program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1, "FSAR Supplement for Aging Management of Applicable Systems." The staff finds that the USAR supplement contains an adequate summary description of the program.

The staff also notes that Entergy committed to implement the new Non-EQ Sensitive Instrumentation Circuits Test Review aging management program. The testing will occur at least every 10 years, with the first test occurring before the period of extended operation.

Conclusion

Based on the NRC staff's audit and review of Entergy's Non-EQ Sensitive Instrumentation Circuits Test Review program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.23 Protective Coating Monitoring and Maintenance

LRA Section B.1.35 describes the existing RBS Protective Coating Monitoring and Maintenance aging management program as consistent with GALL Report AMP XI.S8, "Protective Coating Monitoring and Maintenance."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.S8.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.S8. The staff finds that this aging management program is adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.35 summarizes RBS operating experience related to the Protective Coating Monitoring and Maintenance program. In the LRA, Entergy states that the Protective Coating Monitoring and Maintenance program will effectively ensure that intended functions are maintained consistent with the current licensing basis through the period of extended operation. Entergy also states that the program considers the technical information and industry operating experience provided in the following NRC documents: Information Notice 1988-82, Bulletin 1996-03, Generic Letter 1998-04, Generic Letter 2004-02, and Regulatory Guide 1.54, "Service Level I, II, III, and In-Scope License Renewal Protective Coatings Applied to Nuclear Power Plants."

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff did not identify any operating experience indicating Entergy should modify its proposed program.

Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Protective Coating Monitoring and Maintenance program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.35 provides the USAR supplement for the Protective Coating Monitoring and Maintenance program.

By letter dated April 26, 2018 (ADAMS Accession No. ML18116A622), Entergy amended the USAR supplement to include that the aging management program would be implemented using the guidance provided in RG 1.54 and American Society for Testing and Materials (ASTM) D5163--08, "Standard Guide for Establishing a Program for Condition Assessment of Coating Service Level I Coating Systems in Nuclear Power Plants." The staff reviewed this amended USAR supplement description of the program and notes that it is consistent with the recommended description in SRP-LR Table 3.0-1.

The staff finds that the USAR supplement, as amended, contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's protective coatings monitoring and maintenance program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the amended USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2 Aging Management Programs Consistent with the GALL Report with Exceptions or Enhancements

For aging management programs that an applicant claims are consistent with the GALL Report, with exceptions or enhancements, the staff performs an audit and review to confirm that those attributes or features of the program, for which Entergy claims consistency with the GALL Report, are consistent. The staff also reviews the exceptions or enhancements to determine if they will make the applicant's aging management program consistent with the GALL aging management program to which it is compared. The following sections document the results of the staff's audits and reviews for aging management programs consistent with the GALL Report with exceptions or enhancements.

3.0.3.2.1 Bolting Integrity

LRA Section B.1.2 describes the existing RBS Bolting Integrity program as consistent, with exceptions and enhancements, with GALL Report AMP XI.M18, "Bolting Integrity." Entergy amended this LRA section by letter dated February 20, 2018.

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M18.

The staff also reviewed the portions of Program Element 1 (scope of program) and Program Element 4 (detection of aging effects) associated with exceptions and enhancements to determine whether Entergy's program will adequately manage the aging effects for which it is credited. The staff's evaluation of these exceptions and enhancements follows.

Exception 1. LRA Section B.1.2 includes an exception to Program Element 4 (detection of aging effects) to perform opportunistic inspections for buried fire water system bolting in lieu of periodic inspections. The staff reviewed this exception against the corresponding program element in GALL Report AMP XI.M18 and finds it acceptable for the following reasons:

(1) Entergy's Bolting Integrity program has preventive measures in place to prevent loss of preload that are consistent with GALL Report AMP XI.M18.

(2) The fire water system buried bolts will be visually inspected for the aging effect of loss material during opportunistic inspections through the Buried and Underground Piping program (LRA Section B.1.4), which is a program consistent with the recommendations in GALL Report AMP XI.M41.

(3) The existing RBS Fire Water System program (LRA Section B.1.20) is a program that is consistent, with exceptions and enhancements, with GALL Report AMP XI.M27, "Fire Water System." Consistent with the GALL Report, the RBS Fire Water System program continuously monitors the required operating pressure of the fire water system, which is consistent with the guidelines in the National Fire Protection Association Standard (NFPA) 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems" (2011).

(4) The actions taken to prevent loss of preload and the opportunistic inspections for loss of material, in combination with the Fire Water System program continuous monitoring of the fire water system pressure, are sufficient for Entergy to detect degradation

associated with the buried bolts and take corrective action before there is a loss of intended function.

The staff's evaluation of the Buried and Underground Piping and Tanks Inspection program and Fire Water System program are discussed in SER Section 3.0.3.1.2 and Section 3.0.3.2.8, respectively.

Exception 2. LRA Section B.1.2 includes an exception to Program Element 4 (detection of aging effects) to inspect the submerged pressure-retaining bolting at least once every 10 years (instead of every refueling outage recommended by the GALL Report). For this exception, the staff needed additional information, and therefore issued a request for additional information, RAI B.1.2-2, dated January 22, 2018 (see ADAMS Accession No. ML18022A941). Entergy's response on February 20, 2018 is documented in ADAMS Accession No. ML18051A531.

In its response to RAI B.1.2-2, Entergy states that submerged closure bolts will be subject to visual inspections of the bolt head, threads, and nuts when the components are removed from the water and made accessible during maintenance activities. As part of its response, Entergy also revised LRA Section A.1.2 and Section B.1.2 to state that the Bolting Integrity program will do the following:

(1) Include inspection in each 10-year period during the period of extended operation of a sample of 20 percent, or at least 25 bolts, for each combination of bolting material and environment of the total population (with the exception of the suppression pool suction strainer submerged closure bolting).

(2) Include inspection of all accessible suppression pool suction strainer submerged closure bolting every 10 years during the period of extended operation. If divers perform the inspections of the suppression pool suction strainer submerged closure bolting, they will check for potential loss of preload by physically verifying that the bolting is hand tight.

The staff notes that Entergy's revisions to the Bolting Integrity program frequency and sample size of inspections for the submerged bolting are consistent with the recommendations in NUREG-2191, "Generic Aging Lessons-Learned for Subsequent License Renewal (GALL-SLR) Report," Bolting Integrity program (GALL-SLR Report AMP XI.M18) description. The staff finds Entergy's response and the exception to the detection of aging effects acceptable because Entergy revised its Bolting Integrity program to perform inspections of the submerged closure bolting consistent with the recommendations in the GALL-SLR Report AMP XI.M18.

Enhancement 1. In response to RAI B.1.2-2 discussed above, Entergy revised LRA Section B.1.2 by letter dated February 20, 2018 (see ADAMS Accession No. ML18051A531). This revision includes an enhancement to Program Element 1 (scope of program) and states that all accessible suppression pool suction strainer submerged closure bolting will be inspected at least once every 10 years. If the inspection is performed by divers, accessible bolting not removed will be checked manually to verify tightness. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M18 and finds it acceptable. When Entergy implements the enhancement, the program will be consistent with the recommendations for the inspection of submerged closure bolting in GALL-SLR Report AMP XI.M18.

Enhancement 2. LRA Section B.1.2 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures to volumetrically examine high-strength bolting for cracking in accordance with ASME Section XI. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M18 and finds it acceptable because, when it is implemented, the Bolting Integrity program will perform volumetric inspection of high-strength bolts, consistent with the recommendations in GALL Report AMP XI.M18.

Enhancement 3. LRA Section B.1.2 includes an enhancement to Program Element 4 (detection of aging effects) to revise Bolting Integrity Program documents to specify visual inspection of a representative sample of closure bolting in air environments. For this enhancement, the staff needed additional information, and therefore issued a request for additional information, RAI B.1.2-1, on January 22, 2018 (see ADAMS Accession No. ML18022A941). Entergy's response, dated February 20, 2018, is documented in ADAMS Accession No. ML18051A531.

In its response to RAI B.1.2-1, Entergy states that the enhancement applies to closure bolts exposed to external air environments. This includes closure bolts in systems that have any internal environment. The staff notes that Entergy also enhanced the program (see Enhancement 1, above) to inspect closure bolting in a submerged external environment and any internal environment. The staff finds Entergy's response and the enhancement to Program Element 4 (detection of aging effects) acceptable for the following reason: the Bolting Integrity program includes inspections of a representative sample of 20% of the population, up to a maximum of 25 closure bolts, for each combination of bolting material and environment of the total population during each 10-year period of the period of extended operation. This is consistent with the recommendations in GALL-SLR Report AMP XI.M18 for the inspections of closure bolting in systems with internal air or gas.

Based on its audit and review of Entergy's responses to RAI B.1.2-1 and RAI B.1.2-2, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the program elements of GALL Report AMP XI.M18. The staff also reviewed the exceptions associated with Program Element 4 (detection of aging effects) and their justifications, and finds that this aging management program, with its stated exceptions, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with Program Element 1 (scope of program) and Program Element 4 and finds that, when implemented, this aging management program will be adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.2 summarizes operating experience related to the Bolting Integrity program. In the LRA, Entergy states that the plant-specific operating experience "provide[s] objective evidence that the Bolting Integrity program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation."

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience indicating Entergy should modify its proposed program.

Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Bolting Integrity program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.2 as revised by Entergy's February 20, 2018 response to RAI B.1.2-2 discussed above (see ADAMS Accession No. ML18051A531), provides the USAR supplement for the Bolting Integrity program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to ongoing implementation of the existing Bolting Integrity program for managing the effects of aging for applicable components during the period of extended operation. The staff also notes that Entergy committed to implement the enhancements to the program prior to the period of extended operation. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Bolting Integrity program, the staff finds that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. In addition, the staff reviewed the exceptions and their justification and finds that this aging management program, with exceptions, is adequate to manage the applicable aging effects. Also, the staff reviewed the enhancements and confirms that Entergy's implementation of these enhancements prior to the period of extended operation will make this aging management program adequate to manage the applicable aging effects. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended functions consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a) (3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.2 Neutron Absorbing Material Monitoring

As amended by letter dated February 15, 2018 (ADAMS Accession No. ML18046A044), LRA Section B.1.3 describes the new Neutron Absorbing Material Monitoring program as consistent with GALL Report AMP XI.M40, "Monitoring of Neutron-Absorbing Materials Other than Boraflex." In the February 15, 2018 letter, Entergy also removed reliance on the Boraflex monitoring program and replaced it with the Neutron Absorbing Material Monitoring program.

Staff Evaluation

The staff reviewed Entergy's claim that its new Neutron Absorbing Material Monitoring program is consistent with the GALL Report. The staff compared Program Elements 1 through 7 of Entergy's program (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria, and corrective actions, respectively) against the corresponding program elements for GALL Report AMP XI.M40

The staff finds that Program Elements 1 through 7, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M40. The staff finds that this aging management program is adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.3 summarizes operating experience related to the Neutron Absorbing Material Monitoring program. The neutron-absorbing material to be managed is not currently installed in the RBS spent fuel pool; therefore, no plant-specific operating experience for this material exists. In the LRA, Entergy states that the aluminum boron-carbide neutron-absorbing material will be installed prior to the period of extended operation. Entergy also states that industry operating experience will be considered in the implementation of the new Neutron Absorbing Material Monitoring program. In addition, the program will follow the guidance in Nuclear Energy Institute (NEI) 16-03, Revision 0, “Guidance for Monitoring of Fixed Neutron Absorbers in Spent Fuel Pools” (see ADAMS Accession No. ML17263A133).

The staff evaluated operating experience information through reviewing the license renewal application and conducting the audit. The staff did not identify any operating experience indicating Entergy should modify its proposed program.

Based on its review of the application, as amended, the staff finds that the conditions and operating experience at the plant will be bounded by those for which the Neutron Absorbing Material Monitoring program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.3 provides the USAR supplement for the Neutron Absorbing Material Monitoring program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff’s recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to implementing the new Neutron Absorbing Material Monitoring program before the period of extended operation (i.e., prior to the end of the last refueling outage before August 29, 2025). The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC review of Entergy’s Neutron Absorbing Material Monitoring program, the staff concludes that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.3 BWR Vessel Internals

LRA Section B.1.10, as supplemented by letters dated February 7, 2018 (see ADAMS Accession No. ML18087A164), and March 26, 2018 (see ADAMS Accession No. ML18087A188), describes the existing BWR Vessel Internals program as consistent, with enhancements, with GALL Report AMP XI.M9, “BWR Vessel Internals.”

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements in GALL Report AMP XI.M9. The staff also reviewed Entergy's responses (as provided in LRA Appendix C) to those applicant action items (AAIs) that the staff issued in its final safety evaluation reports of specific Electric Power Research Institute (EPRI) Boiling-Water Reactor Vessel and Internals Project (BWRVIP) technical reports (TRs) that are within the scope of this aging management program. The staff also reviewed the portions of Program Element 2 (preventive actions) and Program Element 4 (detection of aging effects) associated with enhancements. The staff sought to determine whether Entergy's BWR Vessel Internals program, with Entergy's enhancements, will adequately manage the aging effects for which it is credited. The staff's evaluations of these enhancements follows.

Enhancement 1. LRA Section B.1.10 includes an enhancement to Program Element 2 (preventive actions) to revise BWR Vessel Internals Program procedures to maintain operating tensile stresses below a threshold limit during core shroud or other intergranular stress corrosion cracking (IGSCC) repairs. To implement this enhancement, Entergy will revise the aging management program procedures to state that, for core shroud repairs and other intergranular stress corrosion cracking IGSCC repairs, the BWR Vessel Internals program will maintain operating tensile stresses below a threshold limit that precludes intergranular stress corrosion cracking of X-750 material. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M9, "BWR Vessel Internals," and finds it acceptable because when Entergy implements the enhancement, the aging management program will: (a) include tensile stress monitoring activities that will be used to preclude or mitigate the occurrence of intergranular stress corrosion cracking of those reactor vessel internal components that are made of X-750 materials, and (b) include a Program Element 2 (preventive actions) that is consistent with the corresponding program element in GALL AMP XI.M9.

Enhancement 2. LRA Section B.1.10 includes an enhancement to Program Element 4 (detection of aging effects) to evaluate the reactor vessel internal components of cast austenitic stainless steel (CASS) and X-750 alloy for susceptibility to neutron or thermal embrittlement. It states Entergy will evaluate the susceptibility to neutron or thermal embrittlement for reactor vessel internal components made from either cast austenitic stainless steel (CASS) or X-750 materials. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M9, "BWR Vessel Internals," and finds it acceptable because when Entergy implements the enhancement:

a) The aging management program will include supplemental fracture toughness evaluation activities for those reactor vessel internal components that are made from cast austenitic stainless steel or X-750 materials.

b) Entergy will be able to determine whether the components are susceptible to loss of fracture toughness induced by neutron irradiation embrittlement or thermal aging mechanisms.

c) Program Element 4 (detection of aging effects) in Entergy's aging management program will be consistent with the corresponding program element in GALL Report AMP XI.M9.

Enhancement 3. LRA Section B.1.10 includes an enhancement to Program Element 4 (detection of aging effects) that addresses the basis for evaluating reactor vessel internal components if cracking or another form of age-related degradation is detected in a given reactor vessel internal component. This enhancement also addresses the need for the component-specific evaluations to account for critical flaw sizes and fracture toughness properties in the methodologies that will be used to perform the flaw evaluations. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M9, "BWR Vessel Internals," and finds it acceptable because when Entergy implements the enhancement:

a) It will update the procedures of the aging management program to include specific criteria for evaluating the susceptibility of the reactor vessel internal components to the specific aging effects the program is designed to manage. It will also establish the critical flaw sizes and reinspection frequencies for the reactor vessel internal components that are within the scope of the aging management program.

b) Program Element 4 (detection of aging effects) of Entergy's aging management program will be consistent with the corresponding program element in GALL Report AMP XI.M9.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M9, "BWR Vessel Internals." The staff also reviewed the enhancements associated with Program Element 2 (preventive actions) and Program Element 4 (detection of aging effects) and finds that, when implemented, they will make the aging management program adequate to manage the applicable aging effects.

Review of License Renewal Applicant Action Items: The program document for the BWR Vessel Internals program (refer to the audit report section covering LRA AMP B.1.10) explains that the scope of the aging management program includes implementation of the methodologies identified in a number of technical reports issued by the BWRVIP. As part of the staff's approval of these technical reports, the safety evaluations for the technical reports included a number of applicant action items (AAIs) that were to be addressed in a BWR applicant's LRA.

Entergy provided its responses to these applicant action items in Appendix C of the LRA. The staff verified that Entergy provided the appropriate responses to the applicant action items that were issued concerning the following BWRVIP technical reports:

- BWRVIP-18, Revision 1-A for core spray nozzles and internal core spray line components

- BWRVIP-25 for core plate assembly components

- BWRVIP-26-A for the top guide assembly components

- BWRVIP-27-A for standby liquid control line/core ΔP line nozzles and portions of the lines internal to the reactor pressure vessel (RPV)

- BWRVIP-38 for core shroud support components

- BWRVIP-41, Revision 3 for jet pump assembly components

- BWRVIP-42, Revision 1-A for the low-pressure coolant injection couplings

- BWRVIP-47-A for reactor vessel internal components located in the reactor pressure vessel lower plenum region

- BWRVIP-74-A for pressure retaining components in the reactor pressure vessel

- BWRVIP-76, Revision 1-A for the core shroud and core shroud welds

The staff also verified that, in general (and with the exception to the response to AAI 4 on the BWRVIP-27-A methodology and the applicant action items that apply to BWRVIP-139, Appendix B for steam dryer assembly components), Entergy addressed the specific requests in the applicant action items. This includes Entergy's responses to the following types of applicant action items that have been issued concerning the specific BWRVIP technical report methodologies:

(a) supporting information in relation to implementation of BWRVIP-defined inspections or evaluations of reactor vessel internal component-specific locations

(b) evaluation of reactor vessel internal component-specific time-limited aging analyses (TLAAs)

(c) needed performance of supplemental flaw evaluations or expanded component-specific inspections

(d) USAR supplement information needs for describing programmatic bases used to implement specific BWRVIP guideline methodologies

(e) potential identification of technical specification changes needed to manage the effects of aging in reactor vessel internal component-specific locations

In general, the staff found the applicant's bases to be acceptable for resolution of the stated AAIs because the applicant had either: (a) included and evaluated the applicable USAR supplement or TLAA sections in the LRA, (b) demonstrated conformance with the BWRVIP guideline criteria for the specific RVI components, or (c) provided acceptable alternatives to demonstrate that the action requested in the AAI would not need to be implemented at the facility. However, for the specific response to Applicant Action Item No. 4 on the BWRVIP-27-A report that applies to the standby liquid control (SLC)/core ΔP line components and the responses to the applicant action items that apply to technical report No. BWRVIP-139, Appendix B, for steam dryer assembly components, the staff needed additional information. To obtain this information, the staff issued two requests for additional information: RAI B.1.10-2 on February 8, 2018, and RAI B.1.10-3J on January 9, 2018 (see ADAMS Accession Nos. ML18043A008 and ML18009A909, respectively). On March 26, 2018 and February 7, 2018, Entergy responded to the RAIs (see ADAMS Accession Nos. ML18087A188 and ML18087A164, respectively). The staff's bases for resolving Entergy's responses to these applicant action items and RAIs are provided below.

Resolution of Applicant Action Item No. 4 issued in the Safety Evaluation for BWRVIP-27-A: In this applicant action item, the NRC requested BWR applicants for license renewal to identify and evaluate the projected fatigue cumulative usage factor (CUF) values as a potential TLAA issue. In its response to Applicant Action Item No. 4, Entergy states that the SLC/core ΔP lines inside the reactor vessel do not have a safety or license renewal intended function and therefore are not within the scope of the LRA and do not need be subjected to an aging management review.

The staff verified that Entergy included the metal fatigue TLAA for the reactor vessel internal components in LRA Section 4.3.1.2. The staff notes that in Entergy's March 26, 2018 response to RAI 4.3.1-1 (see ADAMS Accession No. ML18087A188), Entergy identified that it evaluated the SLC/core ΔP nozzle with a CUF analysis. The staff notes that this meets the criteria of Applicant Action Item No. 4 for the SLC/core ΔP nozzle that is joined to the reactor pressure vessel with a pressure retaining weld. In SER Section 4.3.1.1, the staff evaluates metal fatigue analyses (i.e., CUF analyses) for the SLC/core ΔP nozzle and other reactor pressure vessel components with CUF analyses. In SER Section 4.3.1.2, the staff evaluates metal fatigue analyses for reactor vessel internal components with CUF analyses.

During its review of the USAR and BWRVIP-27-A, the staff determined that the internal portions of the core ΔP line would not need to be within the scope of license renewal because they only serve a diagnostic differential pressure reading function and do not serve a license renewal-intended function, as defined in 10 CFR 54.4(b). However, the staff notes that USAR Section 9.3.5.2 states the standby liquid control system is designed to meet the requirements in 10 CFR 50.62, "Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants," for mitigating the consequences of anticipated transient without scram (ATWS) events and to shut down the reactor and keep the reactor from going critical again as it cools. The USAR also states that the internal portions of the standby liquid control lines are designed so the borated liquid "is piped into the reactor vessel and discharged near the bottom of the core, so it mixes with the cooling water rising through the core." Based on this USAR information, the staff found that the internal portions of the SLC system may need to be within the scope of license renewal. Therefore, for this applicant action item response, the staff needed additional information and therefore on February 8, 2018, issued request for additional information, RAI B.1.10-2 (see ADAMS Accession No. ML18043A008). Entergy's response on March 26, 2018, is documented in ADAMS Accession No. ML18087A188.

In its response to RAI B.1.10-2, Entergy states that the internal portion of the standby liquid control line does not need to be within the scope of the LRA, subjected to an aging management review, or age managed because the internal portion of the line does not serve a license renewal-intended function. Entergy states that the staff-approved basis in BWRVIP-27-A demonstrates that, upon initiation of the standby liquid control system, adequate uniform mixing of the boron-10 (B-10) solution into the reactor core would occur even if the internal portions of standby liquid control lines were to fail inside of the reactor. The staff notes that the site-specific design basis in the USAR for initiating the standby liquid control system during a postulated anticipated transient without scram event assumes that the B-10 solution will be injected at a flow rate concentration of 3.8–5.1 ppm/min and that injection of the SLC system's borated solution will achieve a minimum average concentration of 143 ppm of B-10 at the reactor core during the event.

The staff notes that the USAR also indicates that an additional 25 % by weight pf B-10 was included in the concentration of the SLC system's B-10 solution in order to account for potential nonuniform flow anomalies that might occur during operation of the SLC system. The staff finds that this additional conservatism in the design basis is sufficient to accept Entergy's position that the reactor pressure vessel-internal portion of the standby liquid control line does not serve a license renewal-intended function and does not need to be scoped into the LRA or subject to an aging management review.

Therefore, based on this review, the staff finds Entergy's response acceptable because Entergy has provided sufficient demonstration that reactor pressure vessel-internal portion of the standby liquid control line does not need to be included in the scope of the LRA. The staff also finds that the LRA does not need to include any TLAAs for the internal portion of the SLC line because: (a) Entergy has sufficiently demonstrated that the internal portion of the SLC line does not need to be included in the scope of the LRA, and (b) there are no time-dependent analyses in the current licensing basis for the internal portion of the standby liquid control line that would meet Criterion 1 for defining TLAAs in 10 CFR 54.3(a)—that is, in order to be TLAAs, the analyses must include components or structures that are within the scope of license renewal. The NRC staff finds that Entergy's response to RAI B.1.10-2 is sufficient to resolve the NRC staff's question concerning Applicant Action Item No 4. RAI B.1.10-2 is therefore closed.

Resolution of Applicant Action Items issued in the Safety Evaluation for BWRVIP-139-A, Appendix B: During its review of the LRA, the staff noted that Program Element 1 (scope of program) and the program evaluation report for the BWR Vessel Internals program identify that Entergy will be using the guidelines in BWRVIP-139-A to inspect the components in the plant's steam dryer assembly during the period of extended operation. In a safety evaluation dated November 8, 2016 (see ADAMS Accession No. ML16180A462), the staff issued its basis for using the guidelines in BWRVIP-139-A and Appendix B of the report to manage aging in BWR steam dryer assembly components. The staff's safety evaluation includes three applicant action items that license renewal applicants must address in order to justify using BWRVIP-139-A for aging management of the steam dryer assemblies during the period of extended operation. However, in Appendix C of the LRA, Entergy did not respond to any of the three applicant action items regarding the BWRVIP-139-A methodology. Therefore, for this issue, the staff needed additional information and therefore issued a request for additional information, RAI B.1.10-3, on January 9, 2018 (see ADAMS Accession No. ML18009A909). Entergy's response, dated February 7, 2018, is documented in ADAMS Accession No. ML18087A164.

During its evaluation of Entergy's response to RAI B.1.10-3, the staff noted that Entergy amended Appendix C of the LRA to include Entergy's responses to the following applicant action items that apply to the BWRVIP-139-A, Appendix B:

- **Applicant Action Item No. 1, Part A:** Entergy confirmed that the RBS steam dryer assembly design is one of the steam dryer assembly designs evaluated in the BWRVIP-139, Appendix A, and contains no plant-specific design aspects that differ from the generic design evaluated in BWRVIP-139-A. The staff has confirmed that the RBS steam dryer assembly design is within the scope of and bounded by the steam dryer assembly designs in the BWRVIP-139-A. The staff finds that Entergy's response provides adequate demonstration that the condition monitoring activities defined for BWR-6 steam dryer designs in the BWRVIP-139-A report can be applied as the basis for inspecting Entergy's steam dryer assembly during the period of extended operation. The action requested of Entergy in Applicant Action Item No. 1, Part A is resolved.

- **Applicant Action Item No. 1, Part B:** Entergy confirmed that the aging management review and operating experienced review for the steam dryer assembly did not identify any additional aging effects requiring management (AERMs) for the steam dryer assembly that are different from those identified in BWRVIP-139-A. The staff finds this acceptable because (a) current operating experience has shown that cracking and loss of material due to wear are the appropriate aging effects that have been detected in BWR steam dryer assemblies to date, and (b) BWRVIP-139-A, Appendix B includes loss of material due to wear as an applicable aging effect requiring management for BWR steam dryer assembly components (i.e., in addition to identifying cracking as an aging effect requiring management for steam dryer assembly designs). The action requested of Entergy in Applicant Action Item No. 1, Part B is resolved.

- **Applicant Action Item No. 2:** Entergy stated that it would amend the USAR supplement summary description for the BWR Vessel Internals program (LRA Section A.1.10) to reference the BWRVIP-139-A as the appropriate condition monitoring methodology for managing aging in the plant's steam dryer assembly. The staff confirmed that, in Entergy's response to RAI B.1.10-3, Entergy amended USAR supplement Section A.1.10 to reference the BWRVIP-139-A report as the basis that it will use to manage aging in the plant's steam dryer assembly during the period of extended operation. Based on the amendment of LRA Section A.1.10, the action requested of Entergy in Applicant Action Item No. 2 is resolved.

- **Applicant Action Item No. 3**: Entergy confirmed that in its TLAA identification review (as discussed in LRA Section 4.1), it did not identify any analyses for the steam dryer assembly that would conform to the definition of a TLAA in 10 CFR 54.3(a) or would need to be identified, evaluated, and dispositioned in accordance the requirements in 10 CFR 54.21(c)(1). During the staff's review of LRA Section 4.1, the staff verified that the current licensing basis does not include any plant analyses, calculations, or evaluations for the steam dryer assembly that conform to the definition of a TLAA in 10 CFR 54.3(a) or would need to be identified, evaluated, and dispositioned in accordance the requirements in 10 CFR 54.21(c)(1). Therefore, the staff finds Entergy's response acceptable. The action requested of Entergy in Applicant Action Item No. 3 is resolved.

Based on its review, the staff finds that Entergy has responded to the applicant action items for BWRVIP-139-A, Appendix B. Therefore, the staff considers the above applicant action items are closed and RAI B.1.10-3 is resolved.

<u>Operating Experience</u>

LRA Section B.1.10 summarizes operating experience related to the BWR Vessel Internals program. In the LRA, Entergy provides specific examples of operating experience to provide evidence that the BWR Vessel Internals program will effectively ensure that the intended functions of the reactor vessel internal components will be maintained consistent with the current licensing basis during the period of extended operation.

The staff reviewed operating experience information provided in the LRA and in Entergy's supporting documents for the LRA, which Entergy provided during the staff's audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the site-specific or generic operating experience information to determine: (a) whether any previously unknown or recurring aging effects were identified in reactor vessel internal components managed by the aging management program, and (b) whether, in light of plant-specific operating experience at the site or generic operating experience in the BWR industry, Entergy's LRA aging management program will adequately manage the aging effects associated with the operating experience. The staff finds that Entergy has demonstrated that it has appropriately identified, evaluated, and dispositioned all reactor vessel internal relevant operating experience, with the exception of the operating experience involving cracking in the core shroud assembly.

The staff needed additional information on cracking in the core shroud assembly. Accordingly, on February 8, 2018, the staff issued a request for additional information, RAI B.1.10-4 (see ADAMS Accession No. ML18043A008). Entergy's response on March 26, 2018 is documented in ADAMS Accession No. ML18087A188. During its evaluation of operating experience involving cracking in the core shroud assembly and Entergy's response to RAI B.1.10-4, the staff noted that Entergy had already revised the station procedures for the BWR Vessel Internals program to categorize the plant's core shroud as a Category C core shroud following the guidelines in BWRVIP-76, Revision 1-A. The staff finds Entergy's response acceptable because it demonstrates that Entergy will be implementing the BWRVIP-76, Revision 1-A report in accordance with the latest BWRVIP-defined category for operable BWR-designed core shrouds containing relevant flaw indications. The issue raised in RAI B.1.10-4 is therefore resolved.

Based on its audit and review of the application and Entergy's response to RAI B.1.10-4, the staff finds that the conditions and operating experience at the plant are bounded by those for which the BWR Vessel Internals program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.10 provides the USAR supplement for the BWR Vessel Internals program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended USAR supplement description for BWR Vessel Internals programs in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to implement the BWR Vessel Internals program, as described in LRA Section A.1.10 and Commitment No. 5 in LRA Table A.4, prior to February 28, 2025, with the initial inspections pursuant to the aging management program to be performed prior to August 29, 2030. As discussed in the evaluation of this aging management program, the staff verified that LRA Section A.1.10 also includes Entergy's enhancements of Program Element 2 (preventive actions) and Program Element 4 (detection of aging effects) in the aging management program. These enhancements relate to performance of tensile stress evaluations for reactor vessel internal repair components made from X-750 materials and component-specific susceptibility analyses for reactor vessel internal components made from X-750 or cast austenitic stainless steel materials.

The staff also notes that by letter dated February 7, 2018 (see ADAMS Accession No. ML18087A164), Entergy amended LRA Section A.1.10 to reference BWRVIP-139-A as the aging management program's referenced methodology for managing aging in the unit's steam dryer assembly. The staff finds this USAR supplement change to be acceptable because it brings the supplement into conformance with the staff's recommended action for resolving Applicant Action Item No. 2 of BWRVIP-139-A, Appendix B.

The staff finds that the USAR supplement, as amended in the letter of February 7, 2018, contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's BWR Vessel Internals program, the staff finds that those program elements, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements in GALL Report AMP XI.M9. In addition, the staff reviewed the enhancements and confirms that their implementation prior to the period of extended operation will make the aging management program adequate to manage the applicable aging effects.

In addition, the staff finds that Entergy has appropriately addressed and closed the actions requested in the applicant action items that are applicable to the BWR Vessel Internals program. Therefore, based on this review, the staff concludes that Entergy has demonstrated that the effects of aging in the reactor vessel internal components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.4 Compressed Air Monitoring

LRA Section B.1.12 describes the existing Compressed Air Monitoring aging management program as consistent, with one exception and two enhancements, with GALL Report AMP XI.M24, "Compressed Air Monitoring."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M24.

The staff also reviewed the portions of Program Element 2 (preventive actions), Program Element 4 (detection of aging effects), and Program Element 5 (monitoring and trending) associated with the one exception and two enhancements to determine whether the Compressed Air Monitoring program will adequately manage the aging effects for which it is credited. The staff's evaluation of this exception and these enhancements follows.

Exception 1. LRA Section B.1.12 includes an exception to Program Element 5 (monitoring and trending) to perform dew point testing and trending quarterly (instead of the daily readings of system dew point recommended by the GALL Report). The staff reviewed this exception against the corresponding program element in GALL Report AMP XI.M24 and noted the following: (a) dew point testing and trending is performed quarterly, (b) Entergy's response to NRC Generic Letter (GL) 88-14 (see ADAMS Legacy Accession No. 8907210175, Card 50641, Microform 296–300) states that dew point testing will be conducted every refueling outage, and (c) Entergy completed a review of operating experience, condition reports, and recent system health reports and did not find degradation that has threatened component intended functions. The staff reviewed the exception and finds quarterly dew point testing and trending acceptable because: (a) dew point testing and trending is conducted more frequently than Entergy's response to GL 88-14, and (b) the staff's independent review of Entergy's operating experience did not identify any degradation that would impact component intended functions.

Enhancement 1. LRA Section B.1.12 enhances Program Element 2 (preventive actions) by revising procedures to apply considerations of industry guidance recommended by the GALL Report. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M24 and finds it acceptable. When Entergy implements the enhancement, this program will be consistent with the GALL Report.

Enhancement 2. LRA Section B.1.12 enhances Program Element 4 (detection of aging effects) by revising procedures to include periodic and opportunistic visual inspections of accessible internal surfaces of system components. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M24 and finds it acceptable because when Entergy implements the enhancement, the program will be consistent with the GALL Report.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M24. The staff also reviewed the exception associated with Program Element 5 (monitoring and trending) and its justification, and finds that the aging management program, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with Program Element 2 (preventive actions) and Program Element 4 (detection of aging effects) and finds that, when implemented, they will make the aging management program adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.12 summarizes operating experience related to the Compressed Air Monitoring program. In the LRA, Entergy states that the Compressed Air Monitoring program will effectively ensure that intended functions will be maintained consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the Operating Experience Audit Report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff did not identify any operating experience indicating Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Compressed Air Monitoring program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.12 provides the USAR supplement for the Compressed Air Monitoring program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to ongoing implementation of the existing Compressed Air Monitoring program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Compressed Air Monitoring program, the staff determines that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. In addition, the staff reviewed the exception and its justification and finds that the aging management program, with the exception, is adequate to manage the applicable aging effects. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the period of extended operation will make the aging management program adequate to manage the applicable aging effects. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.5 Diesel Fuel Monitoring

LRA Section B.1.15 describes the existing Diesel Fuel Monitoring program as consistent, with enhancements, with GALL Report AMP XI.M30, "Fuel Oil Chemistry." Entergy amended this LRA section during the NRC staff's review by letters dated January 24, 2018 and May 10, 2018.

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M30.

For Program Element 3 (parameters monitored or inspected), the staff needed additional information, and therefore issued a request for additional information, RAI B.1.15-1, on December 13, 2017 (see ADAMS Accession No. ML17347B424). Entergy's initial response on January 24, 2018 is documented in ADAMS Accession No. ML18025B544. The NRC then held public meetings on February 27, 2018 (see public meeting summary in ADAMS Accession No. ML18059A822) and April 10, 2018 (see public meeting summary in ADAMS Accession No. ML18120A135). After these public meetings, Entergy provided supplemental responses to the RAI on March 27, 2018 and May 10, 2018. These are documented in ADAMS Accession No. ML18087A087 and No. ML18130A935, respectively.

The staff also reviewed the portions of Program Element 3 (parameters monitored or inspected), Program Element 4 (detection of aging effects), and Program Element 5 (monitoring and trending) associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these enhancements follows.

Enhancement 1. LRA Section B.1.15 includes an enhancement to Program Element 3 (parameters monitored or inspected) to revise procedures to monitor levels of microbiological organisms in fuel storage tanks. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M30 and finds it acceptable because monitoring the levels of microbiological organisms in the standby diesel generator (SDG), high-pressure core spray (HPCS) diesel generator fuel oil storage, day tanks, and the diesel-driven fire pump fuel oil storage tanks, is consistent with the recommendations of the GALL Report.

Enhancement 2. LRA Section B.1.15 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures to include periodic multi-level sampling of tanks with the scope of the program. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M30 and finds it acceptable for the following reason. Periodic multilevel sampling of tanks within the scope of the program to obtain a representative sample, or to obtain samples from the lowest point in the tank, if tank design does not allow for multilevel sampling, will be consistent with the recommendations of the GALL Report when implemented.

Enhancement 3. LRA Section B.1.15 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures to include a periodic cleaning and internal visual inspection of the tanks within the program. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M30 and finds it acceptable for the following reason. Revising the procedures to include a periodic cleaning and internal visual inspection of the tanks within the program, with a frequency of at least once during the 10-year period prior to the period of extended operation and at succeeding 10-year intervals, is consistent with the recommendations of the GALL Report.

Enhancement 4. LRA Section B.1.15 includes an enhancement to Program Element 5 (monitoring and trending) to revise procedures to monitor biological activity and particulate concentrates in the fuel tanks. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M30 and finds it acceptable for the following reason. Revising the procedures to include monitoring biological activity and particulate concentrations in the diesel-driven fire pump fuel oil storage tanks at least quarterly, and also to include monitor levels of microbiological organisms in the standby diesel generator, high-pressure core spray, and day tanks at least quarterly, is consistent with the recommendations of the GALL Report.

Enhancement 5. LRA Section B.1.15 includes an enhancement to Program Element 5 (monitoring and trending) to revise procedures to specify sampling for water and sediment in accordance with American Society for Testing and Materials (ASTM) Standard D2709, “Standard Test Method for Water and Sediment in Middle Distillate Fuels by Centrifuge.” The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M30 and finds it acceptable for the following reason. Using ASTM Standard D2709 for sampling for water and sediment in fuel oil storage tanks is consistent with the recommendations of the GALL Report.

Based on its review, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M30. In addition, the staff reviewed the enhancements associated with Program Element 3 (parameters monitored or inspected), Program Element 4 (detection of aging effects), and Program Element 5 (monitoring and trending) and finds that, when implemented, they will make the aging management program adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.15 summarizes operating experience related to the Diesel Fuel Monitoring program. In the LRA, Entergy states that the Diesel Fuel Monitoring program will effectively ensure that component intended functions are maintained consistent with the current licensing basis during the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting the audit. As discussed in the operating experience audit report, dated January 8, 2018 (see ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine: (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience that would indicate that Entergy should modify its proposed program.

Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Diesel Fuel Monitoring program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.15 provides the USAR supplement for the Diesel Fuel Monitoring program. The staff reviewed this USAR supplement description of the program against the NRC staff's recommended description for this type of program in SRP-LR Table 3.0-1. The staff notes that the SRP-LR describes an acceptable program description for the GALL Report AMP XI.M30, "Fuel Oil Chemistry," which includes the specific American Society for Testing and Materials standards used for monitoring and control of fuel oil contamination to maintain fuel oil quality. Neither LRA Section A.1.15, "Diesel Fuel Monitoring," nor LRA AMP B.1.15 includes industry standards used to monitor fuel oil contaminants. The staff was concerned that the licensing basis for this program for the period of extended operation may not be adequate if Entergy does not incorporate this information in its USAR supplement. To gain more information, staff issued a request for additional information, RAI B.1.15-1, on December 13, 2017 (see ADAMS Accession No. Proprietary Determination Correspondence to RBS in response to the Feb. 7, 2018 letter from W.F. Maguire of Entergy to NRC, Response to License Renewal Application (LRA) NRC Request for Additional Information (RAI) Set 7, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47, Enclosure 4 Containing Proprietary Information Withhold from Public Disclosure under Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding". Entergy's May 10, 2018 response is documented in ADAMS Accession No. ML18130A935. The staff finds Entergy's response to RAI B.1.15-1 and corresponding changes to the USAR acceptable because the description includes specific American Society for Testing and Materials standards that Entergy will use to monitor and control fuel oil contaminates. Therefore, the USAR supplement for the Diesel Fuel Monitoring program is consistent with the corresponding program description in SRP-LR Table 3.0-1.

The staff also notes that Entergy committed to ongoing implementation of the existing Diesel Fuel Monitoring aging management program during the period of extended operation. The staff finds that the information in the USAR supplement contains an adequate summary description of the program.

Conclusion.

On the basis of its audit and review of Entergy's Diesel Fuel Monitoring program, the staff determined that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Also, the staff reviewed the enhancements and confirms that their implementation prior to the period of extended operation will make the Diesel Fuel Monitoring aging management program adequate to manage the applicable aging effects. The staff concludes that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.6 External Surfaces Monitoring

LRA Section B.1.17, as updated by letter dated August 2, 2018 (License Renewal Application Annual Update, ADAMS Accession No. ML18214A162), describes the existing External Surfaces Monitoring program as consistent, with three enhancements, with GALL Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," as modified by LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion under Insulation."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M36. For Program Element 3 (parameters monitored or inspected) and Program Element 6 (acceptance criteria), the staff needed additional information and therefore, on February 7, 2018, issued three requests for additional information: RAI B.1.17-1, RAI B.1.17-2, and RAI B.1.17-3 (see ADAMS Accession No. ML18038B470). A public telephone conference call was held on April 10, 2018 and May 3, 2018 with Entergy regarding the RAIs and responses. Summaries of the calls are documented in ADAMS Accession Nos. ML18120A135 and ML18143B396, respectively. Entergy submitted a draft response, which the NRC added to the docket for public view and which was also in discussed during the second public telephone conference (see ADAMS Accession No. ML18122A126 for this draft response). Entergy's final responses, dated March 8, 2018 and May 10, 2018, are documented in ADAMS Accession Nos. ML18067A437 and ML18130A935, respectively.

Regarding RAI B.1.17-1, the staff finds Entergy's response and corresponding changes to LRA Sections 3.2.2.2.3.2, 3.2.2.2.6, 3.3.2.2.3, 3.3.2.2.5, 3.4.2.2.2, 3.4.2.2.3, A.1.32, and B.1.32 acceptable for the following reason. With the performance of one-time inspections of stainless steel and aluminum components that are externally exposed to outdoor air, Entergy will be able to confirm that loss of material and cracking of these components are not occurring and do not need to be managed for exposure to indoor air. As documented in the telephone conference summary for May 3, 2018, the staff did not pursue the lack of Table 2 aging management review items for the above one-time inspections because the specific inspections were incorporated into the USAR supplement for the One-Time Inspection program. The staff considered this approach to be a reasonable alternative because, for this specific situation, the inspections will be included in the current licensing basis through the USAR supplement.

Regarding RAI B.1.17-2, the staff finds Entergy's response and changes to LRA Table 3.3.2-12 acceptable because (a) consistent with GALL Report Item AP-123, there are no associated aging effects for stainless steel components in the revised indoor air environment and (b) visual inspections for staining due to leaking exhaust gas are capable of identifying cracking.

Regarding RAI B.17-3, the staff finds Entergy's response acceptable because the initiation of a condition report will prompt corrective actions to address the noted lack of documentation prescribed by implementing procedure EN-DC-178, "System Walkdowns."

The staff also reviewed the portions of Program Element 4 (detection of aging effects) and Program Element 6 (acceptance criteria) associated with the enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these enhancements follows.

Enhancement 1. LRA Section B.1.17 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures to include instructions to perform a visual inspection of accessible flexible polymeric component surfaces. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M36 and finds it acceptable because, when it is implemented, the program's procedures for visual inspections of flexible polymeric components will be consistent with the guidance in LR-ISG-2012-02, associated with the GALL Report's External Surfaces Monitoring of Mechanical Components program.

Enhancement 2. LRA Section B.1.17 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures to specify inspections for in-scope insulated components in a condensation of air-outdoor environments. The staff reviewed this enhancement against the corresponding program element in GALL Report AMPXI.M36 and finds it acceptable because, when it is implemented, the program's procedures for inspections of insulated components exposed to condensation or outdoor air will be consistent with the associated inspection guidance in LR-ISG-2012-02 and will make the program adequate to manage the effects of aging.

Enhancement 3. LRA Section B.1.17 includes an enhancement to Program Element 6 (acceptance criteria) to revise procedures to include acceptance criteria for different materials. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M36 and finds it acceptable because, when it is implemented, the program procedures' acceptance criteria for flexible and rigid polymeric materials and for abnormal surface indications on stainless steel and other metals will be consistent with the associated inspection guidance in LR-ISG-2012-02 and will make the program adequate to manage the effects of aging.

Based on its audit and review of Entergy's responses to RAIs B.1.17-1, B.1.17-2, and B.1.17-3, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M36. In addition, the staff reviewed the enhancements associated with Program Element 3 (parameters monitored or inspected) and Program Element 6 (acceptance criteria) and finds that, when implemented, they will make the aging management program adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.17 summarizes operating experience related to the External Surfaces Monitoring program. Entergy described several examples of its plant-specific operating experience and stated these examples provide objective evidence that the External Surfaces Monitoring Program will effectively ensure component intended functions are maintained.

The staff evaluated operating experience information through reviewing the license renewal application and conducting the audit. As discussed in the operating experience audit report, dated January 8, 2018 (see ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the External Surfaces Monitoring program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.17 provides the USAR supplement for the External Surfaces Monitoring program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff finds that the information in the USAR supplement is an adequate summary description of the program. The staff also noted that Entergy committed to enhance the program as described in LRA Section A.1.17 prior to the period of extended operation. The staff finds the information in the USAR supplement to be an adequate summary description of the program.

Conclusion

On the basis of its audits and review of Entergy's External Surfaces Monitoring program, the staff determines that those program elements, for which Entergy claimed consistency with the GALL Report, are consistent. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the period of extended operation will make the aging management program adequate to manage the applicable aging effects. The staff concludes that Entergy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.7 Fatigue Monitoring

LRA Section B1.18 describes the existing RBS Fatigue Monitoring aging management program as consistent, with three enhancements, with GALL Report AMP X.M1, "Fatigue Monitoring." Entergy amended this LRA section by letter dated April 3, 2018 (see ADAMS Accession No. ML18093A099).

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP X.M1.

For Program Element 1 (scope of program), the staff needed additional information and therefore issued a request for additional information. RAI B.1.18-1, dated March 6, 2018, and Entergy's response on April 3, 2018, are documented in ADAMS Accession Nos. ML18065A213 and ML18093A099, respectively. The staff finds Entergy's response acceptable because Entergy clarified the following: (1) Entergy has not yet revised the fatigue monitoring procedure to reflect the changes necessary to track the appropriate transients against their cycle limits during the period of extended operation. (2) As part of Enhancement 1 to this program, Entergy will revise the program procedure to track the required transients. (3) The revised procedure will include all plant design transients that cause cyclic strains that are significant contributors to the fatigue usage factor, consistent with the GALL Report.

For Program Element 3 (parameters monitored or inspected), the staff needed additional information and therefore issued a request for additional information. RAI B.1.18-2, dated March 6, 2018, and Entergy's response on April 3, 2018 are documented in ADAMS Accession No. ML18065A213 and No. ML18093A099, respectively. In its response, Entergy indicates that its February 6, 2018 responses to RAI 4.6-1 and RAI 4.6-2 describe the fatigue monitoring and analyses for the containment liner plate, cylinder and dome, penetrations, and other containment structural components such as the polar crane (see ADAMS Accession No. ML18038B475).

The staff finds Entergy's response acceptable because Entergy clarified that (1) the transients to be tracked in the fatigue monitoring and assessment of containment structural components include safety relief valve (SRV) actuations and earthquakes, and (2) upon implementation of Enhancement 1 to this program, plant procedures will specify tracking of the appropriate cycles including the safety relief valve actuations and earthquakes that must be monitored for fatigue assessment of containment structural components.

In addition, the staff needed additional information regarding Program Element 7 (corrective actions) and therefore issued a request for additional information. RAI B.1.18-3, dated March 6, 2018, and Entergy's response on April 3, 2018 are documented in ADAMS Accession No. ML18065A213 and No. ML18093A099, respectively. In its response, Entergy identifies Commitment No. 11a. It states that Entergy will revise the program basis document to state that acceptable corrective actions include repair of the component, replacement of the component, and a more rigorous analysis of component to demonstrate that the design code limit will not be exceeded during the period of extended operation. The staff finds Entergy's response and Commitment No. 11a acceptable because the revision to the program basis document is consistent with GALL Report AMP X.M1.

The staff also reviewed the portions of Program Element 1 (scope of program), Program Element 2 (preventive actions), and Program Element 4 (detection of aging effects) associated with enhancements to determine whether the aging management program will adequately manage the aging effects for which it is credited. The staff's evaluation of these enhancements follows.

Enhancement 1. LRA Section B.1.18 includes an enhancement to Program Element 1 (scope of program) to revise procedures to monitor and track critical thermal and pressure transients for components with a fatigue TLAA. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP X.M1 and finds it acceptable. When implemented, the enhancement will revise the program procedures to monitor and track critical thermal and pressure transients for components with a fatigue TLAA, consistent with the GALL Report AMP.

Enhancement 2. LRA Section B.1.18 includes an enhancement to Program Element 2 (preventive actions) to develop a set of fatigue usage calculations that consider the effects of the reactor water environment for a set of sample reactor coolant system components. The staff needed additional information and therefore, on March 6, 2018, the staff issued a request for additional information, RAI B.1.18-5 (see ADAMS Accession No. ML18065A213). Entergy's response, dated April 3, 2018, is documented in ADAMS Accession No. ML18093A099. The staff finds Entergy's response acceptable because Entergy clarifies the following: (1) A complex fatigue cycle transient may not involve a constant strain rate and linear temperature change. (2) When a more detailed calculation is required to determine the environmental fatigue correction factor (F_{en}) under a complex transient, the modified rate approach described in Section 4.2.14 of NUREG/CR-6909 "Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials," is used to calculate F_{en} in consideration of the complex temperature and strain rate, consistent with the guidance in GALL Report AMP X.M1.

The staff reviewed this enhancement against the corresponding program element in GALL Report AMP X.M1 and finds the enhancement acceptable because when it is implemented, Entergy will perform the following actions, consistent with the GALL Report AMP: (1) Entergy will develop fatigue usage calculations in consideration of reactor water environment effects for a set of sample reactor coolant system components. (2) The sample components will include the locations identified in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves for Selected Nuclear Power Plant Components," and additional plant-specific component locations in the reactor coolant pressure boundary if they are found more limiting than those considered in NUREG/CR-6260. (3) Entergy will determine environmental correction factors using the formulae recommended in GALL Report AMP X.M1. (4) Stress analysis methods used as inputs to fatigue analyses will consider all six stress components. (5) Entergy will calculate F_{en} consistent with the guidance in the GALL Report.

Enhancement 3. LRA Section B.1.18 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures to provide updates for the fatigue usage calculations on an as-needed basis. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP X.M1 and finds it acceptable for the following reason. When Entergy implements this enhancement, it will revise the program procedures to provide updates of the fatigue usage calculations on an as-needed basis if an allowable cycle limit is approached, a transient definition has been changed, an unanticipated new thermal event is discovered, or the geometry of a component has been modified. The staff finds this enhancement is consistent with the guidance in GALL Report AMP X.M1.

Based on its audit and review of Entergy's responses to RAI B.1.18-1, RAI B.1.18-2, RAI B.1.18-3, and RAI B.1.18-5, the staff finds that Program Elements 1 through 7, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP X.M1. In addition, the staff reviewed the enhancements associated with Program Element 1 (scope of program), Program

Element 2 (preventive actions), and Program Element 4 (detection of aging effects) and finds that, when implemented, they will make the aging management program adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.18 summarizes operating experience related to the Fatigue Monitoring program. In the LRA, Entergy states that monitoring cycle counts and initiating corrective action as necessary maintain the validity of associated fatigue analyses. Entergy also states that completion of the three enhancements discussed above will provide additional assurance that the Fatigue Monitoring program will be effective in the future. In addition, Entergy states that the application of this proven monitoring approach provides reasonable assurance that the associated analyses will remain valid or that appropriate corrective actions will be taken such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the operating experience audit report, dated January 8, 2018 (see ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff identified operating experience for which it needed additional information and therefore issued a request for additional information. RAI B.1.18-4, dated March 6, 2018, and Entergy's response on April 3, 2018, are documented in ADAMS Accession No. ML18065A213 and No. ML18093A099, respectively. The staff finds Entergy's response acceptable because it confirms that (a) additional computer data for fatigue cycles was extracted from the plant computer, (b) a manual review of retrieved cycle events was completed to supplement the missing data from the computer station (i.e., COLLECT computer station), and (c) the data collection for cycle counting no longer relies on an individual computer station and now the data can be retrieved from the plant computer data storage.

Based on the NRC staff's audit, review of the license renewal application, and Entergy's response to RAI B.1.18-4, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Fatigue Monitoring program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.18 provides the USAR supplement for the Fatigue Monitoring program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1 and the guidance in SRP-LR Section 3.1.2.5.

The staff also notes that Entergy committed to implement Enhancement 1 and Enhancement 3 to the program prior to February 28, 2025 (approximately 6 months prior to entering the period of extended operation). The staff further notes that Entergy committed to implement Enhancement 2 at least 2 years prior to August 29, 2023 (i.e., at least 2 years prior to entering the period of extended operation). As previously discussed, Entergy committed to revise Program Element 7 (corrective actions) in the program basis document (Commitment No. 11a) prior to February 28, 2025. This commitment will clarify that the acceptable corrective actions include repair of the component, replacement of the component, and a more rigorous analysis of the component, consistent with the GALL Report.

The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Fatigue Monitoring program, the staff finds that those program elements, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP X.M1. Also, the staff reviewed the enhancements and confirmed that once Entergy implements them, as described in the enhancement and USAR supplement sections, the aging management program will be adequate to manage the applicable aging effects. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.8 Fire Water System

LRA Section B.1.20 describes the existing RBS Fire Water System aging management program as consistent, with 7 exceptions and 26 enhancements, with GALL Report AMP XI.M27, "Fire Water System," as modified by LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion under Insulation." Entergy amended this LRA section by letters dated December 12, 2017 and February 7, 2018.

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 7 of Entergy's program (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria, and corrective actions, respectively) to the corresponding program elements of GALL Report AMP XI.M27, as modified by LR-ISG-2012-02.

For Program Element 1 (scope of program), Program Element 3 (parameters monitored or inspected), Program Element 4 (detection of aging effects), Program Element 5 (monitoring and trending), Program Element 6 (acceptance criteria), and Program Element 7 (corrective actions), the staff found that it needed additional information. However, in response to an earlier request, RAI B.1.11-1 (ADAMS Accession No. ML17347B473), Entergy revised LRA Section A1.20, LRA Section B.1.20, and LRA Table 3.3.2-7, "Fire Protection—Water System," to state that Entergy will only use the Fire Water System program to manage loss of coating integrity for the internal coatings for the fire water storage tanks (FWST). Instead of using the Fire Water System program to manage loss of coating integrity for internally coated piping and piping components in the fire water system, Entergy will use the Coating Integrity program. Managing loss of coating integrity for internally coated piping and piping components in the fire water system with the Coating Integrity program is consistent with GALL Report AMP XI.M42, "Internal Coatings/Linings for In-scope Piping, Piping Components, Heat Exchangers, and Tanks," as described in LR-ISG-2013-01, "Aging Management of Loss of

Coating or Lining Integrity for Internal Coatings/Linings on In-scope Piping, Piping Components, Heat Exchangers and Tanks." Accordingly, the staff's concerns regarding Program Elements 3–7 were resolved.

The staff also reviewed the portions of Program Element 4 (detection of aging effects), Program Element 6 (acceptance criteria), and Program Element 7 (corrective actions) associated with exceptions and enhancements to determine whether the Fire Water System program will adequately manage the aging effects for which it is credited. The staff's evaluation of these exceptions and enhancements follows.

Exception 1. LRA Section B.1.20 includes an exception to Program Element 4 (detection of aging effects) regarding the annual inspection frequency of sprinklers according to NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems." The staff reviewed this exception against the corresponding program element in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable for the following reasons. During the audit, the staff's independent search of plant-specific operating experience and plant-specific inspection results did not reveal any evidence that age-related degradation of sprinklers was occurring. There is a large enough number of sprinklers installed at RBS to establish an adverse performance trend, even with plant-specific inspections being completed on an 18-month or refueling cycle basis rather than annually.

Exception 2. As amended by letter dated February 7, 2018, LRA Section B.1.20 includes an exception to Program Element 4 (detection of aging effects) regarding the 5-year flow testing frequency at the hydraulically most remote hose connections of each zone of an automatic standpipe according to NFPA 25. The staff needed additional information and therefore issued a request for additional information. RAI B.1.20-1, dated January 9, 2018, and Entergy's response on February 7, 2018, are documented in ADAMS Accession No. ML18009A909 and No. ML18087A164, respectively.

The staff finds Entergy's response and the corresponding changes to Exception 2, LRA Section A.1.20, and LRA Section B.1.20 acceptable because: (a) a full flow test will be conducted on the most hydraulically remote hose connection within the scope of license renewal that is located in an area where water disposal can be easily accomplished, (b) the material and environment is the same for all fire water piping supplying in-scope hose stations and as a result, the internal conditions of the pipe supplying hose rack HR96 would reasonably be considered to be consistent with other locations, (c) the plant-specific fire hose test procedure, although it does not require full flow or produce results that can be trended can provide additional insights into gross flow blockage, and (d) main drain testing provides results that can be trended.

Exception 3. LRA Section B.1.20 includes an exception to Program Element 4 (detection of aging effects) related to the annual main drain tests at each water-based system riser according to NFPA 25. The staff notes that NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," was written for a broad range of facilities, including those conducting a few main drain tests at its standpipe locations (e.g., a small manufacturing facility with only one or two standpipes) and those with numerous standpipes (as is typical for nuclear power plants). The staff also notes that conducting tests on 20 percent of a population is consistent with the extent of recommended tests in several sampling-based aging management programs (e.g., GALL Report AMP XI.M38, "Internal Surfaces in Miscellaneous Piping and Ducting Components"). The staff reviewed this exception against the corresponding program element in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because the number of main drain tests Entergy conducts every refueling cycle (instead of every 12 months) is sufficient to establish a trend if potential flow blockage is occurring.

Exception 4. LRA Section B.1.20 includes an exception to Program Element 4 (detection of aging effects) related to the evaluation of interior tank coatings in accordance with the adhesion test of ASTM D3359. The staff reviewed this exception against the corresponding program element in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable. The proposed alternative adhesion testing methods (i.e., alternative American Society for Testing and Materials standards, lightly tapping, scraping or cleaning using cited Society of Protective Coatings (SSPC) specifications) cited in Enhancement 6 and Enhancement 16 can be effective at detecting lack of adhesion. See the staff's evaluation of Enhancement 6 and Enhancement 16 in this section for further information.

Exception 5. LRA Section B.1.20 includes an exception to Program Element 4 (detection of aging effects) related to trip testing preaction valves every 3 years according to NFPA 25. The staff notes that: (a) conducting internal visual inspections every 5 years by removing a sprinkler head from the most remote branch line from the source of water or using the inspector's test valve is consistent with NFPA 25, Section 14.2.1.5 and (b) NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report", GALL-SLR AMP XI.M27 removes the recommendation to conduct testing in accordance with NFPA 25, Section 13.4.3.2.3. However, Entergy's proposed internal inspections are recommended in both the GALL Report and GALL-SLR versions of AMP XI.M27. The staff reviewed this exception against the corresponding program element in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because the combination of main drain testing (see Enhancement 11) and internal visual inspections (see Enhancement 1) are capable of detecting potential flow blockage in the piping prior to a loss of intended function. Furthermore, the proposal is consistent with the staff's current position as documented in the GALL-SLR.

Exception 6. LRA Section B.1.20 includes an exception to Program Element 7 (corrective actions) related to performing an obstruction evaluation when there is a 50 percent increase in time for water to flow out the inspector test valve according to NFPA 25. The staff notes that: (a) the data necessary for the criterion cited in NFPA 25, Section 14.3.1 (14) is associated with an active function of sprinkler systems, and (b) Entergy has implemented an alternative to the testing method that does not include the specific active testing data. The staff reviewed this exception against the corresponding program element in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because: (a) Entergy has incorporated sufficient criteria (see Enhancement 21) to determine whether an obstruction investigation should be conducted, and (b) the internal visual inspections cited in Enhancement 1 and Enhancement 2 can be sufficient to detect flow blockage due to fouling.

Exception 7. During its review of LRA Section B.1.20, the staff identified a difference in Program Element 4 (detection of aging effects) regarding the inspection frequency of fire water storage tanks. In this difference, Entergy's program basis document states that Entergy will use the External Surfaces Monitoring program to manage aging effects associated with the external surfaces of the fire water storage tank. The staff notes that the External Surfaces Monitoring program conducts inspections on a refueling outage interval (i.e., nominally up to 2 years) whereas GALL Report AMP XI.M27 recommends annual inspections of the external surface of the fire water storage tank. The staff notes that: (a) during its independent review of plant-specific operating experience, the staff found no plant-specific operating experience related to adverse indications on the external surfaces of the fire water storage tank, (b) the fire water storage tanks are coated, thus mitigating the potential for external corrosion, and (c) during the onsite audit staff walkdown of the fire water storage tanks, staff observed no significant corrosion on the external surfaces of the fire water storage tanks (see ADAMS

Accession No. ML1734A732). The staff reviewed this difference against the corresponding program element in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because, given the condition of the tanks and the mitigative coating, inspecting the external surfaces of the tank every 2 years will provide sufficient time to detect potential loss of material.

Enhancement 1. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures to perform an internal inspection of the auxiliary building and diesel generator building preaction system's dry piping. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because the inspection periodicity and parameters are consistent with NFPA 25, Section 14.2. Although an obstruction investigation was not cited due to potential blockage, followup inspections of all of the precaution systems in a given building will provide sufficient insights to determine if the foreign material is widespread.

Enhancement 2. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures to perform an internal inspection of the dry piping downstream of the deluge valves on a 5-year frequency. The staff notes that: (a) conducting internal inspections of fire water sprinkler piping every 5 years is consistent with NFPA 25, Section 14.2, (b) NFPA 25, Section 13.4.3.2 allows deluge valve full testing to be conducted up to every 3 years, (c) GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, Table 4a, "Fire Water System Inspection and Testing Recommendations," states that the recommended inspections or tests are cited in order to detect loss of material and flow blockage, (d) internal visual inspections can be more effective at detecting internal pipe conditions because both potential debris and surface irregularities can be detected, and (e) opening a flushing connection and removing the most remote sprinkler for internal visual inspections is consistent with NFPA 25, Section 14.2, "Internal Inspection of Piping." The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable in part because: (a) the internal inspection parameters are consistent with Program Element 4 (detection of aging effects) and (b) the longer periodicity is offset by the more rigorous inspection method. However, the staff lacked sufficient information to conclude that all deluge systems that protect in-scope components are listed in the enhancement. As a result, the staff issued a request for additional information. RAI B.1.20-2, dated January 9, 2018, and Entergy's response on February 7, 2018, are documented in ADAMS Accession No. ML18009A909 and No. ML18087A164, respectively.

The staff finds the response acceptable because Entergy confirmed that within the definition of deluge systems identified in NFPA 25 and the scope of 10 CFR 54.1(a)(3), all deluge systems have been identified in this enhancement.

Enhancement 3. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures to perform an internal piping inspection of every other wet fire water system on a 5-year frequency. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable as follows. When Entergy implements the enhancement, the inspection requirements for wet fire water system sprinkler piping will be consistent with (1) Program Element 4 (detection of aging effects) for internal visual and followup wall thickness inspections, and (2) NFPA 25, Section 14.1 for obstructions.

Enhancement 4. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures to perform flow testing of underground piping according to NFPA 291, “Recommended Practice for Fire Flow Testing and Marking of Hydrants.” The staff notes that NFPA 25, Section A.7.3.1 cites NFPA 291 as the appropriate standard to conduct flow tests of underground piping. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable for the following reason. When Entergy implements the enhancement, the testing will be consistent with the recommended testing in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, Table 4a, “Fire Water System Inspection and Testing Recommendations,” for testing of private fire service mains.

Enhancement 5. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures to inspect fire water sprinkler heads according to NFPA 25. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because when it is implemented, sprinkler inspections will use age-related degradation criteria consistent with LR-ISG-2012-02, Table 4a and NFPA 25, Section 5.2.1.1.

Enhancement 6. As amended by letter dated February 7, 2018, LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures to inspect the interior of the fire water tanks according to NFPA 25. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable for the following reason. When Entergy implements the enhancement, interior fire water storage tank inspections will be consistent (see the staff’s evaluation of bottom thickness measurements in Enhancement 15 of this section) with GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, Table 4a (i.e., citation of NFPA 25, Section 9.2.6 and Section 9.2.7). In addition, the Society for Protective Coatings (SSPC) standards SSPC-SP 2, “Hand Tool Cleaning”; SSPC-SP 3, “Power Tool Cleaning”; SSPC-SP 11, “Bare Metal Power Tool Cleaning”; SSPC-SP WJ-1, “Waterjetting to Bare Substrate”; SSPC-SP WJ-2, “Very Thorough Waterjetting”; SSPC-SP WJ-3, “Thorough Waterjetting”; and SSPC-SP WJ-4, “Light Waterjetting,” are industrywide recognized standards for the surface preparation of noncoated and coated surfaces. These standards provide sufficient direction to ensure that surfaces are properly prepared. See the staff’s evaluation of RAI B.1.20-6 in the discussion of operating experience, below, regarding the acceptability of the change to Enhancement 6.

Enhancement 7. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise the procedures for removing mainline strainers, inspecting for damage and corroded parts, and cleaning on a 5-year frequency. The staff notes that: (a) NUREG-2191, GALL Report-SLR AMP XI.M27 recommends that strainers be inspected after each system actuation while GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, recommends strainer inspection after each system actuation and on a refueling outage interval, (b) the enhancement states that Entergy will conduct strainer inspections at least once per refueling outage cycle if either a fire water system actuation or flow testing occurred during that refueling cycle, and (c) although Entergy’s proposal could defer inspections to some time period during the refueling outage cycle after the actuation or test, during the audit, the staff noted no plant-specific operating experience that revealed a loss of intended function of the in-scope strainers due to flow blockage due to fouling. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable for the following reason. Considering the plant-specific operating experience, it is consistent with the staff’s current position as documented in NUREG-2191 (GALL Report-SLR).

Enhancement 8. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures specifying the testing of replacement of sprinkler heads according to NFPA 25. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable as follows. When it is implemented, it will be consistent with LR-ISG-2012-02, Table 4a and the recommendation that sprinklers that have been inservice for 50 years are replaced or tested.

Enhancement 9. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures specifying a flow test to detect potential flow blockage. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because when it is implemented, it will be consistent with the recommended inspections or tests for normally dry piping that allows water to collect.

Enhancement 10. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures specifying volumetric wall thickness inspections. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because when it is implemented, it will be consistent with the recommended wall thickness inspections for normally dry piping that allows water to collect.

Enhancement 11. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures of performing main drain tests. For more information, see the staff's evaluation of Exception 3 in this section.

Enhancement 12. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures of specifying an annual air flow test of the charcoal filter units. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable for the following reasons: Annual testing of deluge valves is consistent with NFPA 25, Table 10.1.1.2, "Summary of Water Spray Fixed System Inspection, Testing, and Maintenance," and testing with air instead of water is consistent with NFPA 25, Section 13.4.3.2.2.5 (A) where discharging water could damage the property.

Enhancement 13. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures of verifying the hydrant drain within 60 minutes post flushing or flow testing. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because when it is implemented, it will be consistent with NFPA 25, Section 7.3.2.4. However, the GALL Report AMP recommends that NFPA 25, Section 7.3.2., "Hydrants," be met, not just NFPA 25, Section 7.3.2.4. NFPA 25, Section 7.3.2 states that each hydrant shall be opened fully and water flowed until foreign material has cleared and that flow is maintained for at least 1 minute. NFPA 25 states no exception to these recommendations. This resulted in the staff issuing a request for additional information. RAI B.1.20-3, dated January 9, 2018, and Entergy's response, dated February 7, 2018, are documented in ADAMS Accession No. ML18009A909 and No. ML18087A164, respectively.

In evaluating Entergy's response to RAI B.1.20-3, the staff notes that: (a) one of the hydrants within the scope of license renewal (hydrant FHY13) is in a high-traffic area and Entergy claims that it is impractical to full flow test this hydrant due to layout of the necessary hoses, and (b) the underground fire water system piping is cement lined and supplied from well water. It is expected that the level of debris accumulating in a cement lined pipe supplied from well water would be much lower than steel piping supplied from a river or lake. The staff finds Entergy's response to RAI B.1.20-3 and corresponding changes to LRA Section A.1.20 and LRA Section B.1.20 acceptable because: (a) Entergy added a new enhancement

(Enhancement 25) to annually test the other three hydrants in accordance with NFPA 25, Section 7.3.2 (i.e., open fully and water flowed for at least 1 minute and until foreign material has cleared), (b) part of Enhancement 25 also includes annually testing hydrant FHY13 by partially opening the valve until any foreign material has cleared, and (c) the combination of testing the four hydrants in this manner will provide reasonable assurance that foreign material will be flushed from the system given the expected reduced foreign material loading in the system.

Enhancement 14. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures of ensuring training and qualification of individual evaluating the fire water storage tank coating degradation. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable for the following reason: When Entergy implements this enhancement, the training and qualification of individuals conducting the evaluation of fire water storage tank coatings will be in accordance with staff guidance provided in Regulatory Guide 1.54, “Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants,” and GALL Report AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks,” as issued by LR-ISG-2013-01, “Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks.”

Enhancement 15. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures specifying when to return a fire water tank to service upon discovery of interior defects. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M42, as modified by LR-ISG-2013-01, and finds it acceptable because the followup repairs, replacements, inspections, and evaluations for returning a component to service after identifying blistering (that does not meet acceptance criteria), peeling, or delamination will be consistent with Program Element 7 (corrective actions) of GALL Report AMP XI.M42. However, one provision of this enhancement states that Entergy will measure the tank thickness of the fire water storage tank whenever there is evidence of pitting or corrosion. GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, states that regardless of observed conditions, bottom thickness measurements are taken on each tank during the first 10-year period of the period of extended operation. This resulted in the staff issuing a request for additional information. RAI B.1.20-4, dated January 9, 2018, and Entergy’s response, dated February 7, 2018, are documented in ADAMS Accession No. ML18009A909 and No. ML18087A164, respectively.

The staff finds Entergy’s response to RAI B.1.20-4 and corresponding changes to LRA Section A.1.20 and LRA Section B.1.20 (new Enhancement 26) acceptable for the following reasons: (a) in light of the plant-specific operating experience associated with the grout at the tank-to-concrete interface, conducting bottom thickness measurements prior to the period of extended operation and during the first 10-year period of the period of extended operation (consistent with GALL Report AMP XI.M27, as modified by LR-ISG-2012-02), can provide sufficient trend data on the condition of the tank bottom, (b) the location of potential ultrasonic data points (e.g., perimeter of the tank) and the number and spacing of the data points can adequately detect potential loss of material, and (c) using scanning techniques, with followup inspections at discrete locations where there is indication of thinning, can adequately detect potential loss of material.

Enhancement 16. LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) to revise procedures to determine the extent of coating defects on the interior of the fire water tanks. The staff notes that Enhancement 6 and Enhancement 16 both refer to procedure changes for conducting internal inspections of fire water storage tanks. In Enhancement 6, Entergy cites the use of NFPA 25, Section 9.2.7 for followup tests or inspections as a result of detecting degraded conditions associated with interior coatings including adhesion testing, dry film thickness measurements, ultrasonic thickness (UT) measurements, spot wet sponge testing, and vacuum box testing. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because when it is implemented, the cited methods can be effective in detecting coating degradation or the results of coating degradation. The staff confirmed, in reviewing information from EPRI documentation on coatings, that tap testing is an effective method to detect coating adhesion degradation. In particular, the staff finds that lightly tapping the coating and scraping or cleaning the coating in accordance with the Society for Protective Coatings (SSPC) standards cited in Enhancement 6 to determine the coating integrity acceptable because: (a) a combination of the use of industry consensus documents and training will be used to ensure that consistent results can be obtained when testing in the vicinity of degraded coatings, (b) the cited example SSPC standards can be used to demonstrate that loose degraded coatings do not remain in the vicinity of coatings adhering to a surface, and (c) where system flow rates are low (i.e., tanks and piping where laminar flow conditions exist), there is reasonable assurance that the use of light tapping, light hand scraping, or light power tool cleaning as an alternative to adhesion testing will be sufficient to detect coatings that are not adhering to the substrate. In addition, the staff finds it acceptable to use ASTM D3359, “Standard Test Methods for Measuring Adhesion by Tape Test,” and ASTM D4541, “Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers,” to conduct adhesion testing because the NRC endorsed these standards in RG 1.54, Revision 3. The staff also finds Enhancement 21 describes effective methods for identifying the associated degraded conditions because these methods are industry recognized for detecting issues associated with thickness of coatings, holidays, or remaining wall thickness where loss of material has occurred. See also the staff’s evaluation of bottom thickness measurements in Enhancement 15.

Enhancement 17. As amended by letter dated February 7, 2018, Entergy deleted this enhancement of how to inspect, test and maintain pressure reducing valves. In its response to RAI B.1.20-2, Entergy states that the pressure-reducing valves identified in Enhancement 17 are not associated with standpipes, sprinkler connections, or hose stations. The staff finds the deletion of this enhancement acceptable because the pressure-reducing valves are not within the scope of NFPA 25, Section 6.3.1.4, “Flow Tests,” and GALL Report AMP XI.M27, as modified by LR-ISG-2012-02.

Enhancement 18. LRA Section B.1.20 includes an enhancement to Program Element 6 (acceptance criteria) to revise procedures to include acceptance criteria of no abnormal debris. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because when it is implemented, the acceptance criteria and corrective actions associated with debris will be consistent with Program Element 6 (acceptance criteria) in the GALL Report.

Enhancement 19. As amended by letter dated February 7, 2018, LRA Section B.1.20 includes an enhancement to Program Element 6 (acceptance criteria) to revise procedures to include acceptance criteria for the fire water tanks’ interior coating. The staff notes that Program Element 6 (acceptance criteria) of LR-ISG-2013-01, “Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks,” states, “[a]dhesion testing results, when conducted, meet or exceed the degree of adhesion recommended in plant-specific design requirements specific to the coating/lining and substrate.” The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M42, as modified by LR-ISG-2013-01, and this resulted in the staff issuing a request for additional information. RAI B.1.20-5, dated January 9, 2018, and Entergy's response, dated February 7, 2018, are documented in ADAMS Accession No. ML18009A909 and No. ML18087A164, respectively.

The staff finds Entergy's response and corresponding changes to LRA Section A.1.20 and LRA Section B.1.20 acceptable because the acceptance criteria now clearly states that the coating needs to meet the required degree of adhesion specified in plant-specific design documents and is therefore consistent with GALL Report AMP XI.M42.

Enhancement 20. LRA Section B.1.20 includes an enhancement to Program Element 7 (corrective actions) to revise procedures specifying replacement of sprinkler heads with signs of leakage. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because when it is implemented, the criteria for replacement of a sprinkler will be consistent with NFPA 25, Section 5.2.1.1.2 associated with age-related degradation.

Enhancement 21. LRA Section B.1.20 includes an enhancement to Program Element 7 (corrective actions). The staff notes that NFPA 25, Section 14.3, "Obstruction Investigation and Prevention," cites 14 criteria for identifying the need to conduct an obstruction investigation. Of the 14 criteria, 6 criteria are related to aging effects. Of these six aging effect-related criteria cited in NFPA 25, Section 14.3, (a) Criterion 14 is addressed in Exception 6, (b) Criterion 6, "plugged piping in sprinkler systems dismantled during building alterations," is not specifically addressed, however, the applicant included a general criterion, "[f]oreign material is identified during internal inspections," which is consistent with Criterion 6; and (c) the other four criteria are addressed by Enhancement 21. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because when it is implemented the specific criteria and the general criterion cited above envelope the criteria associated with age-related degradation for conducting an obstruction evaluation cited in NFPA 25, Section 14.3.1.

Enhancement 22. LRA Section B.1.20 includes an enhancement to Program Element 7 (corrective actions) to revise procedures to evaluate the microbiologically influenced corrosion if tubercles or slimes are identified. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because when it is implemented, it will be consistent with the criteria in NFPA 25, Section 14.2.1.2 for testing for indications of microbiologically influenced corrosion.

Enhancement 23. As amended by letter dated February 7, 2018, LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) of conducting augmented volumetric wall thickness examinations of fire water system piping. See SER Section 3.3.2.2.8 for the staff's evaluation of the program changes associated with this enhancement.

Enhancement 24. As amended by letter dated February 7, 2018, LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) of performing a full flow test on hose rack HR96, Control Building 135'0" elevation stairwell. The staff's evaluation of the program change associated with this enhancement is addressed in the response to RAI B.1.20-1, Exception 2 (see ADAMS Accession No. ML18087A164).

Enhancement 25. As amended by letter dated February 7, 2018, LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) of testing three hydrants annually in accordance with NFPA 25, and testing one hydrant with the hydrant valve partially open until any foreign material has cleared. The staff's evaluation of the program change associated with this enhancement is addressed in the response to RAI B.1.20-3, Enhancement 13 (see ADAMS Accession No. ML18087A164).

Enhancement 26. As amended by letter dated February 7, 2018, LRA Section B.1.20 includes an enhancement to Program Element 4 (detection of aging effects) of conducting examinations of the fire water storage tank floors. The staff's evaluation of the program change associated with this enhancement is addressed in the response to RAI B.1.20-4, Enhancement 15 (see ADAMS Accession No. ML18087A164).

Based on its audit and review of Entergy's responses to RAI B.1.11-1 and RAI B.1.20-1 through RAI B.1.20-5, the staff finds that Program Elements 1 through 7, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M27, as modified by LR-ISG-2012-02 and LR-ISG-2013-01 (with the exception of staff-identified difference between Entergy's program and GALL Report AMP XI.M27, as modified by LR-ISG-2012-02 and LR-ISG-2013-01). The staff also reviewed the exceptions and the staff-identified difference between Entergy's program and GALL Report AMP XI.M27, as modified by LR-ISG-2012-02 and LR-ISG-2013-01, associated with Program Element 4 (detection of aging effects) and Program Element 7 (corrective actions) and their justifications. The staff finds that the aging management program, with the exceptions, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with Program Element 4 (detection of aging effects), Program Element 6 (acceptance criteria), and Program Element 7 (corrective actions) and finds that, when implemented, they will make the aging management program adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.20 summarizes operating experience related to the Fire Water System program. In the LRA, Entergy states that, "[t]he identification of degradation and initiation of corrective action prior to loss of intended function, along with identification of program deficiencies and subsequent corrective actions, demonstrate that the Fire Water System Program has been effective."

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the operating experience audit report, dated January 8, 2018 (see ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff identified operating experience for which it needed additional information and therefore issued a request for additional information. RAI B.1.20-6, dated January 9, 2018, and Entergy's response, dated February 7, 2018, are documented in ADAMS Accession No. ML18009A909 and No. ML18087A164, respectively. The staff finds Entergy's response and corresponding changes to LRA Section A.1.20 and LRA Section B.1.20, Enhancement 6, acceptable for the following reasons: (a) the fire water storage tanks will be recoated prior to the period of extended operation, and therefore corrective actions will be consistent with GALL Report AMP XI.M42, and (b) future tank inspections will be conducted with the tank drained, thereby improving the effectiveness of the visual inspections of the tank internals.

Based on the NRC staff's audit, review of the license renewal application, and Entergy's response to RAI B.1.20-6, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Fire Water System program was evaluated.

Updated Safety Analysis Report Supplement

As amended by letters dated December 12, 2017, and February 7, 2018, LRA Section A.1.20, provides the USAR supplement for the Fire Water System program.

The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1, as modified by LR-ISG-2012-02 and LR-ISG-2013-01.

The staff also notes that Entergy committed to enhance the Fire Water System program, as described in LRA Section B.1.20, either (1) prior to February 28, 2025, or (2) at the end of the last refueling outage prior to August 29, 2025, whichever is later. In addition, Entergy committed (Commitment No. 12a) to remove the existing coating, perform bottom thickness measurements, and recoat the fire water storage tanks within 7 years, prior to February 28, 2025.

The staff finds that the USAR supplement, as amended by letters dated December 12, 2017, and February 7, 2018, contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Fire Water System program, the staff finds that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. In addition, the staff reviewed the exceptions and their justifications and finds that the Fire Water System aging management program, with the exceptions, is adequate to manage the applicable aging effects. Also, the staff reviewed the enhancements and confirms that their implementation prior to the period of extended operation will make this aging management program adequate to manage the applicable aging effects. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.9 Flow-Accelerated Corrosion

LRA Section B.1.21, as amended by letter dated May 10, 2018 (see ADAMS Accession No. ML18130A935) describes the existing Flow-Accelerated Corrosion program as consistent, with an exception and an enhancement, with GALL Report AMP XI.M17, "Flow-Accelerated Corrosion," as modified by LR-ISG-2012-01, "Wall Thinning Due to Erosion Mechanisms."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 7 of Entergy's program (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria, and corrective actions, respectively) to the corresponding program elements of the modified GALL Report AMP XI.M17.

For Program Element 1 (scope of program), Program Element 4 (detection of aging effects), and Program Element 6 (acceptance criteria), the staff needed additional information and therefore, on February 7, 2018, issued three requests for additional information: RAI B.1.21-1, RAI B.1.21-2, and RAI B.1.21-3 (see ADAMS Accession No. ML18038B470). Entergy responded on March 8, 2018 (see ADAMS Accession No. ML18067A437). However, the NRC staff had followup concerns. A public telephone conference call with Entergy was held on April 10, 2018 to discuss RAI B.1.21-1, RAI B.1.21-2, and RAI B.1.21-3. The summary for the call is documented in ADAMS Accession No. ML18120A135. Entergy provided draft responses, which the NRC placed on the docket for public view (see ADAMS Accession Nos. ML18115A061, and ML18115A163). On May 3, 2018, a public telephone conference call was held with Entergy to discuss the RAI responses (see summary documented in ADAMS Accession No. ML18143B396). Subsequently, Entergy submitted its final response on May 10, 2018 (see ADAMS Accession No. ML18130A935).

Regarding RAI B.1.21-1, the staff finds Entergy's response and corresponding changes to LRA Section B.1.21 acceptable because Entergy resolved the discrepancies between the LRA, the program basis documentation, and the implementing procedures by specifying an acceptable exception to the GALL Report AMP and by initiating changes to remove references to Revision 3 of NSAC-202L from the program's implementing procedures. The staff's evaluation of the exception is discussed below.

Regarding RAI B.1.21-2, Entergy provided details related to the classification, development, and maintenance of the software used by the aging management program. The response states that the associated software (CHECWORKS™ and FAC Manager Web Edition) were developed and are maintained in accordance with the associated vendors' (EPRI and Altran, respectively) quality assurance policies. These policies require a formal software plan, detailed program documentation, and error reporting. The response clarifies that, as specified in Entergy's procedure EN-IT-104, "Software Quality Control," the software requires validation and verification and either Entergy personnel or the software vendor validates the software each time the software is revised. However, because the software is classified as Level C, "Business Important," rather than Level B, "Regulatory Commitments," EN-IT-104 does not require error reporting. As a result, Entergy proposed an additional enhancement to revise the implementing procedures in order to ensure that error reporting will continue to be performed during the period of extended operation. The staff finds the response and the changes to LRA Section B.1.21 acceptable because the use of test cases and test databases as part of the validation process can provide the appropriate quality assurance to ensure that component wear, wear rate, and remaining service life are appropriately calculated by the software. In addition, the enhancement to require continued error reporting (similar to that identified in the operating experience audit report (see ADAMS Accession No. ML17347A383) in CR-RBS-2010-00610, "2009 EPRI reported bug in CHECWORKS software") can ensure that the software errors do not adversely affect aging management activities.

Regarding RAI B.1.21-3, the staff notes that the program's current enhancement includes changes associated with the guidance in LR-ISG-2012-01 for addressing erosion mechanisms. The staff finds Entergy's response acceptable because the timeframe adjustment, depending on whether the examination data indicatives localized degradation typical of erosion instead of a broader degradation area, reasonably accounts for potentially higher wear rates during short-term abnormal operation.

The staff also reviewed the portions of Program Element 1 (scope of program), Program Element 4 (detection of aging effects), Program Element 5 (monitoring and trending), Program Element 6 (acceptance criteria), and Program Element 7 (corrective actions) associated with the exception and the enhancement to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these enhancements follows.

Exception. LRA Section B.1.21, as modified by letter dated March 8, 2018, (ADAMS Accession No. ML18067A437) includes an exception to Program Element 1 (scope of program), Program Element 4 (detection of aging effects), Program Element 5 (monitoring and trending), and Program Element 6 (acceptance criteria) of following the guidelines of a later revision of Nuclear Safety Analysis Center (NSAC)-202L. The staff reviewed this exception against the corresponding program elements in the modified GALL Report AMP XI.M17 and finds it acceptable because, as provided in NUREG-2205, "Safety Evaluation Report, Related to the License Renewal of LaSalle County Station Units 1 and 2," the staff previously found the use of EPRI NSAC-202L, Revision 4 to be acceptable. The staff notes that EPRI periodically updates NSAC-202L by refining and enhancing the recommendations from earlier versions with operating experience and recent developments in detection, modeling, and mitigation techniques.

Enhancement. LRA Section B.1.21 includes an enhancement to Program Element 1 (scope of program), Program Element 4 (detection of aging effects), and Program Element 7 (corrective actions) of managing wall thinning due to erosion mechanisms. The staff reviewed the enhancement against the corresponding program elements in the modified GALL Report AMP XI.M17 and finds it acceptable because the prescribed program procedure changes will implement the guidance provided in LR-ISG-2012-01 for addressing erosion mechanisms through the Flow-Accelerated Corrosion program. In addition, as discussed above for RAI B.1.21-2, the enhancement to revise program procedures to require continued software error reporting will ensure that the current practice, which is not a requirement for the currently classified Level C software, will continue during the period of extended operation.

Based on its audit and review of Entergy's responses to RAI B.1.21-1, RAI B.1.21-2, and RAI B.1.21-3, the staff finds that Program Elements 1 through 7, for which Entergy claimed consistency with the GALL Report, are consistent with the corresponding program elements of the modified GALL Report AMP XI.M17. The staff also reviewed the exception associated with Program Element 1 (scope of program), Program Element 4 (detection of aging effects), Program Element 5 (monitoring and trending), and Program Element 6 (acceptance criteria) and its justification and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with Program Element 1, Program Element 4, and Program Element 7 (corrective actions) and finds that their implementation will result in the AMP being adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.21 summarizes operating experience related to the Flow-Accelerated Corrosion program. Entergy stated that the identification and initiation of corrective action prior to loss of intended function demonstrate that the Flow-Accelerated Corrosion program has been effective.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the operating experience audit report, dated January 8, 2018 (see ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience that would indicate that Entergy should modify its proposed program.

Based on its audit, reviews of the application, and Entergy's responses to RAI B.1.21-1, RAI B.1.21-2, and RAI B.1.21-3, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Flow-Accelerated Corrosion program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.21 provides the USAR supplement for the Flow-Accelerated Corrosion program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that Entergy committed to implement the enhancements to the program, as described in LRA Section A.1.21, prior to February 28, 2025. The staff finds the information in the USAR supplement to be an adequate summary description of the program.

Conclusion

On the basis of its audits and review of Entergy's Flow-Accelerated Corrosion program, the staff finds that the program elements, for which Entergy claimed consistency with the GALL Report, are consistent. In addition, the staff reviewed the exception and its justifications and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. Also, the staff reviewed the enhancement and confirmed that its implementation prior to the period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that Entergy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.10 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

LRA Section B.1.24 describes the existing RBS Inspection of Overhead Heavy Load and Light Load (Related To Refueling) Handling Systems program as consistent, with enhancements, with GALL Report AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M23. The staff also reviewed the portions of Program Element 3 (parameters monitored or inspected), Program Element 4 (detection of aging effects), and Program Element 6 (acceptance criteria) associated with enhancements to determine whether the aging management program will adequately manage the aging effects for which it is credited. In addition, the staff reviewed portions of Program Element 7 (corrective actions) associated with Enhancement 4. The staff also identified an added enhancement or a difference in Program Element 3 (parameters monitored or inspected). The staff's evaluation of these enhancements follows.

Enhancement 1. LRA Section B.1.24 includes an enhancement to Program Element 3 (parameters monitored or inspected) of specifying the program manages various effects (e.g., wear, cracking) of aging for different parts of the crane (e.g., rails, trolley and hoists). The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M23 and finds it acceptable for the following reason: When Entergy implements the enhancement, the program will monitor crane rail and bridge, trolley, and hoist surfaces for loss of material due to corrosion and wear; bolting for loose bolts or nuts and missing nuts; and other conditions indicative of loss of preload. In addition, during the review of this program element, the staff identified a difference with the corresponding GALL Report program element of GALL Report AMP XI.M23. The staff noted this difference further enhances Entergy's program element to monitor deformation and cracking of crane rails and bridge, trolley, and hoist structural components. The staff reviewed this additional enhancement/difference against the corresponding program element in GALL Report AMP XI.M23 and finds it acceptable because its inclusion for this particular inspection and evaluation makes Program Element 3 (parameters monitored or inspected) also consistent with the guidance provided in ASME B30.2. Entergy's implementation of these actions will make Program Element 3 (parameters monitored or inspected) consistent with that of the GALL Report AMP XI.M23.

Enhancement 2. LRA Section B.1.24 includes an enhancement to Program Element 4 (detection of aging effects) of specifying inspection frequency in accordance with ASME B30.2, "Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)," or other appropriate standard in the ASME B30 series. The staff reviewed this enhancement against the corresponding program element in the GALL Report AMP XI.M23 and finds it acceptable for the following reason: When Entergy implements the enhancement, the program's frequency of inspections will be in accordance with ASME Safety Standard B30.2, which provides guidance regarding timely periodic inspections of crane SSCs, or will use another applicable ASME B30 standard. Implementation of these actions will make Program Element 4 (detection of aging effects) consistent with that of the GALL Report AMP XI.M23.

Enhancement 3. LRA Section B.1.24 includes an enhancement to Program Element 6 (acceptance criteria) of specifying acceptance criteria for any visual indication of loss of material or loss of bolting preload. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M23 and finds it acceptable for the following reason: When Entergy implements the enhancement, Entergy will ensure that loss of material due to corrosion or wear in crane rails and loss of preload in bolted connections will be evaluated in accordance with ASME B30.2 or other applicable ASME B30-series standards. Enactment of these activities will make Program Element 6 (acceptance criteria) consistent with that of the GALL Report AMP XI.M23.

Enhancement 4. LRA Section B.1.24 includes an enhancement to Program Element 7 (corrective actions) of specifying maintenance and repair activities in accordance with ASME B30.2 or other appropriate standard in the ASME B30 series. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M23 and finds it acceptable as follows: When it is implemented, Entergy will ensure that repairs of in-scope RBS cranes will be performed in accordance with ASME B30.2 or other appropriate standard in the ASME B30 series. Implementation of these actions will make Program Element 7 (corrective actions) consistent with that of the GALL Report AMP XI.M23.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M23. The staff also reviewed the staff-identified difference between Entergy's aging management program and GALL Report AMP XI.M23 associated with Program Element 3 (parameters monitored or inspected) and its justification. The staff finds that Entergy's Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems aging management program, with the noted difference, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with Program Element 3 (parameters monitored or inspected), Program Element 4 (detection of aging effects), and Program Element 6 (acceptance criteria) and finds that when Entergy implements these enhancements, they will make this aging management program adequate to manage the applicable aging effects. Furthermore, the staff finds the enhancement to Program Element 7 (corrective actions) renders it consistent with that of GALL Report AMP XI.M23.

Operating Experience

LRA Section B.1.24 summarizes operating experience related to the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program. In the LRA, Entergy states that objective evidence that the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program is effective is demonstrated by its ability to identify age-related degradation and initiate corrective actions prior to loss of intended function for the in-scope SSCs for cranes and monorails. Entergy also states that its use of proven program activities provide reasonable assurance that it will manage the effects of aging such that cranes, monorails, and their associated SSCs will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the operating experience audit report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of RBS operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience indicating Entergy should modify its proposed program.

Based on its audit and review of the application, the staff finds that the conditions and operating experience at RBS are bounded by those for which the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.24 provides the USAR supplement for the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to implement the enhancements to the program prior to February 28, 2025. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program, the staff finds that those program elements, for which Entergy claims consistency with the GALL Report AMP XI.M23, are consistent. In addition, the staff reviewed the staff-identified difference between Entergy's program and GALL Report AMP XI.M23 and finds that Entergy's aging management program, with the difference, is still adequate to manage the applicable aging effects. Also, the staff reviewed the enhancements and confirms that their implementation prior to the period of extended operation will make the aging management program adequate to manage the applicable aging effects. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended functions consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.11 Reactor Head Closure Studs

LRA Section B.1.36, as updated by letter dated August 2, 2018 (License Renewal Application Annual Update, ADAMS Accession No. ML18214A162), describes the existing RBS Reactor Head Closure Studs program as consistent, with one exception and one enhancement, with GALL Report AMP XI.M3, "Reactor Head Closure Studs."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M3.

The staff also reviewed portions of Program Element 2 (preventive actions) and Program Element 4 (detection of aging effects) associated with the exception and the enhancement to determine whether the aging management program will adequately manage the aging effects for which it is credited. The staff's evaluation of the exception and enhancement follows.

Exception 1. LRA Section B.1.36 includes an exception to Program Element 2 (preventive actions) of using bolting material for closure studs with a maximum reported ultimate tensile strength below 170 ksi (instead of following the GALL Report recommendation of 150 ksi actual yield strength). The GALL Report AMP recommends that stud materials have a yield strength less than 150 ksi since these materials are known to be resistant to stress corrosion cracking. Entergy's program states that it uses ultimate tensile strength (UTS) instead of yield strength to determine the susceptibility of the stud material to stress corrosion cracking since only the ultimate tensile strength data is available. Entergy states that the stud material at RBS has an ultimate tensile strength less than 170 ksi, and that it is not susceptible to stress corrosion cracking. The staff reviewed this exception against the corresponding program element in GALL Report AMP XI.M3 and finds it acceptable because the stud materials meeting the ultimate tensile strength criterion are also resistant to stress corrosion cracking. The staff notes that based on industry operating experience and research, similar to the 150 ksi yield criterion, bolting materials below 170 ksi ultimate tensile strength are not susceptible to stress corrosion cracking degradation. Additionally, Entergy completed a review of operating experience, including condition reports, and did not find degradation that has impacted the intended functions of the studs, thus demonstrating adequacy of the current program.

Enhancement 1. LRA Section B.1.36 includes an enhancement to Program Element 4 (detection of aging effects) to ensure replacement studs are fabricated from bolting material with actual measured yield strength less than 150 ksi. Energy includes procurement requirements in its Reactor Head Closure Studs program to ensure replacement studs are fabricated from bolting material with actual measured yield strength less than 150 ksi, as consistent with the GALL Report, in place of the ultimate tensile strength criterion. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.M3 and finds it acceptable because when it is implemented, it will be consistent with the GALL Report.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M3. The staff also reviewed the exception associated with Program Element 2 (preventive actions), and its justification, and finds that the aging management program, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancement associated with Program Element 7 (corrective actions) and finds that when implemented, it will make the aging management program consistent with the GALL Report AMP.

Operating Experience

LRA Section B.1.36 summarizes RBS operating experience related to the Reactor Head Closure Studs program. In the LRA, Entergy states that the Reactor Head Closure Studs program will effectively ensure that Entergy maintains the intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the operating experience audit report, dated January 8, 2018 (see ADAMS Accession No. ML17347A383), the staff conducted an independent search of RBS operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program will adequately manage the associated aging effects.

The staff did not identify any operating experience indicating Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at RBS are bounded by those for which the Reactor Head Closure Studs program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.36 provides the USAR supplement for the Reactor Head Closure Studs program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to ongoing implementation of the existing RBS Reactor Head Closure Studs program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Reactor Head Closure Studs program, the staff finds that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. In addition, the staff reviewed the exception and its justification and finds that the aging management program, with the exception, is adequate to manage the applicable aging effects. Also, the staff reviewed the enhancement and confirmed that its implementation prior to the period of extended operation will make the LRA aging management program consistent with the GALL Report AMP. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.12 Reactor Vessel Surveillance

LRA Section B.1.37 describes the existing RBS Reactor Vessel Surveillance aging management program as consistent with GALL Report AMP XI.M31, "Reactor Vessel Materials Surveillance," with one exception. Entergy amended this LRA section by letter dated March 26, 2018 (see ADAMS Accession No. ML18087A188).

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) and Program Elements 8 and 9 (confirmation process and administrative controls) of Entergy's program to the corresponding program elements of GALL Report AMP XI.31.

The staff also reviewed the portions of Program Element 4 (detection of aging effects) associated with the exception to determine whether the Reactor Vessel Surveillance program will adequately manage the aging effects for which it is credited. The staff's evaluation of this exception follows.

Exception. LRA Section B.1.37 includes an exception to Program Element 4 (detection of aging effects) for not meeting the GALL Report recommendation of having at least one capsule with projected neutron fluence equal to or exceeding the 60-year reactor vessel wall neutron fluence. In the exception, Entergy states that GALL Report AMP XI.M31 includes criteria calling for the program to have at least one capsule with a projected neutron fluence that is equal to or exceeds the limiting 60-year neutron fluence for the reactor pressure vessel at the end of the period of extended operation. Entergy states that the BWRVIP-based integrated surveillance program (ISP) for RBS does not meet the criterion for the capsules in a surveillance program. Entergy also justifies that the exception is acceptable based on the fact the regulatory criteria in Regulatory Guide (RG) 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," provides and allows alternative methods for calculating reactor pressure vessel component upper shelf energy (USE) and adjusted reference RT_{NDT} values that do not involve use of applicable reactor pressure vessel surveillance data.

During its review, the staff did not find Entergy's basis cited in the LRA for taking this exception to be acceptable for the following reason: The methods for performing upper shelf energy and RT_{NDT} value calculations in RG 1.99, Revision 2, do not have any relationship to or impact on the time when the referenced reactor pressure vessel surveillance capsule would need to be removed from the reactor pressure vessel in order to achieve a fluence exposure consistent with that specified for capsule removal in GALL Report AMP XI.M31 (i.e., at a removal time when the capsule achieves a limiting inside surface fluence between 1 and 2 times the peak ID fluence for the reactor pressure vessel projected at the end of the period of extended operation). However, the staff finds Entergy's exception acceptable based on the staff's previous approval of the BWR integrated surveillance program in EPRI Report No. BWRVIP-86, Revision 1-A. Specifically, in approving the EPRI report, the staff accepted the EPRI BWRVIP's proposed proprietary time for removing a low-lead-factor license renewal surveillance capsule during the period of extended operation, where the actual neutron fluence exposure of the capsule (upon removal) would be less than that specified for the capsule in GALL Report AMP XI.M31, "Reactor Vessel Surveillance." Thus, the staff finds Entergy's exception to remove the capsule at time when the capsule's fluence exposure would less than 1-to-2 times the peak inside surface fluence of the reactor pressure vessel acceptable.

Based on its audit, the staff finds that the aspects of Program Elements 1 through 6, Program Element 8, and Program Element 9, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M31. The staff also finds that Entergy's exception taken to Program Element 4 (detection of aging effects) in GALL Report AMP XI.M31 is acceptable for implementation during the period of extended operation.

Operating Experience

LRA Section B.1.37 summarizes operating experience related to the Reactor Vessel Surveillance program. In the LRA, Entergy states that the operating experience for this program is summarized in EPRI Report BWRVIP-113-NP (see ADAMS Accession No. ML102580248), which provides the surveillance data for the RBS 183 degree surveillance capsule. Entergy states that continued participation in the BWRVIP integrated surveillance program provides RBS with the benefit of Reactor Vessel Surveillance program operating experience from all participants in the integrated surveillance program. Entergy further states that its implementation of the BWRVIP program will effectively manage reduction of fracture toughness of reactor vessel beltline materials due to neutron irradiation embrittlement so that the affected components will continue to perform their intended functions during the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. The applicable operating experience is reflected in the reactor pressure vessel surveillance data that are generated by the integrated surveillance program and summarized in specific EPRI BWRVIP capsule reports that apply to the reactor pressure vessel integrity evaluations of RBS. (For more information, refer to the reactor pressure vessel neutron embrittlement TLAAs in in LRA Section 4.2 and SER Section 4.2.) As discussed in the operating experience audit report, dated January 8, 2018 (see ADAMS Accession No. ML17347A383), the staff conducted an independent search of RBS operating experience information to determine: (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff finds the general approach for implementing the integrated surveillance program to be acceptable because implementation of the approved integrated surveillance program will generate the applicable integrated surveillance program surveillance data (including the extended-term surveillance data) that need to be incorporated into the reactor pressure vessel integrity assessments during the period of extended operation.

By letter dated March 26, 2018, Entergy amended the Reactor Vessel Surveillance program and made corresponding revisions to LRA AMP B.1.37. These revisions state that integrated surveillance program capsule reports BWRVIP-113NP, Revision 1; BWRVIP-87NP; BWRVIP-111NP, Revision 1; and BWRVIP-169NP are the current BWRVIP integrated surveillance program reports (i.e., in addition to BWRVIP-135) that provide and evaluate the current integrated surveillance program surveillance data for the RBS reactor pressure vessel. The staff finds this change acceptable because it provides an accurate list of the current BWRVIP integrated surveillance program reports that apply to the current licensing basis.

Based on this amendment of the Reactor Vessel Surveillance aging management program, the staff did not identify any operating experience indicating Entergy should modify its proposed program beyond that incorporated in the LRA. Based on its audit and review of the application, the staff finds that the conditions and operating experience at RBS are bounded by those for which the Reactor Vessel Surveillance program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.37 provides the USAR supplement for the Reactor Vessel Surveillance program. The staff reviewed this USAR supplement description of the program against the NRC staff's recommended description for this type of program as described in SRP-LR Table 3.0-1. The staff notes that the USAR supplement provides an adequate summary of the Reactor Vessel Surveillance program, with one exception. The exception relates to the specific BWRVIP reports that Entergy referenced in the USAR supplement section as providing relevant reactor pressure vessel surveillance data test results in accordance with the staff's reporting requirements for implementing the integrated surveillance program, as required by 10 CFR Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements." To obtain more information on this exception, the staff issued a request for additional information.

RAI A.1.37-1, dated February 8, 2018, and Entergy's response, dated March 26, 2018, are documented in ADAMS Accession No. ML18087A188. With respect to RAI A.1.37-1, the USAR supplement for the aging management program states that the relevant surveillance capsule data are provided in EPRI Report No. BWRVIP-135. However, the BWRVIP-135 report is not a capsule report that the EPRI BWRVIP submits to the NRC staff's document control desk for inclusion in the NRC staff's ADAMS document control system. Instead, the staff notes that the current surveillance data for the RBS integrated surveillance program are provided in the following BWR integrated surveillance program surveillance capsule reports that have been submitted to and included in the NRC staff's ADAMS document control system: (a) BWRVIP-87NP, Revision 1, (b) BWRVIP-111NP, Revision 1, (c) BWRVIP-113NP, and (d) BWRVIP-169NP. The staff observes that the USAR supplement did not appropriately reference these reports as being within the scope of the aging management program. To address this, the staff issued RAI A.1.37-1.

As part of its response to RAI A.1.37-1, Entergy amended the USAR supplement Section A.1.37 to indicate that integrated surveillance program capsule reports BWRVIP-113NP, Revision 1; BWRVIP-87NP; BWRVIP-111NP, Revision 1; and BWRVIP-169NP are the current BWRVIP integrated surveillance program reports (i.e., in addition to BWRVIP-135) that provide and evaluate the current integrated surveillance program surveillance data for the RBS reactor pressure vessel. Because Entergy amended the USAR supplement to include an accurate list of the current BWRVIP integrated surveillance program reports that apply to the current licensing basis for RBS, the staff considers RAI A.1.37-1 resolved.

Therefore, the staff finds that the USAR supplement for the Reactor Vessel Surveillance program, as amended by Entergy's letter of March 26, 2018, provides an accurate summary of the aging management program and is consistent with the corresponding program description in SRP-LR Table 3.0-1.

Conclusion

Based on the NRC staff's audit and review of Entergy's Reactor Vessel Surveillance aging management program, the staff finds that those program elements, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements in GALL Report AMP XI.M31, "Reactor Vessel Materials Surveillance." In addition, the staff reviewed the exception and its justification and finds that this aging management program, when implemented with the exception, is adequate to manage the applicable aging effects. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.13 Water Chemistry Control—Closed Treated Water Systems

LRA Section B.1.43 describes the existing Water Chemistry Control—Closed Treated Water Systems program as consistent, with enhancements, with GALL Report AMP XI.M21A, "Closed Treated Water Systems," as modified by LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion under Insulation."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.M21A.

For Program Element 3 (parameters monitored or inspected) and Program Element 4 (detection of aging effects), the staff needed additional information and therefore, on February 7, 2018, issued two requests for additional information: RAI B.1.43-1 and RAI B.1.43-2 (see ADAMS Accession No. ML18038B470). Entergy responded on March 8, 2018 (see ADAMS Accession No. ML18067A437). However, the NRC staff had followup concerns. A public telephone conference call with Entergy was held on April 10, 2018 to discuss the RAIs. The summary for the call is documented in ADAMS Accession No. ML18120A135. Entergy provided draft responses, which the NRC placed on the docket for public view (see ADAMS Accession No. ML18115A228). On April 26, 2018 a second public telephone conference call was held with Entergy to discuss the RAI responses (see summary documented in ADAMS Accession

No. ML18129A356). Subsequently, Entergy submitted its final response on May 10, 2018 (see ADAMS Accession No. ML18130A935).

Regarding RAI B.1.43-1, the staff independently reviewed condition report CR-RBS-2018-1255 to correct an error in site procedure CSP-0006, “Chemistry Surveillance and Scheduling System,” for the standby diesel jacket cooling water C1 and C2 action levels for pH. The staff finds the response acceptable because Entergy’s corrective action program will ensure that the implementing procedure action level values are consistent with the guidance in EPRI 1007820, “Closed Cooling Water Chemistry Guideline,” or will provide justification for deviations from the guidance, as provided in EPRI 1007820.

Regarding RAI B.1.43-2, the staff finds Entergy’s response and changes to LRA Table 3.3.2-3 and Table 3.3.2-18-11, with associated plant-specific note 309, and LRA Section A.1.32 and Section B.1.32 acceptable because (a) the AMR items now reflect the correct environments with an appropriate aging management program, and (b) a one-time inspection of the vacuum breaker piping, which has a periodically replenished air-to-water interface, will confirm the insignificance of loss of material and the potential for consequent fouling.

The staff also reviewed the portions of Program Element 4 (detection of aging effects)and Program Element 6 (acceptance criteria) associated with the enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of these enhancements follows.

Enhancement 1. LRA Section B.1.43 includes an enhancement to Program Element 4 (detection of aging effects) of inspecting accessible components whenever a closed treated water system boundary is open. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M21A, as modified by LR-ISG-2012-02, and finds it acceptable for the following reason: When it is implemented, the inspections of accessible components, whenever an associated system boundary is opened, will confirm that the control of water chemistry adequately manages loss of material, cracking, and reduction of heat transfer.

Enhancement 2. LRA Section B.1.43 includes an enhancement to Program Element 6 (acceptance criteria) of providing acceptance criteria for inspections of accessible components. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.M21A, as modified by LR-ISG-2012-02, and finds it acceptable because when it is implemented, the addition of acceptance criteria for the inspections of accessible components will ensure that components meet the system design requirements.

Based on its audit and review of Entergy’s responses to RAI B.1.43-1 and RAI B.1.43-2, the staff finds that Program Elements 1 through 6, for which Entergy claimed consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.M21A. The staff reviewed the enhancements associated with Program Element 4 (detection of aging effects)and Program Element 6 (acceptance criteria) and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.43 summarizes operating experience related to the Water Chemistry Control—Closed Treated Water Systems program. Entergy stated that the operating experience provides objective evidence that the Water Chemistry Control—Closed Treated Water Systems program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting the audit. As discussed in the operating experience audit report, dated January 8, 2018 (see ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine whether, in light of plant operating experience, Entergy's LRA AMP can adequately manage the associated aging effects. As part of its review of the Service Water Integrity program (see SER Section 3.0.3.1.16, RAI B.1.40-2), the staff notes that the hybrid operation of the normal service water system as a closed treated water system, where substantial amounts of raw water is periodically introduced during surveillance tests, is not bounded by the operating conditions for which the GALL Report AMP was evaluated. However, as previously discussed in RAI B.1.40-2, Entergy provided additional inspections through the Periodic Surveillance and Preventive Maintenance program to identify and manage aging effects that are potentially introduced through the hybrid operation of the system.

Updated Safety Analysis Report Supplement

LRA Section A.1.43 provides the USAR supplement for the Water Chemistry Control—Closed Treated Water Systems. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that Entergy committed to implement the enhancements to the program prior to February 28, 2025. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

Conclusion

On the basis of its audit and review of Entergy's Water Chemistry Control—Closed Treated Water Systems program, the staff finds that those program elements, for which Entergy claimed consistency with the GALL Report, are consistent with the corresponding program elements of the modified GALL Report AMP XI.M21A. The staff reviewed the enhancements and confirmed that their implementation prior to the period of extended operation will make the aging management program adequate to manage the applicable aging effects. The staff concludes that Entergy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.14 Containment Inservice Inspection—IWE

LRA Section B.1.13, as updated by letter dated August 2, 2018 (License Renewal Application Annual Update, ADAMS Accession No. ML18214A162), describes the existing RBS Containment Inservice Inspection—IWE aging management program as consistent, with one enhancement, with GALL Report AMP XI.S1, "ASME Section XI, Subsection IWE."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.S1.

The staff also reviewed the portions of Program Element 2 (preventive actions) associated with the enhancement to determine whether the enhanced program will adequately manage the aging effects for which it is credited. The staff's evaluation of this enhancement follows.

Enhancement 1. LRA Section B.1.13 includes an enhancement to Program Element 2 (preventive actions) to include the preventive actions for storage of ASTM A325, ASTM F1582, and ASTM A490 bolting per Research Council on Structural Connection publication. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.S1 and finds it acceptable as follows: When Entergy implements this enhancement, it will provide guidance for preventive actions to prevent or mitigate degradation and failure, and maintain integrity of ASTM A325, ASTM F1852, or ASTM A490 structural bolting, which is consistent with the recommendations of GALL Report AMP XI.S1.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.S1. In addition, the staff reviewed the enhancement associated with Program Element 2 (preventive actions) and finds that, when implemented, it will make this aging management program adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.13 summarizes operating experience related to the Containment Inservice Inspection—IWE program. In the LRA, Entergy states that the plant-specific operating experience provides objective evidence that the Containment Inservice Inspection—IWE program will effectively ensure that Entergy will maintain the intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the operating experience audit report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of RBS operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects.

The staff did not identify any operating experience indicating that Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at RBS are bounded by those for which the Containment Inservice Inspection—IWE program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.13, as updated by letter dated August 2, 2018 (License Renewal Application Annual Update, ADAMS Accession No. ML18214A162), provides the USAR supplement for the Containment Inservice Inspection—IWE program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to implement the enhancement to the program prior to the period of extended operation. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Containment Inservice Inspection—IWE program, the staff finds that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Also, the staff reviewed the enhancement and confirmed that its implementation prior to the period of extended operation will make this aging management program adequate to manage the applicable aging effects. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.15 Containment Leak Rate

LRA Section B.1.14 describes the existing RBS Containment Leak Rate aging management program as being consistent, with two exceptions, with GALL Report AMP XI.S4, "10 CFR Part 50, Appendix J." Entergy amended this LRA section by letter dated January 24, 2018 (see ADAMS Accession No. ML18025B750).

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.S4.

For Program Element 1 (scope of program), the staff needed additional information and therefore issued a request for additional information. RAI B.1.14-1, dated December 13, 2017, and Entergy's response, dated January 24, 2018, are documented in ADAMS Accession Nos. ML17347B432, and ML18025B750, respectively.

In Entergy's response to RAI B.1.14-1, the staff noted that the containment components Entergy excludes from 10 CFR Part 50 Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," local leak rate testing are part of systems described in the USAR in Chapter 3, Chapter 6, and Chapter 7. Staff verified that Entergy highlighted the components on the license renewal drawings that are subject to aging management reviews. The staff also notes that for the period of extended operation, Entergy's aging management review results propose to use at least one of the following LRA AMPs: B.1.17 (External Surfaces Monitoring), B.1.18 (Fatigue Monitoring) and/or fatigue TLAAs, B.1.25 (Internal Surfaces in Miscellaneous Piping and Ducting Components), or B.1.42 (Water Chemistry Control—BWR);

these AMPs would be used to manage, consistent with Table 1 references, the effects of aging for the excluded pressure boundary:

- Series components of the containment atmosphere monitoring system (System Code CMS), included in LRA Table 3.3.2-9.

- Series components of the equipment and floor drainage (reactor plant floor drains) system (System Code DFR), included in LRA Table 3.3.2-16.

- Series components of the residual heat removal system (System Code E12), included in LRA Table 3.3.2-3.

- Series components of the low pressure core spray system (System Code E21), included in LRA Table 3.3.2-4.

- Series components of the high pressure core spray systems (System Code E22), included in LRA Table 3.3.2-2.

- Series components of the main steam positive leak control system (System Code E33), included in LRA Table 3.3.2-6.

- Series components of the reactor core isolation cooling system (System Code E51), included in LRA Table 3.3.2-5.

- Series components of the penetration valve leakage control system (System Code LSV), included in LRA Table 3.3.2-6.

- Components of the residual heat removal system (System Code RHS), included in LRA Table 3.3.2-3.

- Series components of the reactor plant sampling system (post-accident sampling system (System Code SSR), included in LRA Table 3.3.2-18-22.

A further description of the above described systems (and system codes) can be found in LRA Chapter 2, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review."

Entergy's response to RAI B.1.14-1 states that the following two components (or component surfaces) do not have an aging effect requiring management:

- external/internal surfaces of select HVR-series stainless steel (SS) pressure boundary components of the containment drywell and auxiliary building ventilation system (aging management review results of which are included in LRA Table 3.3.2-13)

- select stainless steel CMS pressure boundary components exposed to indoor air

Similarly, the RAI response states that external surfaces of select stainless steel CMS, stainless steel E22, and stainless steel RHS components exposed to indoor air do not have an aging effect requiring management for that environment. Entergy manages aging effects resulting from their exposure to other identified environments by using the aging management programs and TLAAs listed above.

The staff finds Entergy's approach acceptable because the aging management review results included in the LRA provide reasonable assurance that the designated LRA aging management programs and TLAAs are sufficient to monitor and manage the aging effects that may affect the leak-tightness function of the exempted or excluded containment boundary pressure-retaining components in accordance with 10 CFR 54.21(a)(3), because:

- LRA AMP B.1.17, "External Surfaces Monitoring Program," monitors the condition of components for loss of material and cracking by performing inspections of visually accessible surfaces at least once every refueling outage. For surfaces not readily visible, this program requires inspections when the components are accessible and at such intervals that would ensure that components' intended functions are maintained.

- LRA AMP B.1.25, "Internal Surfaces in Miscellaneous Piping and Ducting Components Program," monitors the condition of components for loss of material and cracking by not only sampling components "in each 10-year period," but also by performing inspections of "bounding or leading components most susceptible to aging because of time in service and severity of operating conditions," as noted in the LRA, during periodic surveillances and maintenance activities. Maintenance activities by rule (10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants") require condition monitoring and preventive maintenance to accessible components at least every refueling cycle and not to exceed a period of 24 months.

- LRA AMP B.1.42, "Water Chemistry Control—BWR Program," provides mitigation for loss of material and stress corrosion cracking of components exposed to the reactor water system chemistry at a frequency specified by EPRI water chemistry guidelines and plant operating conditions.

- LRA AMP B.1.18, "Fatigue Monitoring Program," prevents fatigue TLAAs of components from becoming invalid by assuring their fatigue usage factor does not exceed the code-allowable limit of 1.0.

In addition, the staff notes that the GALL Report states external/internal surfaces of stainless steel components exposed to indoor air/gas are not subject to significant aging mechanisms; thus, consistent with the GALL Report for these components, there are no relevant aging effects requiring management.

The staff's review and evaluation of LRA AMP B.1.17, LRA AMP B.1.18, LRA AMP B.1.25, and LRA AMP B.1.42 are documented in SER Section 3.0.3.2.06, SER Section 3.0.3.2.07, SER Section 3.0.3.1.11, and SER Section 3.0.3.1.17, respectively; the staff documents its review and evaluation for the metal fatigue TLAA in the appropriate subsection of SER Section 4.3. This resolves the staff's concern described in RAI B.1.14-1.

The staff also reviewed the portions of Program Element 5 (monitoring and trending) and Program Element 7 (corrective actions) associated with exceptions to determine whether the Containment Leak Rate program will adequately manage the aging effects for which it is credited. The staff's evaluation of these exceptions follows.

Exception 1. LRA Section B.1.14 includes an exception to Program Element 5 (monitoring and trending) of adopting a later revision of NEI 94-01 as recommended by the GALL Report. The staff reviewed this exception against the corresponding program element in GALL Report AMP XI.S4 and finds it acceptable for the following reason: Entergy adopts NEI 94-01, Revision 3-A as the implementing document to regulatory requirements for 10 CFR Part 50 Appendix J, Option B, “Performance-Based Requirements,” as approved by Amendment 191 to RBS Facility Operating License No. NPF-47 (ADAMS Accession No. ML16287A599). As a result of adopting NEI 94-01, Entergy amends its technical specifications to change the performance-based test intervals for integrated leak rate testing from 120 months to 180 months, and local leak rate testing from 60 months to 75 months.

Exception 2. LRA Section B.1.14 includes an exception to Program Element 7 (corrective actions) of applying the provisions for corrective actions found in a later version of NEI 94-01 as recommended by the GALL Report. The staff reviewed this exception against the corresponding program element in GALL Report AMP XI.S4 and finds it acceptable because RBS applies the provisions for corrective actions in accordance with NEI 94-01, Revision 3-A, which is the implementing document for the 10 CFR Part 50, Appendix J regulatory requirements, as noted in Exception 1 above.

Based on its audit and review of Entergy’s response to RAI B.1.14-1, the staff finds that Program Elements 1 through 7, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.S4. The staff also reviewed the exceptions associated with Program Element 5 (monitoring and trending) and Program Element 7 (corrective actions), and their justifications, and finds that Entergy’s aging management program, with the exceptions, is adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.14 summarizes RBS operating experience related to its existing Containment Leak Rate aging management program. In the LRA, Entergy states that its plant-specific operating experience provides objective evidence of the effectiveness of the Containment Leak Rate program, ensuring containment boundary pressure retaining components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the operating experience audit report, dated January 8, 2018 (see ADAMS Accession No. ML17347A383), the staff conducted an independent search of RBS operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy’s LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience indicating Entergy should modify its proposed program.

The staff notes that the continued use of proven program activities (i.e., performance-based leak rate testing coupled with IWE inservice inspections and corrective actions and using additional LRA aging management programs/TLAAs discussed above and in audit reports) provide reasonable assurance that Entergy will maintain leak-tightness and structural integrity of the primary containment during the period of extended operation.

Based on the NRC staff’s audit, review of the license renewal application, and Entergy’s response to RAI B.1.14-1, the staff finds that Entergy appropriately evaluated plant-specific and industrywide operating experience. Furthermore, the implementation of the Containment Leak Rate program has resulted in the applicant taking corrective actions, as noted in the operating experience section of this AMP and the other AMPs itemized above. In addition, the staff finds that the conditions and operating experience at RBS are bounded by those for which the Containment Leak Rate program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.14 provides the USAR supplement for the Containment Leak Rate aging management program. By letter dated January 24, 2018, Entergy amended the USAR supplement (see ADAMS Accession No. ML18025B750). The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1.

Conclusion

Based on the NRC staff's audit and review of Entergy's Containment Leak Rate program, the staff finds that those program elements, for which Entergy claims consistency with the GALL Report XI.S4, are consistent. In addition, the staff reviewed the exceptions and their justifications and finds that the aging management program, with the exceptions, is adequate to manage the applicable aging effects. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended functions consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.16 Inservice Inspection—IWF

LRA Section B.1.23, as updated by letter dated August 2, 2018 (License Renewal Application Annual Update, ADAMS Accession No. ML18214A162), describes the existing Inservice Inspection—IWF program as consistent, with four enhancements, with GALL Report AMP XI.S3, "ASME Section XI, Subsection IWF."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.S3.

For Program Element 3 (parameters monitored or inspected) and Program Element 4 (detection of aging effects), the staff needed additional information and therefore issued a request for additional information. RAI B.1.41-1, dated December 13, 2017, is documented in ADAMS Accession No. ML17347B432. Entergy's response, dated January 24, 2018, and supplement, dated March 22, 2018, is documented in ADAMS Accession No. ML18025B750 and No. ML18081A021, respectively.

The staff evaluated Entergy's response to RAI B.1.41-1 and notes that RBS has not used high-strength structural bolts in sizes greater than 1 inch in diameter in structural applications subject to an aging management review. Entergy provided an enhancement to the Structures Monitoring program to prevent future use of high-strength bolts in sizes greater than 1 inch in diameter. The staff finds Entergy's response acceptable because it clarifies that there are no high-strength structural bolts in sizes greater than 1 inch diameter that are subject to the

GALL Report AMP XI.S3 recommendations for managing stress corrosion cracking. In its response, Entergy also states that it will revise procurement procedures for high-strength bolting greater than 1 inch in diameter, to specify only bolting material with actual yield strength less than 150 ksi. This is consistent with the GALL Report recommendation that the program prohibit the future use of high-strength bolting greater than 1 inch in diameter to prevent the aging effect of cracking due to stress corrosion cracking.

The staff also reviewed the portions of Program Element 2 (preventive actions), Program Element 4 (detection of aging effects), Program Element 5(monitoring and trending), and Program Element 6 (acceptance criteria) associated with enhancements to determine whether this aging management program will adequately manage the aging effects for which it is credited. The staff's evaluation of these enhancements follows.

Enhancement 1. LRA Section B.1.23 includes an enhancement to Program Element 2 (preventive actions) by following preventive actions for storage of ASTM A325, ASTM F1852, and ASTM A490 bolting per Research Council on Structural Connections publication. The staff reviewed this enhancement against the corresponding program element in the GALL Report AMP and finds it acceptable for the following reasons: When Entergy implements this enhancement, it will add procedures for preventive actions for storage of ASTM A325, ASTM F1852, and ASTM A490 bolting found in Section 2 of the Research Council on Structural Connections publication, "Specification for Structural Joints Using ASTM A325 or A490 Bolts." This will make the program consistent with the recommendations for preventive actions in GALL Report AMP XI.S3.

Enhancement 2. LRA Section B.1.23 includes an enhancement to Program Element 4 (detection off aging effects) to include monitoring anchor bolts for loss of material and loose or missing nuts and bolts. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S3 and finds it acceptable for the following reason: When Entergy implements the enhancement, it will add monitoring for the following GALL Report-recommended aging effects for anchor bolts: (1) monitor anchor bolts for loss of material, (2) monitor anchor bolts for loose or missing nuts and bolts, and (3) monitor for cracking of concrete around the anchor bolts. This will make the program element consistent with the corresponding Program Element 4 (detection off aging effects) of GALL Report AMP XI.S3.

Enhancement 3. LRA Section B.1.23 includes an enhancement to Program Element 5 (monitoring and trending) of assessing the impact on the inspection sample in terms of sample size and representativeness. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S3 and finds it acceptable for the following reason: When Entergy implements the enhancement, the program will assess the effects on the ISI-IWF inspection sample and representativeness of aging degradation if components that are in the inspection sample are reworked. As such, the program will ensure that the sample adequately represents the age-related degradation of the greater population of components.

Enhancement 4. LRA Section B.1.23 includes an enhancement to Program Element 6 (acceptance criteria) of specifying unacceptable conditions. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S3 and finds it acceptable for the following reason: When Entergy implements the enhancement, it will add the following GALL Report-recommended acceptance criteria:

- loss of material due to corrosion or wear that reduces the load bearing capacity of the component support

- debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support

- cracked or sheared bolts, including high-strength bolts and anchors

This will result in the program using the complete list of acceptance criteria recommended in GALL Report AMP XI.S3.

Operating Experience

LRA Section B.1.23 summarizes operating experience related to the Inservice Inspection—IWF program. In the LRA, Entergy states that the plant-specific operating experience provides objective evidence that the Inservice Inspection—IWF program will effectively ensure that Entergy maintains component intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the operating experience audit report, dated January 8, 2018 (see ADAMS Accession No. ML17347A383), the staff conducted an independent search of RBS operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience indicating Entergy should modify its proposed program.

Based on its audit and review of the application, the staff finds that the conditions and operating experience at RBS are bounded by those for which the Inservice Inspection—IWF program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.23 provides the USAR supplement for the Inservice Inspection—IWF program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to ongoing implementation of the existing Inservice Inspection—IWF program for managing the effects of aging for applicable components during the period of extended operation. Finally, Entergy committed to implement the enhancements to the program prior to the period of extended operation. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Inservice Inspection—IWF program, the staff finds that those program elements, for which Entergy claims consistency with the GALL Report AMP XI.S3, are consistent. Also, the staff reviewed the enhancements and confirms that their implementation prior to the period of extended operation will make the aging management program adequate to manage the applicable aging effects. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended functions consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.17 Masonry Wall

LRA Section B.1.26 describes the existing RBS Masonry Wall aging management program as consistent, with four enhancements, with GALL Report AMP XI.S5, "Masonry Wall."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.S5. The staff also reviewed the portions of Program Element 1 (scope of program), Program Element 3 (parameters monitored or inspected), Program Element 4 (detection off aging effects), and Program Element 6 (acceptance criteria) associated with enhancements to determine whether the existing Masonry Wall program will adequately manage the aging effects for which it is credited. The staff's evaluation of these enhancements follows.

Enhancement 1. LRA Section B.1.26 includes an enhancement to Program Element 1 (scope of program) to ensure masonry walls located in in-scope structures are included in the scope of the Masonry Wall program. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S5 and finds it acceptable because when implemented, it will ensure that all masonry walls within the scope of license renewal will be included in the Masonry Wall program.

Enhancement 2. LRA Section B.1.26 includes an enhancement to Program Element 3 (parameters monitored or inspected) to monitor gaps between the structural steel supports and masonry walls that could potentially affect the wall qualification. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S5 and finds it acceptable because when it is implemented, it will ensure the program inspects gaps between steel supports and masonry walls, as recommended in the GALL Report.

Enhancement 3. LRA Section B.1.26 includes an enhancement to Program Element 4 (detection off aging effects) to inspect the masonry walls at least once every 5 years. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S5 and finds it acceptable because when it is implemented, it will ensure masonry walls are inspected on an interval not to exceed 5 years, as recommended in the GALL Report.

Enhancement 4. LRA Section B.1.26 includes an enhancement to Program Element 6 (acceptance criteria) of providing acceptance criteria for masonry wall inspections. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.S5 and finds it acceptable because when it is implemented, it will ensure observed degradation does not invalidate the evaluation basis of a given masonry wall, which aligns with the recommendation in the GALL Report.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.S5. In addition, the staff reviewed the enhancements associated with Program Element 1 (scope of program), Program Element 3 (parameters monitored or inspected), Program Element 4 (detection off aging effects), and Program Element 6 (acceptance criteria) and finds that, when implemented, they will make the Masonry Wall aging management program adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.26 summarizes operating experience related to the Masonry Wall program. In the LRA, Entergy states that the use of proven program activities provides reasonable assurance that it will manage the effects of aging such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the operating experience audit report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of RBS operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience indicating Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at RBS are bounded by those for which the Masonry Wall program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.26 provides the USAR supplement for the Masonry Wall program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to implement the enhancements to the program prior to February 28, 2025. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's Masonry Wall program, the staff finds that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Also, the staff reviewed the enhancements and confirms that their implementation prior to the period of extended operation will make the aging management program adequate to manage the applicable aging effects. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.18 RG 1.127, Inspection of Water-Control Structures Associated With Nuclear Power Plants

LRA Section B.1.38 describes the existing Regulatory Guide (RG) 1.127, Inspection of Water- Control Structures Associated with Nuclear Power Plants aging management program as consistent, with enhancements, with GALL Report AMP XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants."

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.S7. The staff also reviewed the portions of Program Element 1 (scope of program), Program Element 2 (preventive actions), Program Element 3 (parameters monitored or inspected), and Program Element 4 (detection of aging effects) associated with enhancements to determine whether the aging management program will adequately manage the aging effects for which it is credited. The staff's evaluation of these enhancements follows.

Enhancement 1. LRA Section B.1.38 includes an enhancement to Program Element 1 (scope of program) to include a list of structural components and commodities within the scope of license renewal to be monitored. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S7 and finds it acceptable for the following reason: When implemented, it will address additional structures within the scope of license renewal that are not covered by other structural aging management programs. This enhancement makes Entergy's Program Element 1 (scope of program) consistent with the recommendations provided in GALL Report AMP XI.S7 to monitor and assess the impact of age-related degradation on in-scope structures, and to provide assurance that the age-related degradation can be detected and quantified before there is a loss of intended function or functions.

Enhancement 2. LRA Section B.1.38 includes an enhancement to Program Element 2 (preventive actions) to include preventive actions for storage of ASTM A325, ASTM F1852, and ASTM A490 bolting per Research Council on Structural Connections publication. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S7 and finds it acceptable because when implemented, it will include preventive actions for storage of bolts to ensure bolting integrity as recommended by the GALL Report.

Enhancement 3. LRA Section B.1.38 includes an enhancement to Program Element 3 (parameters monitored or inspected) to include parameters to be monitored or inspected. The staff reviewed this enhancement against the corresponding program elements in GALL Report AMP XI.S7 and finds it acceptable for the following reason: When implemented, it will ensure that aging degradation leading to loss of intended function in concrete structures and components will be monitored and the extent of degradation determined. This is consistent with the recommendations provided in Program Element 3 (parameters monitored or inspected) of GALL Report AMP XI.S7.

Enhancement 4. LRA Section B.1.38 includes an enhancement to Program Element 3 (detection of aging effects) to include inspection requirements. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S7 and finds it acceptable because when implemented, it will ensure that inspection frequencies are dependent on the safety significance and condition of the structures. It also will ensure that submerged structures are inspected and groundwater is sampled at least once every 5 years. This is consistent with the recommendations provided in Program Element 4 (detection of aging effects) of GALL Report AMP XI.S7.

Based on its audit, the staff finds that Program Elements 1 through 6, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.S7. In addition, the staff reviewed the enhancements associated with Program Element 1 (scope of program), Program Element 2 (preventive actions), Program Element 3 (parameters monitored or inspected), and Program Element 4 (detection of aging effects) and finds that, when implemented, they will make this aging management program adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.38 summarizes operating experience related to the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants aging management program. In the LRA, Entergy states that the use of proven inspection activities provides reasonable assurance that it will manage the effects of aging such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting an audit. As discussed in the operating experience audit report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of RBS operating experience information to determine (a) whether any previously unknown or recurring aging effects were identified, and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience indicating Entergy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at RBS are bounded by those for which the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.38 provides the USAR supplement for the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed to implement the enhancements to the program either (1) prior to February 28, 2025, or (2) at the end of the last refueling outage prior to August 29, 2025, whichever is later. The staff finds that the USAR supplement contains an adequate summary description of the program.

Conclusion

Based on the NRC staff's audit and review of Entergy's RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program, the staff finds that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Also, the staff reviewed the enhancements and confirms that their implementation prior to the period of extended operation will make this aging management program adequate to manage the applicable aging effects. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.19 Structures Monitoring

LRA Section B.1.41 describes the existing Structures Monitoring program as consistent, with 15 enhancements, with GALL Report AMP XI.S6, "Structures Monitoring." Entergy amended this LRA section by letters dated March 22, 2018, and May 10, 2018.

Staff Evaluation

During its audit, the staff reviewed Entergy's claim of consistency with the GALL Report. The staff compared Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program to the corresponding program elements of GALL Report AMP XI.S6.

For Program Element 3 (parameters monitored or inspected) and Program Element 4 (detection of aging effects), the staff needed additional information and therefore issued a request for additional information. RAI B.1.41-1 and Entergy's response are documented in ADAMS Accession No. ML18081A021.

In Entergy's response to RAI B.1.41-1, the staff notes that RBS has not used high-strength structural bolts in sizes greater than 1 inch diameter in structural applications subject to an aging management review. Entergy provides an enhancement to the Structures Monitoring program to prevent future use of high-strength bolts in sizes greater than 1 inch diameter. The staff finds Entergy's response and corresponding changes to LRA Table 3.5.1, Item 3.5.1-69, acceptable because it clarifies that there are no high-strength structural bolts in sizes greater than 1 inch diameter that are subject to the GALL Report AMP XI.S6 recommendations for managing stress corrosion cracking. In addition, Entergy's changes enhance the Structures Monitoring aging management program (see Enhancement 12 below) to prevent the future use of high-strength bolts that may be susceptible to stress corrosion cracking.

The staff also reviewed the portions of Program Element 1 (scope of program), Program Element 2 (preventive actions), Program Element 3 (parameters monitored or inspected), Program Element 4 (detection of aging effects), and Program Element 7 (corrective actions) associated with enhancements to determine whether the Structures Monitoring aging management program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these enhancements follows.

Enhancement 1. LRA Section B.1.41 includes an enhancement to Program Element 1 (scope of program) to include additional structures to the program. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S6 and finds it acceptable because when implemented, it will make the program consistent with the GALL

Report recommendation by including in the current plant procedure all structures within the scope of license renewal.

Enhancement 2. LRA Section B.1.41 includes an enhancement to Program Element 1 (scope of program) of revising plant procedures to include a list of structural components and commodities within the scope of program. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S6 and finds it acceptable because when implemented, it will make the program consistent with the GALL Report recommendation by including in the current plant procedure all structural components and commodities within the scope of license renewal and subject to an aging management review.

Enhancement 3. LRA Section B.1.41 includes an enhancement to Program Element 1 (scope of program) to include periodic sampling and chemical analysis of groundwater. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S6 and finds it acceptable because when implemented, it will make the program consistent with the GALL Report recommendation by adding to the current plant procedure the periodic sampling and chemical analysis of groundwater.

Enhancement 4. LRA Section B.1.41 includes an enhancement to Program Element 2 (preventive actions) to include preventive actions for storage of ASTM A325, ASTM F1852, and ASTM A490 bolting per Research Council on Structural Connections publication. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S6 and finds it acceptable for the following reason: When implemented, it will make the program consistent with the GALL Report recommendation by adding to the existing preventive actions in current plant procedures the preventive actions for storage of ASTM A325, ASTM F1852, and/or ASTM A490 structural bolting discussed in Section 2 of the Research Council for Structures Connection publication.

Enhancement 5. LRA Section B.1.41 includes an enhancement to Program Element 3 (parameters monitored or inspected) of specifying parameters to be monitored or inspected. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S6 and finds it acceptable as follows: When implemented, it will make the program consistent with the GALL Report recommendation by including in the current plant procedure the following parameters to monitor in concrete structures and components: (1) loss of material, (2) loss of bond, (3) increase in porosity and permeability, (4) loss of strength, and (5) reduction in anchor capacity due to local concrete degradation.

Enhancement 6. LRA Section B.1.41 includes an enhancement to Program Element 3 (parameters monitored or inspected) of specifying parameters to be monitored or inspected. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S6 and finds it acceptable because when implemented, it will make the program consistent with the GALL Report recommendation by including in the current plant procedure the monitoring of pH, chlorides, and sulfates for chemical analysis of groundwater.

Enhancement 7. LRA Section B.1.41 includes an enhancement to Program Element 3 (parameters monitored or inspected) of specifying components to be monitored. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S6 and finds it acceptable because when implemented, it will make the program consistent with the GALL Report recommendation by including in the current plant procedure the following parameters to monitor in anchor bolts: (1) loss of material and (2) loose or missing nuts and bolts.

Enhancement 8. LRA Section B.1.41 includes an enhancement to Program Element 3 (parameters monitored or inspected) of specifying components to be monitored. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S6 and finds it acceptable as follows: When implemented, it will make the program consistent with the GALL Report recommendation by including in the current plant procedure the following parameters to monitor in elastomeric vibration isolators and structural sealants: (1) cracking, (2) loss of material, (3) loss of sealing, and (4) change in material properties (e.g., hardening).

Enhancement 9. LRA Section B.1.41 includes an enhancement to Program Element 4 (detection of aging effects) to include visual inspection of elastomeric material. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S6 and finds it acceptable as follows: When implemented, it will make the program consistent with the GALL Report recommendation by augmenting the visual inspection of elastomeric material with feel or touch to detect hardening if the intended function is suspect.

Enhancement 10. LRA Section B.1.41 includes an enhancement to Program Element 4 (detection of aging effects) to include inspections of submerged structures. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S6 and GALL Report AMP XI.S7, and finds it acceptable as follows: When implemented, it will make the program consistent with the GALL Report recommendations by including the inspection of submerged structures at the same interval as other structures within the program (i.e., at least once every 5 years).

Enhancement 11. LRA Section B.1.41 includes an enhancement to Program Element 4 (detection of aging effects) to include sampling and chemical analysis of ground water at least once every 5 years. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S6 and finds it acceptable because when implemented, it will make the program consistent with the GALL Report recommendation by including the sampling and chemical analysis of groundwater at an interval of at least once every 5 years.

Enhancement 12. LRA Section B.1.41, as amended by letter dated March 22, 2018, includes an enhancement to Program Element 2 (preventive actions) related to the procurement of bolting greater than 1 inch in diameter. The staff reviewed this enhancement against the corresponding program element in GALL Report AMP XI.S6 and finds it acceptable as follows: When implemented, it will prevent the procurement of high-strength structural bolts in sizes greater than 1 inch in diameter (because such bolts may be susceptible to stress corrosion cracking).

Enhancement 13. LRA Section B.1.41, as amended by letter dated May 10, 2018, includes an enhancement to Program Element 4 (detection of aging effects) to include inspections of the service water cooling system cooling tower fill material. In Entergy's response to RAI B.1.40-5, the staff notes that Entergy plans to enhance its Structures Monitoring program to include periodic visual inspections of a sample coupon of the service water cooling system cooling tower fill material, at a frequency of once every 5 years. The purpose of this periodic visual inspection is to detect the aging effect of fouling in the cooling tower fill material. The staff reviewed this enhancement against the criteria in SRP-LR Section A.1.2.3.4 and finds it acceptable because when implemented, it will ensure that Entergy will detect the aging effect in the cooling tower fill material before there is a loss of the intended function(s).

Enhancement 14. LRA Section B.1.41, as amended by letter dated May 10, 2018, includes an enhancement to Program Element 6 (acceptance criteria) of adding acceptance criteria for the inspections cooling tower fill. In Entergy's response to RAI B.1.40-5, the staff notes that the Structures Monitoring program will be enhanced to include the absence of fouling as the acceptance criteria for the inspections of the cooling tower fill material. The staff reviewed this enhancement against the criteria in SRP-LR Section A.1.2.3.6 and finds it acceptable because when implemented, it will ensure that Entergy maintains the intended function(s) of the service water cooling system consistent with all current licensing basis design conditions during the period of extended operation.

Enhancement 15. LRA Section B.1.41, as amended by letter dated May 10, 2018, includes an enhancement to Program Element 7 (corrective actions) specifying the actions to take for cooling tower fill not meeting the acceptance criteria. In Entergy's response to RAI B.1.40-5, the staff notes that the Structures Monitoring program will be enhanced to ensure that conditions not meeting the acceptance criteria for the cooling tower fill will be entered into the corrective action program for further evaluation to determine the need for additional corrective actions. The staff reviewed this enhancement against the criteria in SRP-LR Section A.1.2.3.7 and finds it acceptable because it describes the action(s) to be taken prior to loss of function when the acceptance criteria is not met.

Based on its audit and Entergy's responses to RAI B.1.41-1 and RAI B.1.40-5, the staff finds that Program Elements 1 through 7, for which Entergy claims consistency with the GALL Report, are consistent with the corresponding program elements of GALL Report AMP XI.S6. Staff also confirms that the plant-specific enhancements to Program Element 4 (detection of aging effects), Program Element 6 (acceptance criteria), and Program Element 7 (corrective actions) satisfy the criteria defined in SRP-LR Section A.1.2.3.4, Section A.1.2.3.6, and Section A.1.2.3.7. In addition, the staff reviewed the enhancements associated with Program Element 1 (scope of program), Program Element 2 (preventive actions), Program Element 3 (parameters monitored or inspected), and Program Element 4 (detection of aging effects) and finds that, when implemented, they will make the aging management program adequate to manage the applicable aging effects.

Operating Experience

LRA Section B.1.41 summarizes RBS operating experience related to the Structures Monitoring program. In the LRA, Entergy states that the identification of degradation and initiation of corrective action prior to loss of intended function, along with the use of other program activities, provides reasonable assurance that it will manage the effects of aging such that components will continue to perform their intended function consistent with the current licensing basis through the period of extended operation.

The staff evaluated operating experience information through reviewing the license renewal application and conducting the audit. As discussed in the operating experience audit report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine: (a) whether any previously unknown or recurring aging effects were identified; and (b) whether, in light of plant operating experience, Entergy's LRA aging management program can adequately manage the associated aging effects. The staff did not identify any operating experience indicating that Entergy should modify its proposed program beyond what it has already incorporated in the LRA.

Based on its audit and review of the application, the staff finds that the conditions and operating experience at RBS are bounded by those for which the structural monitoring program was evaluated.

Updated Safety Analysis Report Supplement

LRA Section A.1.41 provides the USAR supplement for the Structures Monitoring program. The staff reviewed this USAR supplement description of the program and notes that it is consistent with the NRC staff's recommended description in SRP-LR Table 3.0-1. The staff also notes that Entergy committed (in Commitment No. 28) to enhance the Structures Monitoring program as described in LRA Section A.1.41. The staff also notes that Entergy committed to implement the enhancements to the program either (1) prior to February 28, 2025, or (2) at the end of the last refueling outage prior to August 29, 2025, whichever is later. The staff finds that the USAR supplement, as amended by letters dated March 22, 2018, and May 10, 2018, contains an adequate summary description of the program.

Conclusion

On the basis of its audit and review of Entergy's Structures Monitoring program, the staff finds that those program elements, for which Entergy claims consistency with the GALL Report, are consistent. Also, the staff reviewed the enhancements and confirms that their implementation prior to the period of extended operation will make this aging management program adequate to manage the applicable aging effects. The staff concludes that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this aging management program and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3 Aging Management Programs Not Consistent with or Not Addressed in the GALL Report

For LRA aging management programs not consistent with the GALL Report or not addressed in the GALL Report, the staff performed a complete review to determine their adequacy to monitor or manage aging. The following sections document the staff's review of these plant-specific aging management programs.

3.0.3.3.1 Periodic Surveillance and Preventive Maintenance

LRA Section B.1.34 describes the existing Periodic Surveillance and Preventive Maintenance program as a plant-specific AMP with enhancements. Entergy amended this LRA section by letters dated December 12, 2017, May 10, 2018, and May 16, 2018 (see ADAMS Accession Nos. ML17347B473, ML18130A935, and ML18138A144, respectively).

Staff Evaluation

The staff reviewed Program Elements 1 through 6 (i.e., scope of program, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, and acceptance criteria, respectively) of Entergy's program against the acceptance criteria for the corresponding elements as stated in SRP-LR Section A.1.2.3. The staff's review focused on how Entergy's program manages aging effects through the effective incorporation of these program elements. The staff's evaluation of each of these program elements follows. The staff's review of Program Element 7 (corrective actions), Program Element 8 (confirmation process), and Program Element 9 (administrative controls) are documented in SER Section 3.0.4.

Scope of Program

The staff reviewed Entergy's Program Element 1 (scope of program) against the criterion in SRP-LR Section A.1.2.3.1. The staff needed additional information and therefore issued a request for additional information. RAI B.1.34-1, dated November 16, 2017, and Entergy's response, dated December 16, 2017, are documented in ADAMS Accession Nos. ML17320B099 and ML17347B473.

Regarding RAI B.1.34-1, the staff finds Entergy's response and changes to LRA Section B.1.34 acceptable because the deletion of flex hoses from the scope of the program resolves the inconsistency with the components addressed in LRA Table 3.3.2-18-17, "Radiation Monitoring System, Nonsafety-Related Components Affecting Safety-Related Systems." The staff also finds Entergy's response to cracking not being an applicable aging effect for stainless steel components when exposed to waste water in the process radiation monitoring system acceptable because: (a) Entergy stated that the temperature of the waste water is less than 140 °F; and (b) consistent with GALL Report Item AP-278, cracking would not be expected for a waste water environment where the temperature is less than 140 °F.

The staff finds Entergy's Program Element 1 (scope of program) adequate because the scope of the program includes the specific structures and components, the aging of which the program manages.

Based on its review of the application and Entergy's response to RAI B.1.34-1, the staff confirms that Program Element 1 (scope of program) satisfies the criterion defined in SRP-LR Section A.1.2.3.1. Therefore, the staff finds it acceptable.

Preventive Actions. The staff reviewed Entergy's "preventive actions" program element against the criteria in SRP-LR Section A.1.2.3.2.

The staff finds Entergy's Program Element 2 (preventive actions) adequate because Entergy has provided information that clearly identifies the program as being a condition monitoring program only, with no preventive actions needing description.

Based on its review of the application, the staff confirms that Entergy's Program Element 2 (preventive actions) satisfies the criteria defined in SRP-LR Section A.1.2.3.2 and, therefore, the staff finds it acceptable.

Parameters Monitored or Inspected. The staff reviewed Entergy's Program Element 3 (parameters monitored or inspected) against the criteria in SRP-LR Section A.1.2.3.3.

The staff notes that although the physical manipulation of elastomeric components is not discussed in this program element, it is discussed in Program Element 4 (detection of aging effects). The staff also notes the following:

- Using visual inspections to detect cracking of stainless steel components is consistent with (1) GALL Report Item AP-128, which cites GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," (b) GALL Report Item AP-209, which cites GALL Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," and (c) GALL Report Item AP-186, which cites GALL Report AMP XI.M21A, "Closed Treated Water Systems."

- Using visual inspections to detect loss of material due to general corrosion for steel components is consistent with (a) GALL Report Item AP-270, which cites GALL Report AMP XI.M38, (b) GALL Report Item A-24, which cites GALL Report AMP XI.M36, and (c) GALL Report Item AP-281, which cites GALL Report AMP XI.M38.

- Using visual inspections to detect reduction of heat transfer for air-to-water heat exchangers is consistent with Generic Letter (GL) 89-13, "Service Water System Problems Affecting Safety-Related Equipment." GL 89-13 allows visual inspections of the heat exchanger's air side to verify cleanliness because such inspections can effectively detect fouling on these heat exchanger surfaces.

- Using visual inspections to detect loss of material for copper alloy components is consistent with GALL Report item AP-272, which cites GALL Report AMP XI.M38.

- Using visual inspections to detect loss of sealing is consistent with GALL Report Item TP-7, which cites GALL Report AMP XI.S6, "Structures Monitoring."

The staff finds Entergy's Program Element 3 (parameters monitored or inspected) adequate because using visual inspections (accompanied by physical manipulation for elastomeric components) to detect loss of material and cracking for steel and stainless steel components, loss of sealing for elastomeric seals, and reduction of heat transfer for air-cooled heat exchangers is consistent with the GALL Report or other staff guidance.

Based on its review of the application, the staff confirms that Entergy's Program Element 3 (parameters monitored or inspected) satisfies the criteria defined in SRP-LR Section A.1.2.3.3. Therefore, the staff finds it acceptable.

Detection of Aging Effects. The staff reviewed Entergy's Program Element 4 (detection of aging effects) against the criteria in SRP-LR Section A.1.2.3.4. The staff needed additional information and therefore issued a request for additional information. RAI B.1.34-2, dated November 16, 2018, and Entergy's response, dated December 16, 2017, are documented in ADAMS Accession Nos. ML17320B099 and ML17347B473, respectively.

As part of its response to RAI B.1.34-2, Entergy revised (a) LRA Table 3.5.1, Item 3.5.1-26 to state that the periodic surveillance and preventive maintenance program is used to manage "cracking and change in material properties to prevent loss of sealing for elastomeric commodities," (b) LRA Section B.1.34 to require that 10 percent of the surface area of elastomeric components be manipulated during examination and to specify that cracking is an applicable aging effect for elastomeric materials, (c) LRA Section A.1.34 and Section B.1.34 so that the periodicity, sample size, and inspection location criteria cited in in these sections is consistent with GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," (a GALL Report equivalent program), and (d) LRA Section A.1.34 and LRA Section B.1.34 to require manipulation of elastomers during visual inspections. The staff finds Entergy's response and Entergy's Program

Element 4 (detection of aging effects) adequate because the aging management program is consistent with GALL Report AMP XI.M38 as follows: (a) the periodic surveillance and preventive maintenance program and the cited inspection parameters for LRA Table 3.5.1, Item 3.5.1-26 are consistent, (b) inspections are performed by personnel qualified to perform the selected technique, (c) the interval between inspections, sample size, and inspection location criteria are consistent with GALL Report AMP XI.M38, (d) the inspection techniques (see Program Element 3 (parameters monitored or inspected)) can adequately detect the cited aging effects, and (e) the percent of seal to be physically manipulated is consistent with GALL Report AMP XI.M38.

Based on its review of the application and Entergy's response to RAI B.1.34-2, the staff confirms that Program Element 4 (detection of aging effects) satisfies the criteria defined in SRP-LR Section A.1.2.3.4 and, therefore, the staff finds it acceptable.

Monitoring and Trending. The staff reviewed Entergy's Program Element 5 (monitoring and trending) against the criteria in SRP-LR Section A.1.2.3.5.

The staff noted that although Program Element 5 does not state how the data collected are evaluated, Program Element 6 (acceptance criteria) states that the acceptance criteria are defined in specific procedures and that the criterion is that there are no indications of relevant degradation. As a result, Program Element 6 (acceptance criteria) describes how the inspection results are evaluated. The staff also noted that Program Element 5 (monitoring and trending) of AMP XI.M38 states, "[h]owever, the program does not include formal trending. The Periodic Surveillance and Preventive Maintenance program is equivalent to GALL Report AMP XI.M38.

The staff finds Entergy's Program Element 5 (monitoring and trending) to be adequate because inspection results are evaluated against acceptance criterion, based on the monitoring, identified degradation is evaluated, and inspection intervals are established in order to ensure that the timing of the next scheduled inspection will occur before there is an impact on "plant performance, equipment reliability, and safety."

Based on its review of the application, the staff confirms that Program Element 5 (monitoring and trending) satisfies the criteria defined in SRP-LR Section A.1.2.3.5. Therefore, the staff finds it acceptable.

Acceptance Criteria. The staff reviewed Entergy's Program Element 6 (acceptance criteria) against the criteria in SRP-LR Section A.1.2.3.6.

The staff finds Entergy's Program Element 6 (acceptance criteria) to be adequate (i.e., no indication of relevant degradation) because it is consistent with the recommended acceptance criteria in GALL Report AMP XI.M36 and GALL Report AMP XI.M38. Based on its review of the application, the staff confirms that Entergy's Program Element 6 (acceptance criteria) satisfies the criteria defined in SRP-LR Section A.1.2.3.6. Therefore, the staff finds it acceptable.

The staff also reviewed the portions of Program Element 1 (scope of program) and Program Element 6 (acceptance criteria) associated with the enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these enhancements follows.

Enhancement 1. LRA Section B.1.34 includes an enhancement to Program Element 1 (scope of program) to incorporate identified activities under the Periodic Surveillance and Preventive

Maintenance Program. The staff reviewed this enhancement and finds it acceptable because when it is implemented it can ensure that all of the aging effects associated with cited components will be identified in plant-specific procedures in order to conduct inspections.

Enhancement 2. LRA Section B.1.34 includes an enhancement to Program Element 6 (acceptance criteria) to state that the acceptance criterion is no indication of relevant degradation and such indications will be evaluated. The staff reviewed this enhancement and finds it acceptable because when Entergy implements the enhancement, it can ensure that the appropriate acceptance criterion will be documented in plant-specific procedures.

Operating Experience

LRA Section B.1.34 summarizes operating experience related to the Periodic Surveillance and Preventive Maintenance program. Entergy stated that, "[t]he identification of degradation and initiation of corrective action prior to loss of intended function, along with identification of program deficiencies and subsequent corrective actions, demonstrate that the PSPM [Periodic Surveillance and Preventive Maintenance] Program has been effective."

The staff evaluated operating experience information through reviewing of the license renewal application and conducting the audit against the acceptance criteria in SRP-LR Section A.1.2.3.10. As discussed in the operating experience audit report, dated January 8, 2018 (ADAMS Accession No. ML17347A383), the staff conducted an independent search of the plant operating experience information to determine whether: (a) any previously unknown or recurring aging effects were identified and (b) whether, in light of plant operating experience, Entergy's LRA AMP can adequately manage the associated aging effects. Based on its review, the staff identified operating experience that indicated that the LRA AMP may not be adequate to manage strainers with an intended function of filtration in the plant drains system. To address this concern, the staff issued RAI 3.3.2.3.16-1. In SER Section 3.3.2.3.16, the staff evaluates the issue and ultimately determines that the design of the strainers preclude the flow blockage concern. The staff concludes that the operating experience does not indicate that Entergy should consider modifying its proposed program.

The staff noted that in LRA Section A.1 and Section B.0.4, consistent with LR-ISG-2011-05, "Ongoing Review of Operating Experience," Entergy states that it will review operating experience from plant-specific and industry sources on an ongoing basis.

Based on its review of the application, the staff finds that the "operating experience" program element satisfies the criteria in SRP-LR Section A.1.2.3.10 and, therefore, the staff finds it acceptable.

Updated Safety Analysis Report Supplement

LRA Section A.1.34 provides the USAR supplement for the Periodic Surveillance and Preventive Maintenance program. The staff reviewed this USAR supplement description of the program against the recommended description for this type of program as described in SRP-LR Table 3.0-1 and noted (a) that USAR supplement did not include the periodicity, sample size, and criteria for selecting inspection locations, and (b) that physical manipulation of elastomers are conducted in addition to visual inspections. The staff was concerned that the licensing basis for this program for the period of extended operation may not be adequate if Entergy does not incorporate this information in its USAR supplement. As a result of this concern, the staff issued a request for additional information. RAI B.1.34-3, dated

November 16, 2017, and the Entergy's response, dated December 16, 2017, are documented in ADAMS Accession Nos. ML17320B099 and ML17347B473.

As part of its response to RAI B.1.34-3, Entergy revised LRA Section A.1.34: (a) to address inspection periodicity, sample size, and location criteria, and (b) to require manipulation of elastomers during visual inspections. The staff finds Entergy's response and corresponding changes to LRA Section A.1.34 acceptable because they are consistent with the recommended FSAR supplement description for AMP XI.M38 (a GALL Report equivalent program) as modified by LR-ISG-2012-02.

The staff also notes that Entergy committed to enhance the program as described in LRA Section A.1.34 either (1) prior to February 28, 2025, or (2) at the end of the last refueling outage prior to August 29, 2025, whichever is later.

The staff finds that the information in the USAR supplement, as amended by letters dated December 12, 2017; May 10, 2018; and May 16, 2018, is an adequate summary description of the program.

Conclusion

On the basis of its technical review of Entergy's Periodic Surveillance and Preventive Maintenance program, the staff concludes that Entergy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for Periodic Surveillance and Preventive Maintenance program and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.4 Quality Assurance Program Attributes Integral to Aging Management Programs

The regulations in 10 CFR 54.21(a)(3) require license renewal applicants to demonstrate that for structures and components subject to an aging management review, they will adequately manage aging in a way that maintains intended function(s) consistent with the current licensing basis for the period of extended operation. SRP-LR, Branch Technical Position (BTP) RLSB-1, "Aging Management Review—Generic," describes 10 elements of an acceptable aging management program. Program Elements 7, 8, and 9 are associated with the quality assurance activities of corrective actions, confirmation process, and administrative controls, respectively. BTP RLSB-1 Table A.1-1, "Elements of an Aging Management Program for License Renewal," provides the following description of these program elements:

(7) Corrective Actions—Corrective actions, including root cause determination and prevention of recurrence, should be timely.

(8) Confirmation Process—The confirmation process should ensure that preventative actions are adequate and that appropriate corrective actions are completed and effective.

(9) Administrative Controls—Administrative controls should provide for a formal review and approval process.

BTP IQMB-1, “Quality Assurance for Aging Management Programs,” notes that aging management program aspects that affect the quality of safety-related structures, systems, and components are subject to the quality assurance requirements of 10 CFR Part 50 Appendix B. Additionally, for nonsafety-related structures and components subject to an aging management review, applicants may use the existing 10 CFR Part 50 Appendix B quality assurance program to address Program Element 7 (corrective actions), Program Element 8 (confirmation process), and Program Element 9 (administrative controls). BTP IQMB-1 provides the following guidance on the quality assurance attributes of aging management programs:

- Safety-related structures and components are subject to 10 CFR Part 50 Appendix B requirements, which are adequate to address all quality-related aspects of an aging management program consistent with the current licensing basis of the facility for the period of extended operation.
- For nonsafety-related structures and components that are subject to an aging management review, applicants have an option to expand the scope of their 10 CFR Part 50 Appendix B program to include these structures and components to address Program Element 7 (corrective actions), Program Element 8 (confirmation process), and Program Element 9 (administrative controls) for aging management during the period of extended operation. In this case, the applicant should document such commitment in the USAR supplement in accordance with 10 CFR 54.21(d).

3.0.4.1 Summary of Technical Information in the Application

LRA Appendix A, Section A.1., “Aging Management Programs,” and LRA Appendix B, Section B.0.3, “Corrective Actions, Confirmation Process and Administrative Controls,” describe Program Element 7 (corrective actions), Program Element 8 (confirmation process), and Program Element 9 (administrative controls) that are applied to the aging management programs for both safety-related and nonsafety-related components.

LRA Appendix A, Section A.1., states:

> RBS quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR 50, Appendix B. The RBS Quality Assurance Program applies to safety-related and important to safety structures and components. Corrective actions and administrative (document) control for both safety-related and nonsafety-related structures and components are accomplished in accordance with the established RBS corrective action program and document control program and are applicable to all aging management programs and activities during the period of extended operation. The confirmation process is part of the corrective action program and includes reviews to assure adequacy of corrective actions, tracking and reporting of open corrective actions, and review of corrective action effectiveness. Any follow-up inspection required by the confirmation process is documented in accordance with the corrective action program.

LRA Appendix B, Section B.0.3, states:

> Corrective actions and administrative (document) control for both safety-related and nonsafety-related structures and components are accomplished in accordance with the

existing RBS corrective action program and document control program. The confirmation process is part of the corrective action program and includes the following:

- Reviews to assure that corrective actions are adequate.
- Tracking and reporting of open corrective actions.
- Review of corrective action effectiveness.

Any follow-up inspection required by the confirmation process is documented in accordance with the corrective action program. The corrective action program constitutes the confirmation process for aging management programs and activities. The RBS confirmation process is consistent with NUREG-1801.

3.0.4.2 Staff Evaluation

The staff reviewed LRA Appendix A, Section A.1, and LRA Appendix B, Section B.0.3, which describe how Entergy's existing quality assurance program includes the quality assurance-related elements (corrective action, confirmation process, and administrative controls) for aging management programs consistent with the staff's guidance described in Branch Technical Position IQMB-1. The staff also reviewed a sample of Entergy's aging management program basis documents and verified that the aging management programs implement the corrective action program, confirmation processes, and administrative controls as described in the LRA. Based on its review, the staff determines that the quality attributes Entergy presented in the aging management program basis documents and the associated aging management program are consistent with the staff's position regarding quality assurance for aging management.

3.0.4.3 Conclusion

On the basis of the staff's review of LRA Appendix A, Section A.1., LRA Appendix B, Section B.0.3, and the aging management program basis documents, the staff concludes that the quality assurance attributes (corrective action, confirmation process, and administrative control) of Entergy's aging management program are consistent with 10 CFR 54.21(a)(3) and SRP-LR, Branch Technical Position RLSB-1.

3.0.5 Operating Experience for Aging Management Programs

3.0.5.1 Summary of Technical Information in Application

LRA Appendix A, "Updated Safety Analysis Report Supplement," Section A.1, "Aging Management Programs," and LRA Appendix B, "Aging Management Programs and Activities," Sections B.0.4,"Operating Experience," and B.1, "Aging Management Programs and Activities," describe the consideration of operating experience for aging management programs. The LRA states that Entergy reviews the operating experience for the programs credited with managing the effects of aging in order to identify corrective actions that may result in program enhancements.

In a supplement to LRA Appendix A, Section A.1 (letter dated March 29, 2018 (see ADAMS Accession No. ML18149A638)) Entergy provided its consideration of the guidance contained in LR-ISG-2011-05, "Ongoing Review of Operating Experience" (see ADAMS Accession

No. ML18143B686). The supplement modified LRA Appendix A, Section A.1 to further address the guidance contained in LR-ISG-2011-05, Appendix A, "Areas of Further Review." In addition, Entergy indicated that the program as described in LRA Appendix A and LRA Appendix B was currently in place and did not require further enhancements.

LRA Appendix A, Section A.1 and Appendix B, Section B.0.4 state that Entergy does a systematic review of plant-specific and industry operating experience concerning aging management and age-related degradation to ensure that the license renewal aging management program will effectively manage the aging effects for which they are credited.

3.0.5.2 Staff Evaluation

3.0.5.2.1 Overview

In accordance with 10 CFR 54.21(a)(3), an applicant is required to demonstrate that it will adequately manage the effects of aging on structures and components subject to an aging management review so that their intended functions will be maintained in a way that is consistent with the current licensing basis for the period of extended operation. In the SRP-LR, Appendix A, "Aging Management Review—Generic (Branch Technical Position RLSB 1)," describes 10 elements of an acceptable aging management program. SRP-LR, Appendix A, Section A.1.2.3.10, "Operating Experience," describes Program Element 10 (operating experience). On March 16, 2012, the staff issued Final LR-ISG-2011-05, "Ongoing Review of Operating Experience," which includes interim revisions to the SRP-LR to clarify the criteria for Program Element 10. SER Section 3.0.3 discusses the staff's review of the second and third LR-ISG-2011-05 criteria, which concern currently available operating experience. The following evaluation covers the staff's review of the first LR-ISG-2011-05 criterion, which concerns the consideration of future operating experience.

3.0.5.2.2 Consideration of Future Operating Experience

The staff reviewed LRA Appendix A, Section A.1; Appendix B, Section B.0.4; and Appendix B, Section B.1 to determine how Entergy will use future operating experience to ensure that the aging management programs are effective. Each of the program descriptions in LRA Appendix B, Section B.1 indicate that LRA Appendix B, Section B.0.4 describes the process for review of future plant-specific and industry operating experience. The staff evaluated Entergy's operating experience review activities, as described in the LRA. The staff's evaluations with respect to these SRP-LR sections follow in SER Section 3.0.5.2.3 and Section 3.0.5.2.4, respectively.

3.0.5.2.3 Acceptability of Existing Programs

SRP-LR Section A.4.2 (as revised by LR-ISG-2011-05) describes existing programs that the NRC generally finds acceptable for the capture, processing, and evaluation of operating experience concerning age-related degradation and aging management during the term of a renewed operating license. The acceptable programs are those the applicant relies on to meet the requirements of 10 CFR Part 50, Appendix B and Item I.C.5, "Procedures for Feedback of Operating Experience to Plant Staff," in NUREG-0737, "Clarification of TMI Action Plan Requirements," dated November 1980. SRP-LR Section A.4.2 also states that, as part of meeting the requirements of NUREG-0737, Item I.C.5, the applicant's operating experience program should rely on active participation in the Institute of Nuclear Power Operations (INPO) operating experience program (formerly the INPO Significant Event Evaluation and Information

Network (SEE IN) program endorsed by the NRC in Generic Letter (GL) 82-04, "Use of INPO SEE IN Program," dated March 9, 1982).

LRA Appendix A, Section A.1 and Appendix B, Section B.0.4 state that Entergy uses its operating experience program to systematically capture and review operating experience from plant-specific and industry sources. Entergy stated that the operating experience program meets the requirements of NUREG-0737. Entergy further stated that the operating experience program interfaces and relies on active participation in the INPO operating experience program. Based on this information, the staff determines that Entergy's operating experience program is consistent with the programs described in SRP-LR Section A.4.2.

3.0.5.2.4 Areas of Further Review

Application of Existing Programs and Procedures to the Processing of Operating Experience Related to Aging. SRP-LR Section A.4.2 states that the programs and procedures the applicant relies on to meet the requirements of 10 CFR Part 50, Appendix B and NUREG-0737, Item I.C.5, should not preclude the consideration of operating experience on age-related degradation and aging management.

LRA Appendix A, Section A.1 and Appendix B, Section B.0.4 state that Entergy systematically captures and reviews operating experience from plant-specific and industry sources on an ongoing basis in accordance with the QA program. This is consistent with Appendix B to 10 CFR Part 50, and the operating experience program, which is consistent with NUREG-0737, Item I.C.5. LRA Appendix A, Section A.1 and Appendix B, Section B.0.4 state that the ongoing evaluation of operating experience included a review of corrective actions resulting in program enhancements. The LRA states that for inspection programs, Entergy reviewed reports of recent inspections, examinations, and tests to determine whether aging effects have been identified on applicable components. For monitoring programs, Entergy reviewed reports of sample results to determine whether parameters are being maintained as required by the program. In addition, the LRA states that program owners contributed evidence of program success or weakness and identified applicable self-assessments, QA audits, peer evaluations, and NRC reviews.

Based on this information, the staff determines that the processes Entergy implemented under the QA program, the corrective action program, and the operating experience program would not preclude consideration of age-related operating experience, which is consistent with the guidance in SRP-LR Section A.4.2. In addition, SRP-LR Section A.4.2 states that the applicant should use the option described in SRP-LR Appendix A.2 to expand the scope of the QA program under Appendix B to 10 CFR Part 50 to include nonsafety-related structures and components.

LRA Sections A.1 and B.0.4 state that Entergy's QA program includes nonsafety-related SCs, which the staff finds consistent with the guidance in SRP-LR Section A.2 and, therefore, consistent with SRP-LR Section A.4.2 as well. SER Section 3.0.4 documents the staff's evaluation of LRA Section B.0.4 relative to the application of the QA program to nonsafety-related SSCs.

Consideration of Guidance Documents as Industry Operating Experience. SRP-LR Section A.4.2 states that NRC and industry guidance documents and standards applicable to aging management, including revisions to the GALL Report, should be considered as sources of industry operating experience and evaluated accordingly.

LRA Appendix A, Section A.1 and Appendix B, Section B.0.4 state that the sources of external operating experience include active participation in the INPO operating experience program, GALL Report revisions, and other NRC review and guidance documentation.

The staff finds the sources of industry operating experience acceptable because Entergy will consider an appropriate breadth of industry operating experience for impacts to its aging management activities, which includes sources that the staff considers to be the primary sources of external operating experience information. Entergy's consideration of industry guidance documents as operating experience is therefore consistent with the guidance in SRP-LR Section A.4.2.

Screening of Incoming Operating Experience. SRP-LR Section A.4.2 states that all incoming plant-specific and industry operating experience should be screened to determine whether it involves age-related degradation or impacts to aging management activities.

LRA Appendix A, Section A.1 and Appendix B, Section B.0.4 state that Entergy captures and systematically reviews the internal and external operating experience on an ongoing basis and that the operating experience program provides for evaluation of the effectiveness of their self-assessment process for each AMP described in the USAR supplement. Entergy screens site-specific and industry operating experience items to determine whether they involve lessons learned that may impact aging management programs. Items are evaluated and affected AMPs are either enhanced or new AMPs are developed, as appropriate, when it is determined that the effects of aging are not adequately managed. The staff finds Entergy's operating experience review processes acceptable because, after enhancement, these processes will include screening of all new operating experience to identify and evaluate items that have the potential to impact the aging management activities. Entergy's screening of plant-specific and industry operating experience is therefore consistent with the guidance in SRP-LR Section A.4.2.

Identification of Operating Experience Related to Aging. SRP-LR Section A.4.2 states that coding should be used within the plant corrective action program to identify operating experience involving age-related degradation applicable to the plant. The SRP-LR also states that the associated entries should be periodically reviewed and any adverse trends should receive further evaluation.

LRA Section A.1 states that the corrective action includes aging type codes to identify either plant conditions related to aging or industry operating experience related to aging.

The staff finds Entergy's identification of operating experience related to aging acceptable because Entergy has a means at a programmatic level to identify, trend, and evaluate operating experience that involves age-related degradation. Entergy's identification of age-related operating experience applicable to the plants is therefore consistent with the guidance in SRP-LR Section A.4.2.

Information Considered in Operating Experience Evaluations. SRP-LR Section A.4.2 states that operating experience identified as involving aging should receive further evaluation based on consideration of information, such as the affected SSCs, materials, environments, aging effects, aging mechanisms, and AMPs. The SRP-LR also states that actions should be initiated within the corrective action program to either enhance the AMPs or develop and implement new AMPs if an operating experience evaluation finds that the effects of aging may not be adequately managed.

LRA Appendix A, Section A.1 and Appendix B, Section B.0.4 state that Entergy's program requires that when evaluations indicate that the effects of aging are not being adequately managed, the affected AMPs are either enhanced or new AMPs are developed, as appropriate.

The staff determines that Entergy's evaluations of age-related operating experience includes the assessment of appropriate information to determine potential impacts to the aging management activities. The staff also determines that Entergy's operating experience program, in conjunction with the corrective action program, will implement any changes necessary to manage the effects of aging, as determined through its operating experience evaluations. Therefore, the staff finds that the information considered in Entergy's operating experience evaluations and use of the operating experience program and corrective action program to ensure that the effects of aging are adequately managed is consistent with the guidance in SRP-LR Section A.4.2.

Evaluation of AMP Implementation Results. SRP-LR Section A.4.2 states that the results of implementing the AMPs, such as data from inspections, tests, and analyses, should be evaluated regardless of whether the acceptance criteria of the particular AMP have been met. SRP-LR Section A.4.2 states that this information should be used to determine whether it is necessary to adjust the inspection activities for aging management. In addition, SRP-LR Section A.4.2 states that actions should be initiated within the plant corrective action program to either enhance the AMPs or develop and implement new AMPs if these evaluations indicate that the effects of aging may not be adequately managed.

For inspection programs, the staff reviewed reports of recent inspections, examinations, or tests to determine whether aging effects have been identified on applicable components. For monitoring programs, the staff reviewed reports of sample results to determine whether parameters are being maintained as required by the program. In addition, program owners contributed evidence of program success or weakness and identified applicable self-assessments, QA audits, peer evaluations, and NRC reviews.

The staff reviewed the LRA and finds Entergy's treatment of AMP implementation results as operating experience acceptable because Entergy will evaluate these results and use the information to determine whether to adjust the aging management activities. Entergy's activities for the evaluation of AMP implementation results are therefore consistent with the guidance in SRP-LR Section A.4.2.

Training. SRP-LR Section A.4.2 states that training on age-related degradation and aging management should be provided to those personnel responsible for implementing the AMPs and those personnel that may submit, screen, assign, evaluate, or otherwise process plant-specific and industry operating experience. SRP-LR Section A.4.2 also states that the training should be periodic and include provisions to accommodate the turnover of plant personnel.

LRA Appendix A, Section A.1 and Appendix B, Section B.0.4 state that based on the complexity of the job performance requirements and assigned responsibilities, Entergy's operating experience program provides for training for (1) personnel responsible for submitting, screening, assigning, evaluating, or otherwise processing plant-specific and industry operating experience concerning age-related degradation and aging management and for (2) personnel responsible for implementing AMPs.

The staff reviewed the LRA and determines that the scope of personnel included in Entergy's training program are consistent with the guidelines in SRP-LR Section A.4.2. The staff also determines that Entergy has demonstrated that its training program will cover age-related degradation and aging management topics. Entergy's training activities are therefore consistent with the guidance in SRP-LR Section A.4.2.

Reporting Operating Experience to the Industry. SRP-LR Section A.4.2 states that guidelines should be established for reporting plant-specific operating experience on age-related degradation and aging management to the industry.

The staff finds Entergy's operating experience program acceptable because Entergy has established appropriate expectations and guidelines for identifying plant-specific operating experience concerning aging management and age-related degradation to the industry. Entergy's establishment of these guidelines is therefore consistent with the guidance in SRP-LR Section A.4.2.

Schedule for Implementing the Operating Experience Review Activities. SRP-LR Section A.4.2 states that the operating experience review activities should be implemented on an ongoing basis throughout the term of a renewed license.

LRA Appendix A, Section A.1 and Appendix B, Section B.0.4 state that Entergy's self-assessment process provides for periodic evaluation of the effectiveness of this operating experience program described in the USAR supplement. These LRA sections state that the operating experience program will be implemented on an ongoing basis throughout the term of the renewed license. LRA Appendix A, Section A.1 provides the USAR supplement summary description of Entergy's enhanced programmatic activities for ongoing review of the operating experience. On issuance of the renewed license in accordance with 10 CFR 54.3(c), this summary description will be incorporated into the current licensing basis, and, at that time, Entergy will be obligated to conduct its operating experience review activities accordingly.

The staff finds the implementation schedule acceptable because Entergy will implement the operating experience review activities on an ongoing basis throughout the term of the renewed operating license.

3.0.5.2.5 Summary

Based on its review of the LRA, the staff determines that Entergy's programmatic activities for the ongoing review of operating experience are acceptable for (a) the systematic review of plant-specific and industry operating experience to ensure that the license renewal AMPs are, and will continue to be, effective in managing the aging effects for which they are credited and (b) the enhancement of AMPs or development of new AMPs when it is determined through the evaluation of operating experience that the effects of aging may not be adequately managed. Based on the staff's review and the consistency of Entergy's operating experience review activities with the guidance in LR-ISG-2011-05, the staff finds Entergy's programmatic activities for the ongoing review of operating experience acceptable.

3.0.5.3 Updated Safety Analysis Report Supplement

In accordance with 10 CFR 54.21(d), the USAR supplement must contain a summary description of the programs and activities for managing the effects of aging. LRA Appendix A, Section A.1 provides the USAR supplement summary description of the applicant's programmatic activities for the ongoing review of operating experience that will ensure that plant-specific and industry operating experience related to aging management will be used effectively.

The staff reviewed LRA Appendix A, Section A.1 and finds that the summary description of the ongoing evaluation of operating experience related to aging management will consider (a) SSCs, (b) materials, (c) environments, (d) aging effects, (e) aging mechanisms, and (f) AMPs and that procedures will be revised to specify these evaluations.

Based on its review, the staff determines that the content of Entergy's summary description is consistent with the example and also sufficiently comprehensive to describe Entergy's programmatic activities for evaluating operating experience to maintain the effectiveness of the AMPs. Therefore, the staff finds Entergy's USAR supplement summary description acceptable.

3.0.5.4 Conclusion

Based on its review of Entergy's programmatic activities for the ongoing review of operating experience, the staff concludes that Entergy has demonstrated that it will review operating experience to ensure that it adequately manages the effects of aging so that the intended functions will remain consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for these activities and concludes that it provides an adequate summary description, as required by 10 CFR 54.21(d).

3.1 Aging Management of Reactor Vessel, Internals, and Reactor Coolant System

3.1.1 Summary of Technical Information in the Application

LRA Section 3.1 provides aging management review results for the reactor vessel, reactor vessel internals, and reactor coolant system components and component groups.
LRA Table 3.1.1, "Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of NUREG-1801," is a summary comparison of Entergy's aging management reviews with those evaluated in the GALL Report for the reactor vessel, reactor vessel internals, and reactor coolant system components and component groups.

3.1.2 Staff Evaluation

Table 3.1-1, below, summarizes the staff's evaluation of components, aging effects or mechanisms, and aging management programs listed in LRA Section 3.1 and addressed in the GALL Report.

Table 3.1-1 Staff Evaluation for Reactor Vessel, Reactor Vessel Internals, and Reactor Coolant System Components in the GALL Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.1.1-1	Consistent with the GALL Report (see SER Section 3.1.2.2.1)
3.1.1-2	Not Applicable to BWRs (see SER Section 3.1.2.1.1)

Component Group (SRP-LR Item No.)	Staff Evaluation
3.1.1-3	Consistent with the GALL Report (see SER Section 3.1.2.2.1)
3.1.1-4	Consistent with the GALL Report (see SER Section 3.1.2.2.1)
3.1.1-5	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-6	Consistent with the GALL Report (see SER Section 3.1.2.2.1)
3.1.1-7	Consistent with the GALL Report (see SER Section 3.1.2.2.1)
3.1.1-8	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-9	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-10	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-11	Consistent with the GALL Report (see SER Section 3.1.2.2.1)
3.1.1-12	Not Applicable to BWRs (see SER Section 3.1.2.2.2)
3.1.1-13	Consistent with the GALL Report (see SER Section 3.1.2.2.3)
3.1.1-14	Consistent with the GALL Report (see SER Section 3.1.2.2.3)
3.1.1-15	Not Applicable to BWRs (see SER Section 3.1.2.2.3)
3.1.1-16	Consistent with the GALL Report (see SER Section 3.1.2.2.4)
3.1.1-17	Consistent with the GALL Report (see SER Section 3.1.2.2.4)
3.1.1-18	Not Applicable to BWRs (see SER Section 3.1.2.2.5)
3.1.1-19	Not Applicable to BWRs (see SER Section 3.1.2.2.6)
3.1.1-20	Not Applicable to BWRs (see SER Section 3.1.2.2.6)
3.1.1-21	Consistent with the GALL Report (see SER Section 3.1.2.2.7)
3.1.1-22	Not Applicable to BWRs (see SER Section 3.1.2.1.8)
3.1.1-23	Deleted from the SRP-LR by LR-ISG-2011-04 (see SER Section 3.1.2.1.1).
3.1.1-24	Deleted from the SRP-LR by LR-ISG-2011-04 (see SER Section 3.1.2.1.1).
3.1.1-25	Not Applicable to BWRs (see SER Section 3.1.2.2.11)
3.1.1-26	Deleted from the SRP-LR by LR-ISG-2011-04 (see SER Section 3.1.2.1.1).
3.1.1-27	Deleted from the SRP-LR by LR-ISG-2011-04 (see SER Section 3.1.2.1.1).
3.1.1-28	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-29	Consistent with the GALL Report (see SER Section 3.1.2.1.3)
3.1.1-30	Not Applicable to RBS (see SER Section 3.1.2.1.1)
3.1.1-31	Not Applicable to RBS (see SER Section 3.1.2.1.1)
3.1.1-32	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-33	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-34	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-35	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-36	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-37	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-38	Consistent with the GALL Report
3.1.1-39	Consistent with the GALL Report
3.1.1-40	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-40.5	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-41	Not Applicable to RBS (see SER Section 3.1.2.1.1)
3.1.1-42	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-43	Consistent with the GALL Report (see SER Section 3.1.2.1.4)
3.1.1-44	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-45	Not Applicable to BWRs (see SER Section 3.1.2.1.1)

Component Group (SRP-LR Item No.)	Staff Evaluation
3.1.1-46	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-47	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-48	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-49	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-50	Not Applicable to RBS (see SER Section 3.1.2.1.1)
3.1.1-51a	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-51b	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-52a	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-52b	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-52c	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-53a	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-53b	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-53c	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-54	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-55a	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-55b	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-55c	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-56a	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-56b	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-56c	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-58a	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-58b	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-59a	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-59b	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-59c	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-60	Consistent with the GALL Report
3.1.1-61	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-62	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-63	Consistent with the GALL Report
3.1.1-64	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-65	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-66	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-67	Consistent with the GALL Report
3.1.1-68	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-69	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-70	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-71	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-72	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-73	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-74	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-75	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-76	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-77	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-78	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-79	Consistent with the GALL Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.1.1-80	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-81	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-82	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-83	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-84	Consistent with the GALL Report
3.1.1-85	Consistent with the GALL Report
3.1.1-86	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-87	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-88	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-89	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-90	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-91	Consistent with the GALL Report
3.1.1-92	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-93	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-94	Consistent with the GALL Report
3.1.1-95	Consistent with the GALL Report
3.1.1-96	Not Applicable to RBS (see SER Section 3.1.2.1.1)
3.1.1-97	Consistent with the GALL Report (see SER Section 3.1.2.1.2)
3.1.1-98	Consistent with the GALL Report
3.1.1-99	Consistent with the GALL Report
3.1.1-100	Consistent with the GALL Report
3.1.1-101	Consistent with the GALL Report
3.1.1-102	Consistent with the GALL Report
3.1.1-103	Consistent with the GALL Report (see SER Section 3.1.2.1.5)
3.1.1-104	Not Applicable to RBS (see SER Section 3.1.2.1.1)
3.1.1-105	Not Applicable to RBS (see SER Section 3.1.2.1.1)
3.1.1-106	Consistent with the GALL Report
3.1.1-107	Consistent with the GALL Report
3.1.1-108	Not Applicable to BWRs (see SER Section 3.1.2.1.1)
3.1.1-110	Not Applicable to RBS (see SER Section 3.1.2.1.1)

The staff's review of the reactor vessel, reactor vessel internals, and reactor coolant system component groups follow one of three approaches:

1) One approach, documented in SER Section 3.1.2.1, reviews aging management review results for components that Entergy indicates are consistent with the GALL Report and require no further evaluation.

2) Another approach, documented in SER Section 3.1.2.2, reviews aging management review results for components that Entergy indicates are consistent with the GALL Report and for which further evaluation is recommended.

3) A third approach, documented in SER Section 3.1.2.3, reviews aging management review results for components that Entergy indicates are not consistent with or not addressed in the GALL Report.

SER Section 3.0.3 documents the staff's review of aging management programs credited to manage or monitor aging effects of the reactor vessel, reactor vessel internals, and reactor coolant system components.

3.1.2.1 Aging Management Review Results Consistent with the GALL Report

LRA Section 3.1.2.1 identifies the materials, environments, aging effects requiring management, and the programs that manage aging effects for the reactor vessel, reactor vessel internals, and reactor coolant system components.

LRA Table 3.1.2-1 through Table 3.1.2-3, LRA Table 3.1.2-4-1, and LRA Table 3.1.2-4-2 summarize aging management reviews for the reactor vessel, reactor vessel internals, and reactor coolant system components and indicate aging management reviews that Entergy claims are consistent with the GALL Report.

3.1.2.1.1 Aging Management Review Results Identified as Not Applicable or Not Used

For LRA Table 3.1.1, Item 3.1.1-2, Item 3.1.1-5, Item 3.1.1-8 through Item 3.1.1-10, Item 3.1.1-12, Item 3.1.1-15, Item 3.1.1-18 through Item 3.1.1-20, Item 3.1.1-22, Item 3.1.1-25, Item 3.1.1-28, Item 3.1.1-32 through Item 3.1.1-37, Item 3.1.1-40, Item 3.1.1-40.5, Item 3.1.1-42, Item 3.1.1-44 through Item 3.1.1-49, Item 3.1.1-51a, Item 3.1.1-51b, Items 3.1.1-52a–c, Items 3.1.1-53a–c, Item 3.1.1-54, Items 3.1.1-55a–c, Items 3.1.1-56a–c, Item 3.1.1-58a, Item 3.1.1-58b, Items 3.1.1-59a–c, Item 3.1.1-61, Item 3.1.1-62, Item 3.1.1-64 through Item 3.1.1-66, Item 3.1.1-68 through Item 3.1.1-78, Item 3.1.1-80 through Item 3.1.1-83, Item 3.1.1-86 through Item 3.1.1-90, Item 3.1.1-92, Item 3.1.1-93, and Item 3.1.1-108, Entergy claims that the corresponding aging management review items in the GALL Report are not applicable because the associated items are only applicable to pressurized-water reactors (PWRs). The staff reviewed the SRP-LR, confirmed these items only apply to pressurized-water reactors, and finds that these items are not applicable to RBS because it is a boiling-water reactor.

For LRA Table 3.1.1, Item 3.1.1-23, Item 3.1.1-24, Item 3.1.1-26, and Item 3.1.1-27, the staff reviewed the LRA and the SRP-LR and confirms that the items were deleted from the SRP-LR by LR-ISG-2011-04 and are therefore not applicable to RBS.

LRA Table 3.1.1, item 3.1.1-30 addresses cracking due to stress corrosion cracking, intergranular stress corrosion cracking, or cyclical loading in BWR reactor pressure vessel (RPV) bottom head drains that are made from either nickel alloy or stainless steel materials and are exposed to reactor coolant. In LRA Table 3.1.1, Item 3.1.1-30, Entergy stated the item is not applicable because the reactor pressure vessel bottom head drain line is made of a material (i.e., carbon steel) that is different from the materials listed for this component in SRP-LR Table 3.1-1, Item 30. The staff noted that, due to the difference in the material used for fabrication of the drain line, Entergy identified that loss of material due to flow-accelerated corrosion, general corrosion, pitting, and crevice corrosion is the aging effect that requires management for the carbon steel used to make the drain line and that Entergy uses other AMR items in LRA Table 3.1.1 and in LRA Table 3.1.2-2 to manage any loss of material that may occur in the component. The staff reviewed the LRA and confirms that loss of material due to general, pitting and crevice corrosion, and due to flow-accelerated corrosion is the only aging effect that is applicable to the carbon steel material used in the drain line design. The staff confirms that the loss of material due to flow-accelerated corrosion is addressed in LRA Table 3.1.1, Item 3.1.1-60 and in the item in LRA Table 3.1.2-1 that references use of GALL Report AMR Item IV.C1.R-23. The staff also confirms that loss of material due to general, pitting, and crevice corrosion of the drain line is addressed in LRA Table 3.1.1, Item 3.1.1-84 and in the item in LRA Table 3.1.2-1 that references use of GALL Report AMR Item IV.A1.RP-50. Therefore, the staff finds Entergy's proposal acceptable because (1) the staff has verified that loss of material is the applicable aging effect requiring management for the carbon steel material used in drain line design, and (2) using these GALL Report-based items, Entergy will use a combination of its Flow-Accelerated Corrosion program, Water Chemistry Control—BWR program, and One-Time Inspection program to manage any loss of material that may occur in the drain line during the period of extended operation. SER Table 3.1-1 indicates that LRA Table 3.1.1, Item 3.1.1-30 is not applicable to RBS and that LRA Table 3.1.1, Items 3.1.1-60 and 3.1.1-84 are the applicable items that will be used to manage loss of material in in the reactor pressure vessel drain line design.

LRA Table 3.1.1, Item 3.1.1-31 corresponding to SRP-LR Table 3.1-1, Item 31, addresses loss of material due to general (carbon steel only) pitting or crevice corrosion in BWR isolation condensers made from either stainless steel or steel materials. In LRA Table 3.1.1, Item 3.1.1-31, Entergy stated the item is not applicable because the reactor at RBS is not designed with an isolation condenser. The staff evaluated Entergy's claim and finds it acceptable because: (1) the staff reviewed the USAR and has verified that the plant design uses a reactor core isolation system to achieve safe shutdown conditions, and (2) the plant design does not include or use an isolation condenser to achieve this license renewal intended function. SER Table 3.1-1 identifies LRA Table 3.1.1, Item 3.1.1-31 as not applicable to RBS.

LRA Table 3.1.1, Item 3.1.1-41 addresses cracking due to stress corrosion cracking, intergranular stress corrosion cracking, or intergranular stress corrosion cracking in BWR core shroud access hole covers that are made from a nickel alloy material and involve a bolted (mechanical) access hole cover design. In LRA Table 3.1.1, Item 3.1.1-41, Entergy stated the item is not applicable because it is only applicable to bolted BWR core shroud access hole cover designs. In contrast, the RBS site's access hole cover is made from a welded design. Entergy addresses cracking in the welded access hole cover design by other AMR items in LRA Table 3.1.1 and in LRA Table 3.1.2-2. The staff reviewed the LRA and confirmed that cracking of the welded access hole cover design is addressed in LRA Table 3.1.1, Item 3.1.1-29 and in the item in LRA Table 3.1.2-2 that references use of GALL Report AMR Item IV. B1.R-94.

On this basis, Entergy will use its BWR Vessel Internals Program as the condition monitoring program for managing cracking in the access hole cover in lieu of using the plant's Inservice Inspection program, which is typically cited for use in GALL Report Item IV.B1.R-94. The staff finds the alternate AMP basis to be acceptable because the AMP will implement guidance in EPRI Report BWRVIP-180 as the basis for inspecting the access hole cover, and this is consistent with the version of AMP XI.M9, BWR Vessel Internals inthe GALL-SLR. SER Table 3.1-1 indicates that LRA Table 3.1.1, Item 3.1.1-41 is not applicable to the LRA and that LRA Table 3.1.1, Item 3.1.1-29 is the AMR item that is cited in the LRA for managing cracking in the access hole cover.

LRA Table 3.1.1, Item 3.1.1-50 addresses cast austenitic stainless steel Class 1 piping, piping components, and piping elements and control rod drive pressure housings exposed to reactor coolant. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim and finds it acceptable because: (1) the staff reviewed the USAR and did not identify any Class 1 piping, piping components, or piping elements fabricated from cast austenitic stainless steel, and (2) the staff agrees with Entergy's claim that the non-Class 1 cast austenitic stainless steel piping components composed of low molybdenum and centrifugally cast are not susceptible to thermal aging embrittlement, as verified by an NRC letter titled, "License Renewal Issue No. 98-0030, 'Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Components," dated May 19, 2000 (ADAMS Accession No. ML003717179).

LRA Table 3.1.1, Item 3.1.1-96 addresses cracking due to cyclical loading steel in (with or without stainless steel cladding) BWR control rod drive (CRD) return line nozzles that are exposed to reactor coolant. In LRA Table 3.1.1, Item 3.1.1-96, Entergy stated that the AMR item was not used for the LRA because the control rod drive return line was modified in a manner (i.e., cut and capped) that reduced fatigue loads on the control rod drive return line nozzle configuration. The staff evaluated Entergy's claim and finds it acceptable because: a) the staff has verified that Entergy has modified its control rod drive return line in accordance with the staff's guidance in Generic Letter (GL) 80-095 and NUREG-0619, "BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking: Resolution of Generic Technical Activity A-10 (Technical Report)," and (b) instead, Entergy credits LRA Table 3.1.1, Item 3.1.1-97 and GALL Report AMR Item IV.A1.R-68, and will use the BWR CRD Return Line Nozzle program and Water Chemistry Control—BWR program (for applicable stress corrosion mechanisms) to manage any cracking that may occur in the modified and capped configuration of the control rod drive return line nozzle during the period of extended operation.

For LRA Table 3.1.1, Item 3.1.1-104, Entergy claims that the corresponding items in the GALL Report are not applicable because they are addressed by other items in LRA Table 3.1.1. The staff reviewed the LRA and confirms that, for management of cracking due to stress corrosion cracking, intergranular stress corrosion cracking, or irradiation-assisted stress corrosion cracking in reactor internals made from either stainless steel or nickel alloy materials, Entergy addressed management of the aging effect and mechanisms in other LRA Table 3.1.1 items, including Item 3.1.1-102 and Item 3.1.1-103. Therefore, the staff finds Entergy's proposal acceptable.

For LRA Table 3.1.1, Item 3.1.1-105, Entergy claims that it is not applicable. The staff reviewed the LRA and USAR and confirms that Entergy's LRA does not have any aging management review results that are applicable for this item, or this item requires no aging management.

LRA Table 3.1.1, Item 3.1.1-110 addresses any material, piping, piping components, and piping elements exposed to reactor coolant. Entergy states this item is not applicable to RBS because reviews of plant operating experience did not identify any components as being susceptible to wall thinning due to erosion in the reactor coolant system. The staff evaluated Entergy's claim and finds it acceptable because, during its audit, the staff searched Entergy's operating experience database and did not identify any components in the reactor coolant system that were experiencing wall thinning due to erosion Therefore, there is reasonable assurance that aging management is not required

3.1.2.1.2 <u>Cracking Due to Stress Corrosion Cracking</u>

LRA Table 3.1.1, Item 3.1.1-97 addresses stainless steel and nickel alloy piping, piping components, and piping elements ≥ 4-inch nominal pipe size (NPS) and exposed to treated water or steam, for which Entergy will manage cracking due to stress corrosion cracking. LRA Table 3.1.1, Item 3.1.1-97 indicates that, for some components to which the BWR Stress

Corrosion Cracking program is not applicable, Entergy manages cracking using the Water Chemistry Control—BWR program, and either the Inservice Inspection program or BWR CRD Return Line Nozzle program.

For the aging management review items that cite generic Note E, the LRA credits the Inservice Inspection program and Water Chemistry Control—BWR program to manage the aging effect for stainless steel and nickel alloy valve body components (including safety valve nozzles and disk inserts); stainless steel thermowells, condensing chambers and recirculation pump seal water heat exchanger inner tubes; and carbon steel clad with stainless steel reactor vessel components (reactor vessel plates, top head flange and bottom head). In addition, the LRA credits the BWR CRD Return Line Nozzle program and Water Chemistry Control—BWR program to manage cracking for the capped control rod drive return line nozzle.

Based on its review of components associated with LRA Table 3.1.1, Item 3.1.1-97 for which Entergy cites generic Note E, the staff finds that Entergy's proposal to manage the effects of aging using the Inservice Inspection program or the BWR CRD Return Line Nozzle program in conjunction with the Water Chemistry Control—BWR program is acceptable because (1) the Inservice Inspection and BWR CRD Return Line Nozzle programs include visual and volumetric inspections that can detect and manage cracking, and (2) the Water Chemistry Control—BWR program monitors and controls the concentration of chemical species known to promote stress corrosion cracking within the acceptable ranges to minimize the environmental effect of stress corrosion cracking.

3.1.2.1.3 Cracking Due to Stress Corrosion Cracking, Intergranular Stress Corrosion Cracking, or Irradiation-Assisted Stress Corrosion Cracking

LRA Table 3.1.1, Item 3.1.1-29 addresses nickel alloy access hole cover welds exposed to a treated water environment, for which Entergy will manage cracking due to stress corrosion cracking (SSC), intergranular stress corrosion cracking (IGSCC), or irradiation-assisted stress corrosion cracking (IASCC). For the aging management review items that cite generic Note E, the LRA credits a combination of the BWR Vessel Internals program (LRA AMP B.1.10) and the Water Chemistry Control—BWR program (LRA AMP B.1.42) to manage the aging effect for stainless steel and nickel alloy reactor vessel internal components exposed to this environment.

Based on its review of components associated with LRA Table 3.1.1, Item 3.1.1-29, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the effects of aging using the BWR Vessel Internals program (LRA AMP B.1.10) and the Water Chemistry Control—BWR program (LRA AMP B.1.42) acceptable because: (a) the staff has confirmed that Entergy's program includes appropriate programmatic condition-monitoring activities for detecting cracking in the reactor vessel internal components, (b) Entergy will use the approved methodology in technical report BWRVIP-47-A to assess the need for inspecting the access hole covers during the period of extended operation, (c) Entergy's basis is consistent with the basis in GALL Report AMP XI.M9 for managing cracking in BWR vessel internal lower plenum component locations, and (d) in the GALL-SLR (NUREG-2191), the staff cites the BWR Vessel Internals program (GALL-SLR AMP B.1.10) as an acceptable means to manage the aging of the access hole cover.

3.1.2.1.4 Loss of Material Due to Pitting and Crevice Corrosion

LRA Table 3.1.1, Item 3.1.1-43 addresses stainless steel and nickel alloy reactor vessel internal components exposed to treated water, treated water > 482 ºF and neutron flux, or treated water

> 140 ºF environments, for which Entergy will manage loss of material due to pitting and crevice corrosion. For the aging management review items that cite generic Note E, the LRA credits the Water Chemistry Control—BWR program (LRA AMP B.1.42) and the One-Time Inspection program (LRA AMP B.1.32) to manage this aging effect for stainless steel and nickel alloy reactor vessel internal components that are exposed to these environments. For its alternative generic Note E basis, Entergy states that the Inservice Inspection program does not include sufficient inspections of reactor vessel internal components to justify its use.

During its review of LRA Table 3.1.1, AMR Item 3.1.1-43, and the aging management review items in LRA Table 3.1.2-2 referencing AMR Item 3.1.1-43, the staff needed additional information, and therefore issued a request for additional information. RAI 3.1.2.1.2-1, dated February 8, 2018, and Entergy's response, dated March 26, 2018, are documented in ADAMS Accession No. ML18087A188.

The staff evaluated Entergy's response to RAI 3.1.2.1.2-1, and notes that Entergy reiterated its basis for using the alternative aging management review item in GALL Report Item IV.C1.RP-158 as the basis for justifying that a one-time inspection, when implemented in conjunction with Entergy's Water Chemistry Control—BWR program, provides an adequate basis for managing loss of material due to pitting and crevice corrosion in reactor vessel internal components made from stainless steel or nickel alloy materials. Entergy also states that this combination of programs is effective at managing this aging effect for these types of components.

Entergy's RAI response basis maintains Entergy's position for applying a GALL-based aging management review item for ASME Code Class 1 piping components and the One-Time Inspection program as the basis for managing loss of material due to pitting and crevice corrosion in the reactor vessel internal components. Normally, the staff would not find this basis to be acceptable for managing loss of material in the reactor vessel internal components for the following reasons: (1) because Entergy's basis assumes the reactor coolant environment in the vicinity of the reactor coolant pressure boundary (RCPB) piping is the same as the reactor coolant environment around the reactor vessel internal components, and (2) because GALL Report Table IV.B1 does not include any aging management review items that apply a new One-Time Inspection program as the basis for managing specific age-related degradation effects in BWR vessel internal components.[1] However, the staff notes that Entergy credits the BWR Vessel Internals program as a defined periodic condition monitoring aging management program for managing all other aging effects that are identified as being applicable to reactor vessel internal components, including cracking, reduction of fracture toughness, and loss of material due to wear.

As a result, the staff notes that Entergy's protocols for implementing its BWR Vessel Internals program and the applicable BWRVIP reports in the aging management program would take appropriate actions to evaluate any loss of material that was detected in the reactor vessel internal components as a result of implementing the BWRVIP guideline inspections under the scope of the aging management program. Therefore, the staff finds that it is acceptable for Entergy to use the One-Time Inspection program to manage loss of material due to pitting or crevice corrosion in the components because: (a) Entergy will be implementing its

[1] As an example, the environmental conditions for the reactor coolant in the vicinity of reactor vessel internal components may include additional environmental factors that do not normally apply to Class 1 piping components, such as impacts from radiolysis effects, effects of gamma exposure and heating, or exposures to high-energy neutrons.

BWRVIP-defined inspections of reactor vessel internal components in accordance with BWR Vessel Internals program during the period of extended operation, (b) Entergy will enter any detection of loss of material due to pitting or crevice corrosion in reactor vessel internal components into its condition report process if the aging effect is detected as a result of implementing the BWRVIP report inspections that are within the scope of the BWR Vessel Internals program, and (c) as a result, the BWR Vessel Internals program will serve as an additional basis for managing loss of material due to pitting or crevice corrosion in the reactor vessel internal components, even though Entergy has not formally credited it for aging management of loss of material due to pitting or crevice corrosion in the aging management review items for reactor vessel internal components in LRA Table 3.1.2-2. This resolves RAI 3.1.2.1.2-1.

Based on its review of components associated with AMR Item 3.1.1-43, for which Entergy cited generic Note E, staff finds Entergy's proposal to manage the loss of material due to pitting or crevice corrosion using the One-Time Inspection program acceptable because: (a) Entergy will implement both the One-Time Inspection program and the BWR Vessel Internals program during the period of extended operation, and (b) the staff has confirmed that both aging management programs will be capable of detecting and managing any loss of material that may occur in the reactor vessel internal components as a result of a pitting or crevice corrosion mechanism.

3.1.2.1.5 Cracking Due to Stress Corrosion Cracking, Intergranular Stress Corrosion Cracking, or Cyclic Loading

LRA Table 3.1.1, Item 3.1.1-103 in part addresses the stainless steel incore instrument (ICI) flux monitoring dry tubes (ICI dry tubes) exposed to a treated water > 140 ºF environment, for which Entergy will manage cracking. For the aging management review items that cite generic Note E, the LRA credits the Inservice Inspection and Water Chemistry Control—BWR programs to manage cracking that may occur in the stainless steel steam incore instrument flux monitoring dry tubes during the period of extended operation.

During its review of LRA Table 3.1.1, AMR Item 3.1.1-103, and the aging management review items in LRA Table 3.1.2-2 referencing AMR Item 3.1.1-103, the staff needed additional information and therefore issued a request for additional information. RAI 3.1.2.1.2-2, dated February 8, 2018, and Entergy's response, dated March 6, 2018, are documented in ADAMS Accession Nos. ML18043A008, and ML18087A188, respectively.

The staff evaluated Entergy's response to RAI 3.1.2.1.2-2 and notes that Entergy amended AMR Item 3.1.1-103 to credit the Water Chemistry Control—BWR program (LRA AMP B.1.37) and the BWR Vessel Internals program (LRA AMP B.1.10) as the condition-monitoring programs for managing cracking in the incore instrument flux monitoring dry tubes. Entergy explained that any decision to replace the incore instrument flux monitoring dry tubes during the period of extended operation are outside the scope of the BWR Vessel Internals program. The staff finds Entergy's response and amendment of AMR Item 3.1.1-103 to be acceptable because: (a) the changes to the aging management review item have made the item consistent with Item 103 of SRP-LR Table 3.1-1, and (b) consistent with basis in the SRP-LR item, Entergy will use a combination of the Water Chemistry Control—BWR program and the BWR Vessel Internals program to manage cracking in the incore instrument flux monitoring dry tubes. The staff also finds Entergy's basis to keep any future incore instrument flux monitoring dry tube replacement activities outside of the scope of the BWR Vessel Internals program acceptable because these types of activities would adequately fall within the scope of Entergy's facility maintenance program. This resolves the issues raised in RAI 3.1.2.1.2-2.

Based on its review of components associated with AMR Item 3.1.1-103, for which Entergy originally cited generic Note E, the staff finds Entergy's amended proposal to manage the effects of aging using the Water Chemistry Control—BWR program and the BWR Vessel Internals program acceptable because the amended basis for aging management is consistent with the staff's basis in AMR Item 103 of SRP-LR Table 3.1-1.

3.1.2.1.6 Conclusion

The staff evaluated the GALL Report aging management review items that Entergy claims are not applicable. Based on its review, the staff concludes that the aging management review items, which Entergy claims are not applicable are not applicable to RBS, are not applicable to RBS.

As discussed in SER Section 3.1.2.1, for those aging management reviews for which Entergy claims consistency with the GALL Report, the staff evaluated Entergy's claim of consistency. The staff also reviewed information pertaining to Entergy's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the aging management review results, which Entergy claims to be consistent with the GALL Report, are consistent.

Therefore, the staff concludes that Entergy has demonstrated that it will adequately manage the effects of aging for these components in a way that maintains their intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2 Aging Management Review Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.1.2.2, Entergy further evaluates aging management, as recommended by the GALL Report, for the reactor vessel, internals, and reactor coolant system components and provides information concerning how it will manage the applicable aging effects.

For component groups evaluated in the GALL Report, for which Entergy claims consistency with the report and for which the report recommends further evaluation, the staff reviewed Entergy's evaluation to determine whether it adequately addresses the issues further evaluated. In addition, the staff reviewed Entergy's further evaluations against the criteria contained in SRP-LR Section 3.1.2.2. The staff's review of Entergy's further evaluation follows.

3.1.2.2.1 Cumulative Fatigue Damage

LRA Section 3.1.2.2.1 states that the plant-specific analyses for evaluating metal fatigue in reactor coolant pressure boundary components (i.e., ASME Code Class 1 components) are time-limited aging analyses (TLAAs) for the LRA. Entergy states that it evaluated these TLAAs in accordance with the requirements in 10 CFR 54.21(c)(1) and documented its evaluation in LRA Section 4.3.1, "Class 1 Fatigue." The identification of fatigue TLAAs for the reactor coolant system components is consistent with SRP-LR Section 3.1.2.2.1 and is therefore acceptable. See SER Section 4.3.1 for the staff's evaluation of the metal fatigue TLAAs for the ASME Code Class 1 components.

Entergy provides its environmentally assisted fatigue (EAF) assessment for these components in LRA Section 4.3.3. SER Section 4.3.3 documents the staff's evaluation of the environmentally assisted fatigue assessment.

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

The staff reviewed LRA Section 3.1.2.2.2 against the following criteria in SRP-LR Section 3.1.2.2.2:

Item 1. LRA Section 3.1.2.2.2, Item 1 is associated with LRA Table 3.1.1, Item 3.1.1-12 and addresses loss of material for various portions of pressurized-water reactor steam generator components. Entergy states that this item is not applicable because RBS is a BWR. The staff confirms that the associated item is not applicable because it only applies to pressurized-water reactors and finds Entergy's claim acceptable.

Item 2. LRA Section 3.1.2.2.2, Item 2 is associated with LRA Table 3.1.1, Item 3.1.1-12 and addresses loss of material for various portions of pressurized-water reactor steam generator components. Entergy states that this item is not applicable because RBS is a BWR. The staff confirmed that the associated item is not applicable because it only applies to pressurized-water reactors and finds Entergy's claim acceptable.

3.1.2.2.3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

The staff reviewed LRA Section 3.1.2.2.3 against the following criteria in SRP-LR Section 3.1.2.2.3:

Item 1. LRA Section 3.1.2.2.3, Item 1, associated with LRA Table 3.1.1, Item 3.1.1-13, addresses the steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds exposed to reactor coolant, for which Entergy will manage loss of fracture toughness due to neutron irradiation embrittlement. The staff reviewed Entergy's proposal against the criteria in SRP-LR Section 3.1.2.2.3, Item 1. The LRA states that neutron irradiation embrittlement is a TLAA evaluated in accordance with 10 CFR 54.21(c) and that the evaluation of these TLAAs are addressed in LRA Section 4.2. This is consistent with SRP-LR Section 3.1.2.2.3, Item 1 and is therefore acceptable. SER Section 4.2 and its subsections document the staff's evaluation of these TLAAs for neutron irradiation embrittlement.

Item 2. LRA Section 3.1.2.2.3, Item 2, associated with LRA Table 3.1.1, Item 3.1.1-14, addresses steel reactor vessel beltline shell, nozzles, and welds exposed to reactor coolant and neutron flux. Entergy will manage these for loss of fracture toughness due to neutron irradiation embrittlement by using the Reactor Vessel Surveillance program. The staff reviewed Entergy's proposal against the criteria in SRP-LR Section 3.1.2.2.3, Item 2.

The staff notes that: (a) Entergy included the applicable aging management review items for the reactor vessel beltline components in LRA Table 3.1-1, (b) Entergy credited the Reactor Vessel Surveillance program for the components to manage loss of fracture toughness due to neutron irradiation embrittlement, (c) Entergy's Reactor Vessel Surveillance program is consistent with the GALL Report AMP XI.M31, with a staff-approved exception, and (d) Entergy's Reactor Vessel Surveillance program is in compliance with the surveillance capsule withdrawal schedule requirements of 10 CFR Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements." In its review of components associated with LRA Table 3.1.1, Item 3.1.1-14, the staff finds that Entergy has met the further evaluation criteria. Entergy's proposal to manage the effects of aging using the Reactor Vessel Surveillance program is acceptable because Entergy credits an acceptable aging management program that is: a) consistent with the GALL Report, with a staff-approved exception, and b) in compliance with 10 CFR Part 50, Appendix H.

Based on the program that Entergy identified, the staff finds that Entergy's program meets the SRP-LR Section 3.1.2.2.3, Item 2 criterion. For those items associated with LRA Section 3.1.2.2.3, Item 2, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. LRA Section 3.1.2.2.3, associated with LRA Table 3.1.1, Item 3.1.1-15, addresses reduction in ductility and fracture toughness due to neutron irradiation embrittlement in stainless steel or nickel alloy reactor vessel internal components that are exposed to a reactor coolant with neutron flux environment. Entergy states that this item is not applicable to RBS.

The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.1.2.2.3, Item 3 and finds it acceptable because: (a) SRP-LR Section 3.1.2.2.3, Item 3 states that the aging management review item and further evaluation criteria apply only to the reactor vessel internal components in pressurized-water reactors designed by the Babcock & Wilcox Company, and (b) the staff reviewed Entergy's USAR and confirmed that RBS is a BWR facility with a nuclear steam supply system (including the reactor vessel internal components) designed by the General Electric Company (and not by Babcock & Wilcox).

3.1.2.2.4 Cracking Due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.4 against the following criteria in SRP-LR Section 3.1.2.2.4:

Item 1. LRA Section 3.1.2.2.4.1, associated with LRA Table 3.1.1, Item 3.1.1-16, addresses the top head enclosure vessel flange leak detection line exposed to treated water that Entergy will manage for cracking due to stress corrosion cracking (SCC) and intergranular stress corrosion (IGSCC) by using the Water Chemistry Control—BWR program and the new One-Time Inspection program. The criteria in SRP-LR Section 3.1.2.2.4.1 state that cracking due to stress corrosion cracking and intergranular stress corrosion cracking could occur in the stainless steel and nickel alloy BWR top head enclosure vessel flange leak detection lines. The SRP-LR also states that the GALL Report recommends that a plant-specific program be evaluated because existing programs may not be capable of mitigating or detecting cracking due to stress corrosion cracking and intergranular stress corrosion cracking.

The LRA also states that the leak detection line flow path from the nickel alloy nozzle to the drain is fabricated with carbon steel, which is not susceptible to stress corrosion cracking. The LRA further states that the stainless steel portion of the vessel flange leak detection line is an instrumentation branch line for a pressure switch.

The staff's evaluations of Entergy's Water Chemistry Control—BWR program and new One-Time Inspection program are documented in SER Sections 3.0.3.1.17 and 3.0.3.1.3, respectively. In its review of components associated with LRA Table 3.1.1, Item 3.1.1-16, the staff finds that Entergy has met the further evaluation criteria. Entergy's proposal to manage the effects of aging using these programs is acceptable because the Water Chemistry Control—BWR program limits the concentrations of chemical species known to cause stress corrosion cracking within the acceptable ranges to minimize the environmental effect on stress corrosion cracking, and the new One-Time Inspection program confirms the effectiveness of the Water Chemistry Control—BWR program.

Based on the programs identified, the staff finds that Entergy's programs and aging management evaluation meet the SRP-LR Section 3.1.2.2.4.1 criteria. For those items associated with LRA Section 3.1.2.2.4.1, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 2. LRA Section 3.1.2.2.4, associated with LRA Table 3.1.1, Item 3.1.1-17, addresses stress corrosion cracking and intergranular stress corrosion cracking in stainless steel BWR isolation condenser components exposed to reactor coolant. Entergy states that this item is not applicable because RBS does not have an isolation condenser. The staff reviewed the USAR and confirmed that the RBS design does not include a BWR isolation condenser.

3.1.2.2.5 Crack Growth Due to Cyclic Loading

The staff reviewed LRA Section 3.1.2.2.5 against the criteria in SRP-LR Section 3.1.2.2.5.

LRA Section 3.1.2.2.5, associated with LRA Table 3.1.1, Item 3.1.1-18, addresses crack growth due to cyclic loading in the reactor vessel shell fabricated of SA-508-Cl 2 forgings clad with stainless steel using a high-heat-input welding process exposed to reactor coolant. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.1.2.2.5 and confirmed that this item is associated only with pressurized-water reactors. Therefore, the staff finds Entergy's claim acceptable.

3.1.2.2.6 Cracking Due to Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.6 against the criteria in SRP-LR Section 3.1.2.2.6.

In LRA Section 3.1.2.2.6, Item 1, associated with LRA Table 3.1.1, Item 3.1.1-19, Entergy states that this item is not applicable to RBS, which is a BWR, because the associated item in LRA Table 3.1.1 is applicable to pressurized-water reactors only. The staff evaluated Entergy's claim of, aging management consistency with the GALL Report, against the criteria in SRP-LR Section 3.1.2.2.6, Item 1 and confirms that this item is associated only with pressurized-water reactors. Therefore, the staff finds Entergy's claim acceptable.

LRA Section 3.1.2.2.6, Item 2, associated with LRA Table 3.1.1, Item 3.1.1-20, addresses cracking due to stress corrosion cracking in cast austenitic stainless steel (CASS) Class 1 piping, piping components, and piping elements exposed to reactor coolant. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.1.2.2.6, Item 2 and confirms that this item is associated only with pressurized-water reactors. Therefore, the staff finds Entergy's claim acceptable.

3.1.2.2.7 Cracking Due to Cyclic Loading

The staff reviewed LRA Section 3.1.2.2.7 against the criteria in SRP-LR Section 3.1.2.2.7.

LRA Section 3.1.2.2.7, associated with LRA Table 3.1.1, Item 3.1.1-21, addresses cracking due to cyclic loading in stainless steel BWR isolation condenser components exposed to reactor coolant. Entergy states that this item is not applicable because RBS does not have an isolation condenser. The staff reviewed the USAR and confirms that the RBS design does not include a BWR isolation condenser.

3.1.2.2.8 Loss of Material Due to Erosion

LRA Section 3.1.2.2.8 is associated with LRA Table 3.1.1, Item 3.1.1-22 and addresses loss of material due to erosion in pressurized-water reactor steam generator components. Entergy states that this item is not applicable to RBS because it is a BWR. The staff confirms that the associated item is not applicable because it only applies to pressurized-water reactors and finds Entergy's claim acceptable.

3.1.2.2.9 Cracking Due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking

Entergy states that this further evaluation item was removed from the SRP-LR as a result of LR-ISG-2011-04. The staff confirms that this item was removed from the SRP-LR by LR-ISG-2011-04.

3.1.2.2.10 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement, Change in Dimension Due to Void Swelling, Loss of Preload Due to Stress Relaxation, or Loss of Material Due to Wear

Entergy states that this further evaluation item was removed from the SRP-LR as a result of LR-ISG-2011-04. The staff confirms that this item was removed from the SRP-LR by LR-ISG-2011-04.

3.1.2.2.11 Cracking Due to Primary Water Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.11 against the criteria in SRP-LR Section 3.1.2.2.11.

Item 1. LRA Section 3.1.2.2.11, associated with LRA Table 3.1.1, Item 3.1.1-25, addresses cracking due to primary water stress corrosion cracking in nickel alloy steam generator divider plate assemblies exposed to reactor coolant. Entergy states that this item is not applicable. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.1.2.2.11, Item 1 and finds it acceptable because RBS does not have steam generators.

Item 2. LRA Section 3.1.2.2.11, associated with LRA Table 3.1.1, Item 3.1.1-25, addresses cracking due to primary water stress corrosion cracking in nickel alloy tube-to-tubesheet welds exposed to reactor coolant. Entergy states that this item is not applicable. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.1.2.2.11, Item 2 and finds it acceptable because RBS does not have steam generators.

3.1.2.2.12 Cracking Due to Fatigue

Entergy states that this further evaluation item was removed from the SRP-LR as a result of LR-ISG-2011-04. The staff confirms that this item was removed from the SRP-LR by LR-ISG-2011-04.

3.1.2.2.13 Cracking Due to Stress Corrosion Cracking and Fatigue

Entergy states that this further evaluation item was removed from the SRP-LR as a result of LR-ISG-2011-04. The staff confirms that this item was removed from the SRP-LR by LR-ISG-2011-04.

3.1.2.2.14 Loss of Material Due to Wear

Entergy states that this further evaluation item was removed from the SRP-LR as a result of LR-ISG-2011-04. The staff confirms that this item was removed from the SRP-LR by LR-ISG-2011-04.

3.1.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of Entergy's quality assurance program.

3.1.2.2.16 Ongoing Review of Operating Experience

SER Section 3.0.5 documents the staff's evaluation of Entergy's ongoing review of operating experience.

3.1.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL Report

In LRA Table 3.1.2-1 through Table 3.1.2-4, LRA Table 3.1.2-4-1, and LRA Table 3.1.2-4-2, the staff reviewed additional details of the aging management review results for material, environment, aging effect requiring management, and aging management program combinations not consistent with or not addressed in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed Entergy's evaluation to determine whether Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation. The following sections document the staff's evaluation.

3.1.2.3.1 Reactor Vessel—Summary of Aging Management Review—LRA Table 3.1.2-1

The staff reviewed LRA Table 3.1.2-1, which summarizes the results of aging management review evaluations for the reactor vessel component groups.

Carbon Steel Reactor Coolant Pressure Boundary Components Exposed to Air – Indoor (Ext).

In LRA Table 3.1.2-1, Entergy states that, for carbon steel and carbon steel clad with stainless steel reactor coolant pressure boundary components exposed to air – indoor (external), aging effects are not applicable, and Entergy proposes no aging management program. The aging management review items cite generic Note G. The aging management review items also cite plant-specific Note 102, which states that high component surface temperature precludes moisture accumulation that could result in corrosion.

The components in LRA Table 3.1.2-1 are associated with reactor vessel components that are exposed to reactor coolant temperatures during operating and shutdown conditions. Therefore, the staff finds Entergy's claim that the cited components would be expected to be dry (i.e., above the dew point) during both operating and shutdown conditions acceptable.

The staff reviewed the associated items in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and environment description. The staff did not identify any additional, applicable aging effects.

The staff finds Entergy's proposal to manage the effects of aging acceptable because: a) based on its review of the GALL Report, there are no aging effects requiring management and no recommended aging management program for dry surfaces of steel components exposed to indoor air, and b) these components are expected to remain dry during operating and shutdown conditions due to the high component surface temperature.

<u>Carbon Steel Reactor Vessel Components Exposed to Air – Indoor (Ext).</u>

In LRA Section 3.1.2.1.1 and associated LRA Table 3.1.2-1, Entergy states that carbon steel reactor vessel externally attached support skirt exposed to indoor air will be managed for loss of material by using Entergy's Inservice Inspection program. The aging management review item cites generic Note H, indicating that the aging effect is not in the GALL Report for this component, material, and environment combination. The staff reviewed the associated item in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and environment description. Based on its review, the staff finds that Entergy identified all credible aging effects for these components, materials, and environment combination.

The staff's evaluation of the Inservice Inspection program is documented in SER Section 3.0.3.1.10. The staff notes that the Inservice Inspection program manages loss of material for the reactor vessel externally attached support skirt using visual inspection in accordance with ASME Code Section XI, Subsection IWA. The staff finds that Entergy's proposed program to manage loss of material for carbon steel that is exposed to indoor air acceptable because Entergy will use inspection techniques that are in accordance with ASME Code Section XI, Subsection IWA, which are acceptable for detection of loss of material.

On the basis of its review, the staff finds that Entergy has appropriately evaluated the aging management review results of material, environment, aging effect requiring management, and aging management program combinations not evaluated in the GALL Report. The staff finds that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.2 <u>Reactor Vessel Internals—Summary of Aging Management Review—LRA Table 3.1.2-2</u>

The staff reviewed LRA Table 3.1.2-2, which summarizes the results of aging management review evaluations for the reactor vessel internals system component groups.

<u>Stainless Steel Steam Dryer Assembly Components Exposed to Treated Water > 140 ºF.</u>

In LRA Table 3.1.2-2, Entergy states that the steam dryer assembly components made from stainless steel and exposed to a treated water > 140 ºF environment will be managed for cracking by using the Water Chemistry Control—BWR program (LRA AMP B.1.42). The aging management review item cites generic Note H.

The staff finds Entergy's proposal to manage cracking using both the BWR Vessel Internals program and the Water Chemistry Control—BWR program acceptable because: (a) the basis is consistent with AMR Item 101 and Item 103 of SRP-LR Table 3.1-1, (b) the BWR Vessel Internals program accounts for cracking that may be induced in the steam dryer components due to cyclical load, vibrational loading, stress corrosion cracking, or intergranular stress corrosion cracking mechanisms, (c) the Water Chemistry Control—BWR program will provide additional preventive or mitigative controls for managing any cracking that is induced by a stress corrosion cracking or intergranular stress corrosion cracking mechanism,[2] and (d) based on its review of the GALL Report, SRP-LR, and the aging guidance in EPRI Report BWRVIP-139-A (including Appendix B of the report), the staff finds that Entergy has addressed all credible cracking mechanisms for this component, material, and environment combination.

Stainless Steel Reactor Vessel Internals (RVI) Bolts Exposed to Treated Water > 140 ºF

In LRA Table 3.1.2-2, Entergy states that the reactor vessel internal bolts and brackets made from stainless steel and exposed to a treated water > 140 ºF environment will be managed for loss of preload by using the BWR Vessel Internals program (LRA AMP B.1.10). The aging management review item cites generic Note H, for which Entergy has identified loss of preload as an additional aging effect.

The staff finds Entergy's proposal to manage loss of preload acceptable because: (a) the staff confirms that Entergy's program includes appropriate programmatic condition monitoring activities for detecting loss of preload or loss of integrity in the reactor vessel internal bolted connections in the plant design, and (b) Entergy's basis is consistent with the basis in GALL Report AMP XI.M9 for managing loss of preload or loss of integrity in BWR vessel internal bolted connection locations.

3.1.2.3.3 Reactor Coolant Pressure Boundary—Summary of Aging Management Review—LRA Table 3.1.2-3

The staff reviewed LRA Table 3.1.2-3, which summarizes the results of aging management review evaluations for the reactor coolant pressure boundary system component groups.

Carbon Steel Flange Seal Leak Detection Components (Non-Class 1) Exposed Internally to Treated Water.

In LRA Table 3.1.2-3, Entergy states that carbon steel flange seal leak detection components exposed internally to treated water will be managed for loss of material by the Water Chemistry Control—BWR program and the new One-Time Inspection program. The aging management review item cites generic Note H, for which Entergy has identified loss of material as an additional aging effect.

[2] The staff has not listed irradiated-assisted stress corrosion cracking (IASCC) as an applicable mechanism for inducing cracking in stainless steel steam dryer assembly components. The mechanism of IASCC is not normally applicable to stainless steel components in the steam dryer assembly because the steam dryers are located above the reactor core, where the neutron fluence exposures of the components are typically less than that needed for initiating cracking in the components by an IASCC mechanism.

The staff finds Entergy's proposal to manage loss of material acceptable because the Water Chemistry Control—BWR program is capable of managing loss of material by periodic monitoring and control of corrosive impurities listed in the EPRI water chemistry guidelines. Additionally, Entergy will use the new One-Time Inspection program to verify the effectiveness of the Water Chemistry Control—BWR program designed to prevent or minimize the effects of aging to the extent that they will not cause the loss of intended function during the period of extended operation.

In LRA Table 3.1.2-3, Entergy states that carbon steel flange seal leak detection components exposed internally to treated water will be managed for loss of material by using the Water Chemistry Control—BWR program and the new One-Time Inspection program. The aging management review item cites generic Note F.

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by Entergy constitute all of the credible aging effects for this component, material, and environment description. The staff notes that Entergy addresses loss of material, and loss of material—FAC (flow-accelerated corrosion) for this material and environment combination in LRA Table 3.1.2-3, Item 3.2.1-16 and Item 3.1.1-60, respectively. The staff also notes that the carbon steel flange seal leak detection components are not susceptible to wall thinning due to flow-accelerated corrosion because the components in question do not have a constant flow, which is needed for wall thinning to occur. Based on its review of the GALL Report, which states that carbon steel is vulnerable to loss of material due to general, pitting, and crevice corrosion, the staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination.

The staff finds Entergy's proposal to manage the effects of aging acceptable because the Water Chemistry Control—BWR program is capable of managing loss of material by periodic monitoring and control of corrosive impurities listed in the EPRI water chemistry guidelines. Additionally, Entergy will use the new One-Time Inspection program to verify the effectiveness of the Water Chemistry Control—BWR program.

Nickel Alloy Flex Hose (Non-Class 1) Exposed to Treated Water

In LRA Table 3.1.2-3, Entergy states that nickel alloy flex hose exposed to treated water will be managed for cracking by using the Water Chemistry Control—BWR program . The aging management review item cites generic Note H, for which Entergy has identified cracking as an additional aging effect.

The staff notes that cracking is an aging effect requiring management for nickel alloy components in various environments. The staff finds Entergy's proposal to manage cracking using the Water Chemistry Control—BWR program acceptable because this program is capable of managing cracking by periodic monitoring and control of corrosive impurities listed in the EPRI water chemistry guidelines. Additionally, Entergy will use the new One-Time Inspection program to verify the effectiveness of the Water Chemistry Control—BWR program.

Carbon Steel Piping and Valve Bodies Exposed to Air – Indoor (External)

In LRA Table 3.1.2-3, Entergy states that for carbon steel piping and valve bodies exposed to indoor air, there is no aging effect and Entergy proposes no aging management program. The aging management review items cite generic Note G. The aging management review items also cite plant-specific Note 102, which states the component's high surface temperature precludes moisture accumulation that could result in corrosion.

The staff reviewed the associated items in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and environment description. The staff notes that Entergy addresses loss of material for this component, material, and environment combination in other aging management review items, where component surface temperatures may not preclude moisture accumulation. Based on its review of the GALL Report (AP-2), there are no aging effects requiring management and no recommended aging management program for dry surfaces of steel components exposed to indoor air, therefore, the staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination. Additionally, the staff notes that, during shutdown conditions, component temperatures can reach near or below the dew point, which means moisture could potentially accumulate. However, the staff finds Entergy's proposal to manage the effects of aging acceptable because there is reasonable assurance that if moisture does accumulate, the duration of moisture accumulation would be too short to allow significant corrosion resulting in a loss of intended function to occur.

3.1.2.3.4 Nuclear Boiler Instrumentation System Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Review—LRA Table 3.1.2-4-1

The staff reviewed the LRA Table 3.1.2-4-1, which summarizes the results of aging management review evaluations for the nuclear boiler instrumentation system component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.1.2.3.5 Reactor Recirculation System Nonsafety-Related Components Affecting Safety-Related Systems—LRA Table 3.1.2-4-2

Nickel Alloy Flex Hose Exposed to Lube Oil

In LRA Table 3.1.2-4-2, Entergy states that nickel alloy flex hose exposed to lube oil will be managed for loss of material by using the Oil Analysis program. The aging management review item cites generic Note G.

The staff reviewed the associated items in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and environment description. The staff notes that Entergy addresses cracking caused by metal fatigue for this component, material, and environment combination in other aging management review items. Based on its review of the ASM *Specialty Handbook – Nickel, Cobalt, and Their Alloys*, dated December 2000, which states that nickel alloys, such as alloy 600 from which the elements are constructed, are "highly resistant to general corrosion and stress corrosion cracking but can be attacked at high caustic concentrations and temperatures." In addition, stress corrosion cracking has also been found to occur in environments with elevated levels of halides and sulfur species. The staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination. The staff also notes that the item does not cite a verification program, such as the One-Time Inspection program, to verify that the Oil Analysis program has been effective at managing the aging effects of loss of material.

Additionally, the LRA did not specify if a new One-Time Inspection program will be used in LRA Table 3.1.2-4-2 and Table 3.3.2-3. The staff needed additional information and therefore issued a request for additional information. RAI 3.1.2.4.2.1, dated December 13, 2017, and Entergy's response, dated January 24, 2018, are documented in ADAMS Accession No. ML17347B424 and No. ML18025B544, respectively. The staff finds Entergy's response acceptable because the LRA tables in question will be included in the new One-Time Inspection program. The staff finds Entergy's proposal to manage the effects of aging acceptable because the new One-Time Inspection program will verify the effectiveness of the Oil Analysis program by confirming that unacceptable loss of material is not occurring.

On the basis of its review, the staff finds that Entergy has appropriately evaluated the aging management review results of material, environment, aging effect requiring management, and aging management program combinations not evaluated in the GALL Report. The staff finds that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.3 Conclusion

The staff concludes that Entergy has demonstrated that it will adequately manage the effects of aging of the reactor vessel, reactor vessel internals, and reactor coolant system components within the scope of license renewal and subject to an aging management review in a way that maintains the intended functions consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2 Aging Management of Engineered Safety Features Systems

3.2.1 Summary of Technical Information in the Application

LRA Section 3.2 provides aging management review results for the engineered safety features (ESF) systems components and component groups. LRA Table 3.2.1, "Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801," is a summary comparison of Entergy's aging management reviews with those evaluated in the GALL Report for the engineered safety features systems components and component groups.

3.2.2 Staff Evaluation

Table 3.2-1 summarizes the staff's evaluation of components, aging effects or mechanisms, and aging management programs listed in LRA Section 3.2 and addressed in the GALL Report.

Table 3.2-1 Staff Evaluation for Engineered Safety Features Systems Components in the GALL Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.2.1-1	Consistent with the GALL Report (see SER Section 3.2.2.2.1)
3.2.1-2	Not Applicable to BWRs (see SER Section 3.2.2.2.2)
3.2.1-3	Not Applicable to RBS (see SER Section 3.2.2.2.3)
3.2.1-4	Consistent with the GALL Report (see SER Section 3.2.2.2.3)

Component Group (SRP-LR Item No.)	Staff Evaluation
3.2.1-5	Not Applicable to BWRs (see SER Section 3.2.2.2.4)
3.2.1-6	Not Applicable to RBS (see SER Section 3.2.2.2.5)
3.2.1-7	Consistent with the GALL Report (see SER Section 3.2.2.2.6)
3.2.1-8	Not Applicable to BWRs (see SER Section 3.2.2.1.1)
3.2.1-9	Not Applicable to BWRs (see SER Section 3.2.2.1.1)
3.2.1-10	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-11	Consistent with the GALL Report
3.2.1-12	Consistent with the GALL Report
3.2.1-13	Consistent with the GALL Report
3.2.1-14	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-15	Consistent with the GALL Report
3.2.1-16	Consistent with the GALL Report
3.2.1-17	Consistent with the GALL Report (see SER Section 3.2.2.1.4)
3.2.1-18	Consistent with the GALL Report
3.2.1-19	Consistent with the GALL Report
3.2.1-20	Not Applicable to BWRs (see SER Section 3.2.2.1.1)
3.2.1-21	Not Applicable to BWRs (see SER Section 3.2.2.1.1)
3.2.1-22	Not Applicable to BWRs (see SER Section 3.2.2.1.1)
3.2.1-23	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-24	Not Applicable to BWRs (see SER Section 3.2.2.1.1)
3.2.1-25	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-26	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-27	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-28	Consistent with the GALL Report
3.2.1-29	Consistent with the GALL Report
3.2.1-30	Consistent with the GALL Report (see SER Section 3.2.2.1.2)
3.2.1-31	Consistent with the GALL Report
3.2.1-32	Consistent with the GALL Report (see SER Section 3.2.2.1.2)
3.2.1-33	Consistent with the GALL Report
3.2.1-34	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-35	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-36	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-37	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-38	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-39	Consistent with the GALL Report
3.2.1-40	Consistent with the GALL Report
3.2.1-41	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-42	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-43	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-44	Consistent with the GALL Report (see SER Section 3.2.2.1.3)
3.2.1-45	Not Applicable to BWRs (see SER Section 3.2.2.1.1)
3.2.1-46	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-47	Not Applicable to BWRs (see SER Section 3.2.2.1.1)
3.2.1-48	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-49	Consistent with the GALL Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.2.1-50	Consistent with the GALL Report
3.2.1-51	Consistent with the GALL Report
3.2.1-52	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-53	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-53.5	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-54	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-55	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-56	Consistent with the GALL Report
3.2.1-57	Consistent with the GALL Report
3.2.1-58	Not Applicable to BWRs (see SER Section 3.2.2.1.1)
3.2.1-59	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-60	Consistent with the GALL Report
3.2.1-61	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-62	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-63	Consistent with the GALL Report
3.2.1-64	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-65	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-66	Consistent with the GALL Report (see SER Section 3.2.2.2.9)
3.2.1-67	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-68	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-69	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-70	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-71	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-72	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-73	Not Applicable to RBS (see SER Section 3.2.2.1.1)
3.2.1-74	Not Applicable to RBS (see SER Section 3.2.2.1.1)
…	

The staff's review of the engineered safety features systems component groups followed one of three approaches.

1) One approach, documented in SER Section 3.2.2.1, reviews aging management review results for components that Entergy claims are consistent with the GALL Report and require no further evaluation.

2) Another approach, documented in SER Section 3.2.2.2, reviews aging management review results for components that Entergy claims are consistent with the GALL Report and for which further evaluation is recommended.

3) A third approach, documented in SER Section 3.2.2.3, reviews aging management review results for components that Entergy claims are not consistent with, or not addressed in, the GALL Report.

SER Section 3.0.3 documents the staff's review of aging management programs credited to manage or monitor aging effects of the engineered safety features systems components.

3.2.2.1 Aging Management Review Results Consistent with the GALL Report

LRA Section 3.2.2.1 identifies the materials, environments, aging effects requiring management, and aging management programs for the engineered safety features systems components.

LRA Table 3.2.2-1 through Table 3.2.2-7 and LRA Table 3.2.2-8-1 through Table 3.2.2-8-5 summarize Entergy's aging management reviews for RBS engineered safety features systems components and indicate aging management reviews Entergy claims are consistent with the GALL Report.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material in the LRA was applicable and that Entergy identified the appropriate GALL Report aging management reviews. The staff's evaluation follows.

3.2.2.1.1 Aging Management Review Results Identified as Not Applicable or Not Used

For LRA Table 3.2.1, Item 3.2.1-8, Item 3.2.1-9, Item 3.2.1-20 through Item 3.2.1-22, Item 3.2.1-24, Item 3.2.1-45, Item 3.2.1-47, and Item 3.2.1-58, Entergy claims that the corresponding aging management review items in the GALL Report are not applicable because the associated items are only applicable to pressurized-water reactors (PWRs). The staff reviewed the SRP-LR, confirmed these items only apply to pressurized-water reactors, and agrees that these items are not applicable to RBS because it is a BWR.

For LRA Table 3.2.1, Item 3.2.1-23, Item 3.2.1-25 through Item 3.2.1-27, Item 3.2.1-34 through Item 3.2.1-38, Item 3.2.1-41 through Item 3.2.1-43, Item 3.2.1-46, Item 3.2.1-48, Item 3.2.1-52, Item 3.2.1-53, Item 3.2.1-53.5, Item 3.2.1-54, Item 3.2.1-55, Item 3.2.1-59, Item 3.2.1-61, Item 3.2.1-62, Item 3.2.1-64 and Item 3.2.1-67 through Item 3.2.1-74, Entergy claims that they are not applicable or not used. The staff reviewed the LRA and USAR and confirms that Entergy's LRA does not have any aging management review results that are applicable for these items, or the items require no aging management.

LRA Table 3.2.1, Item 3.2.1-10 addresses cast austenitic stainless steel piping, piping components, and piping elements exposed to borated treated water >250 °C (>482 °F) and treated water >250 °C (>482 °F). Entergy stated that this item is not applicable. The staff evaluated Entergy's claim and finds it acceptable because the staff reviewed the USAR and did not identify any applicable cast austenitic stainless steel piping components in engineered safety features systems that are within the scope of license renewal.

For LRA Table 3.2.1, Item 3.2.1-14, Entergy claims that the corresponding items in the GALL Report are not applicable because they are addressed by other items in LRA Table 3.2.1. The staff reviewed the LRA and confirms that Entergy will address the aging effects by other LRA Table 3.2.1 items. Therefore, the staff finds Entergy's proposal acceptable.

LRA Table 3.2.1, Item 3.2.1-65 addresses components made from any material exposed to treated water. Entergy states that this item is not applicable to RBS because there are no components in RBS engineered safety features systems that are susceptible to wall thinning due to erosion. The staff evaluated Entergy's claim and finds it acceptable because during its audit, the staff searched Entergy's operating experience database and did not identify any components in RBS engineered safety features systems that were experiencing wall thinning due to erosion.

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

LRA Table 3.2.1, Item 3.2.1-30 and Item 3.2.1-32 address carbon steel and copper alloy heat exchanger components exposed to closed-cycle cooling water, for which Entergy will manage loss of material due to general, pitting, crevice, and galvanic corrosion. For the aging management review items that cite generic Note E, the LRA credits the Service Water Integrity program to manage the effects of aging for carbon steel heat exchanger channel heads and copper alloy heat exchanger tubes and tubesheets.

The staff notes that Entergy's initial response to Generic Letter (GL) 89-13, dated February 2, 1990 (see ADAMS Accession No. ML18018A012), includes the development of scheduled inspections and specific maintenance instructions for service water heat exchangers. In addition, Entergy's updated response to GL 89-13, dated October 21, 1998 (see ADAMS Accession No. ML18018A014), includes the continuing commitment to test the residual heat removal heat exchangers due to shell-side concerns from untreated suppression pool water. Based on its review of components associated with LRA Table 3.2.1, Item 3.2.1-30 and Item 3.2.1-32, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the effects of aging using the Service Water Integrity program acceptable. The Service Water Integrity program, which implements the guidance from GL 89-13, includes sufficient inspection and testing activities to identify loss of material in the associated heat exchanger components.

3.2.2.1.3 Loss of Material Due to General Corrosion

LRA Table 3.2.1, Item 3.2.1-44 addresses carbon steel piping, ducting, and components internally exposed to uncontrolled indoor air, for which Entergy will manage loss of material due to general corrosion. For the aging management review items that cite generic Note E, the LRA credits the External Surfaces Monitoring program to manage the aging effect for steel piping, fan housings, and valve bodies.

Based on its review of components associated with LRA Table 3.2.1, Item 3.2.1-44, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the effects of aging using the External Surfaces Monitoring program acceptable because the program requires periodic visual inspections of component external surfaces (at least once each refueling outage). These periodic visual inspections are sufficient to identify the potential for corrosion of component internal surfaces when internal and external environments are the same.

3.2.2.1.4 Loss of Material Due to Pitting and Crevice Corrosion

LRA Table 3.2.1, Item 3.2.1-17 addresses stainless steel piping exposed to treated water internally and externally, for which Entergy will manage loss of material due to pitting and crevice corrosion. For the aging management review items that cite generic Note E, the LRA credits the new One-Time Inspection program to manage the aging effect for stainless steel piping. These aging management review items also cite plant-specific Note 203, which states that the associated piping potentially has accelerated loss of material because it passes through the waterline region of the suppression pool with the environment alternating between wet and dry.

Based on its review of components associated with LRA Table 3.2.1, Item 3.2.1-17, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the effects of aging using the new One-Time Inspection program acceptable. The new One-Time Inspection program will confirm that either the aging effect is not occurring or that the aging effect is occurring so slowly that it does not affect the component's or structure's intended function. Additionally, the staff recognizes that because the piping passing through the waterline region of the suppression pool is exposed to treated water, Entergy will also manage this piping for loss of material by using the Water Chemistry Control—BWR aging management program. This aging management program includes periodic monitoring and control of corrosive impurities listed in the EPRI water chemistry guidelines.

3.2.2.1.5 Conclusion

The staff evaluated the GALL Report aging management review items that Entergy claims are not applicable. On the basis of its review, the staff concludes that the aging management review results, which Entergy claims are not applicable, are not applicable to RBS.

As discussed in SER Section 3.2.2.1, for those aging management reviews for which Entergy claims consistency with the GALL Report, the staff evaluated Entergy's claim of consistency. The staff also reviewed information pertaining to Entergy's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the aging management review results, which Entergy claims are consistent with the GALL Report, are consistent.

Therefore, the staff concludes that Entergy has demonstrated that it will adequately manage the effects of aging for these components in a way that maintains their intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2 Aging Management Review Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.2.2.2, Entergy further evaluates aging management, as recommended by the GALL Report, for the engineered safety features systems components and provides information concerning how it will manage the applicable aging effects.

For component groups evaluated in the GALL Report, for which Entergy claims consistency with the report and for which the report recommends further evaluation, the staff audited and reviewed Entergy's evaluation to determine whether it adequately addresses the issues further evaluated. In addition, the staff reviewed Entergy's further evaluations against the criteria in SRP-LR Section 3.2.2.2. The staff's review of Entergy's further evaluation follows.

3.2.2.2.1 Cumulative Fatigue Damage

LRA Section 3.2.2.2.1 states that the plant-specific analyses for evaluating metal fatigue in emergency safety feature system components are time-limited aging analyses (TLAAs) for the LRA. Entergy states that it evaluated these TLAAs in accordance with requirements in 10 CFR 54.21(c)(1) and documents this evaluation in LRA Section 4.3.2, "Non-Class 1 Fatigue." This is consistent with SRP-LR Section 3.2.2.2.1 and is therefore acceptable. In SER Section 4.3.2, the staff evaluates the metal fatigue TLAAs for the emergency safety feature components.

3.2.2.2.2 Loss of Material Due to Cladding Breach

LRA Section 3.2.2.2.2, associated with LRA Table 3.2.1, Item 3.2.1-2, addresses loss of material due to cladding breach in pressurized-water reactor steel pump casings with stainless steel cladding exposed to treated borated water. Entergy states that this item is not applicable to RBS (which is a BWR) because the item is only applicable to pressurized-water reactors. The staff confirms that this item is associated only with pressurized-water reactor plants; therefore, the staff finds Entergy's determination acceptable.

3.2.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion

Item 1. LRA Section 3.2.2.2.3, associated with LRA Table 3.2.1, Item 3.2.1-3, addresses loss of material due to pitting and crevice corrosion in partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.2.2.2.3, Item 1 and finds it acceptable because based on a review of the LRA and USAR, RBS engineered safety feature systems do not include partially encased stainless steel tanks exposed to this environment.

Item 2. LRA Section 3.2.2.2.3, associated with LRA Table 3.2.1, item 3.2.1-4, addresses loss of material due to pitting and crevice corrosion in stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. Entergy states that this item is not applicable because there are no in-scope stainless steel components exposed to outdoor air in the engineered safety features systems. However, during its review of indoor stainless steel components in the engineered safety features, auxiliary, and steam and power conversion systems exposed to air which has recently been introduced into buildings (associated with further evaluation LRA Sections 3.2.2.2.3.2, 3.2.2.2.6, 3.3.2.2.3, 3.3.2.2.5, 3.4.2.2.2, and 3.4.2.2.3), the staff needed additional information. Therefore, on February 7, 2018, the staff issued a request for additional information, RAI B.1.17-1 (see ADAMS Accession No. ML18038B470). The summary of the public telephone conference call on April 10, 2018 to discuss Entergy's response to RAI B.1.17-1 is documented in ADAMS Accession No. ML18120A135. Entergy's responses on March 8, 2018 and May 10, 2018, are documented in ADAMS Accession Nos. ML18067A437 and ML18130A935, respectively.

The staff evaluated Entergy's responses to RAI B.1.17-1 and notes that Entergy will use the One-Time Inspection program to perform surface examinations (for cracking due to stress corrosion cracking) and visual examinations (for loss of material) on stainless steel components exposed to outdoor air to verify aging effects are not occurring on stainless steel components exposed to air which has been recently introduced into buildings. The staff finds Entergy's response and changes to the One-Time Inspection program and associated USAR supplement acceptable because one-time surface and visual examinations performed on a representative sample of stainless steel components exposed to the more aggressive outdoor air environment within the 10 years prior to the period of extended operation will provide reasonable assurance that cracking and loss of material are not occurring on stainless steel components exposed to air which has recently been introduced into buildings.

Based on the program identified, the staff determines that Entergy's program meets SRP-LR Section 3.2.2.2.3.2 criteria. For those items associated with LRA Section 3.2.2.2.3.2, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.4 Loss of Material Due to Erosion

LRA Section 3.2.2.2.4, associated with LRA Table 3.2.1, Item 3.2.1-5, addresses loss of material due to erosion in the stainless steel minimum flow orifices of the high-pressure safety injection pumps for pressurized-water reactors. Entergy states that this item is not applicable to RBS because it is a BWR. The staff agrees that the associated item is not applicable because it only applies to pressurized-water reactors.

3.2.2.2.5 Loss of Material Due to General Corrosion and Fouling That Leads to Corrosion

LRA Section 3.2.2.2.5, associated with LRA Table 3.2.1, Item 3.2.1-6, addresses loss of material due to general corrosion and fouling for steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to indoor air. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.2.2.2.5 and finds it acceptable because there are no in-scope steel nozzles or orifices exposed to indoor air in the engineered safety features systems at RBS.

3.2.2.2.6 Cracking Due to Stress Corrosion Cracking

As amended by letter dated May 10, 2018, LRA Section 3.2.2.2.6, associated with LRA Table 3.2.1, Item 3.2.1-7, addresses cracking in stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air and air recently introduced into buildings. Entergy states (a) there are no engineered safety features system components exposed to outdoor air in the scope of license renewal, and (b) stainless steel components exposed to air recently introduced into buildings will be managed for cracking due to stress corrosion cracking by the One-Time Inspection program.

The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.2.2.2.6 and finds it acceptable because (a) there are no in-scope stainless steel components exposed to outdoor air in the engineered safety features systems, and (b) the staff's evaluation of stainless steel components exposed to air recently introduced into buildings, which are being managed for cracking due to stress corrosion cracking using the One-Time Inspection program, found the proposal acceptable, as is documented in SER Section 3.2.2.2.3, Item 2.

Based on the program identified, the staff finds that Entergy's program meets SRP-LR Section 3.2.2.2.6 criteria. For those items associated with LRA Section 3.2.2.2.6, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.7 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of Entergy's quality assurance program.

3.2.2.2.8 Ongoing Review of Operating Experience

SER Section 3.0.5 documents the staff's evaluation of Entergy's ongoing review of operating experience.

3.2.2.2.9 Loss of Material Due to Recurring Internal Corrosion

LRA Section 3.2.2.2.9, associated with LRA Table 3.2.1, Item 3.2.1-66, addresses loss of material due to recurring internal corrosion in metallic piping and components exposed to raw water or waste water. Entergy states that its review of RBS plant operating experience did not identify conditions meeting the definition of recurring internal corrosion. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.2.2.2.9 and finds it acceptable because the staff did not identify any examples of recurring internal corrosion in engineered safety features systems during its independent review of Entergy's operating experience database.

3.2.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL Report

The staff reviewed LRA Table 3.2.2-1 through Table 3.2.2-7, and LRA Table 3.2.2.8-1 through Table 3.2.2.8-5, for additional details of Entergy's aging management review results for material, environment, aging effects requiring management, and aging management program combinations not consistent with or not addressed in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed Entergy's evaluation to determine whether Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation. The staff's evaluation is documented in the following sections.

3.2.2.3.1 Pressure Relief System—Summary of Aging Management Review—LRA Table 3.2.2-1

The staff reviewed LRA Table 3.2.2-1, which summarizes Entergy's aging management review evaluations for the pressure relief system component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.2.2.3.2 High-Pressure Core Spray System—Summary of Aging Management Review—LRA Table 3.2.2-2

Metallic Strainers, Filters, Cyclone Separators, Orifices, Air Dryers, Screens, Demisters, and Moisture Separators with a Filtration Intended Function

During its review of LRA Tables 3.2.2-2, 3.2.2-3, 3.2.2-4, 3.2.2-5, 3.2.2-6, 3.3.2-1, 3.3.2-3, 3.3.2-4, 3.3.2-6, 3.3.2-10, 3.3.2-11, 3.3.2-12, 3.3.2-13, 3.3.2-14, 3.3.2-17, and 3.4.2-1, the staff noted that for components with the intended function of filtration (e.g., metallic strainers, filters, cyclone separators, orifices, air dryers, screens, demisters, and moisture separators) none of Entergy's aging management review items cite flow blockage due to fouling as an aging effect requiring management (AERM). The staff questioned whether flow blockage due to fouling should be considered as an applicable aging effect requiring management for these components. To address this question, the staff issued a request for additional information (RAI 3.2.2.3.2-1). The staff's request, dated November 29, 2017, is documented in ADAMS Accession No. ML17335A098. Entergy responded on December 29, 2017 (see ADAMS Accession No. ML18010A848). However, the NRC staff had followup concerns. A public telephone conference call with Entergy was held on February 27, 2018 to discuss the RAI (see summary of telephone conference call in ADAMS Accession No. ML18071A018). The NRC issued a followup RAI dated March 6, 2018 (see ADAMS Accession No. ML18065A213). Entergy provided a draft response to the followup RAI, and NRC placed this draft response on the docket for public view (see ADAMS Accession No. ML18131A241). Entergy submitted a followup response on April 3, 2018 (see ADAMS Accession No. ML18093A099). On April 18, 2018m a second public telephone conference call was held with Entergy to discuss its RAI responses (see summary of second telephone conference in ADAMS Accession No. ML18127A034). Subsequently, Entergy submitted its final response on May 10, 2018 (see ADAMS Accession No. ML18138A144).

The staff finds Entergy's responses acceptable because:

a) For self-cleaning filtration components, or for components in systems without substantial fouling (LRA Tables 3.2.2-3, 3.3.2-13, 3.3.2-14, and 3.4.2-1), flow blockage due to fouling is not expected to need to be managed.

b) For filtration components where differential pressures are either monitored or alarmed, or for component where fouling can be identified through abnormal system operation (LRA Tables 3.2.2-6, 3.3.2-1, 3.3.2-3, 3.3.2-4, 3.3.2-6, 3.3.2-10, 3.3.2-11, 3.3.2-12, 3.3.2-14, and 3.3.2-17), it is reasonable to conclude that flow blockage can be detected prior to a loss of intended function.

c) For the emergency core cooling system suction strainers (LRA Tables 3.2.2-2, 3.2.2-3, 3.2.2-4, and 3.2.2-5), the addition of aging management review items specifically crediting activities in the Periodic Surveillance and Preventive Maintenance program to routinely inspect and clean these components can ensure that fouling will be maintained less than the current licensing basis limits during the period of extended operation.

<u>Stainless Steel Strainers Exposed to Treated Water.</u>

As amended by letter dated May 16, 2018, LRA Tables 3.2.2-2, 3.2.2-3, 3.2.2-4, and 3.2.2-5 state that stainless steel strainers exposed to treated water will be managed for flow blockage due to fouling by the Periodic Surveillance and Preventive Maintenance program. The aging management review items cite generic Note H, for which Entergy has identified flow blockage due to fouling as an additional aging effect. The aging management review items cite plant-specific Note 206, stating "[s]trainers are designed to collect debris whether resulting from aging effects or other causes. Inspections are performed to ensure strainers are free of excessive debris that could cause flow blockage."

The staff finds Entergy's proposal, as discussed in its response to RAI 3.2.2.3.2-1, to manage flow blockage due to fouling, acceptable because the requirements for: (a) suction strainer inspections to catalog, record, and remove all material/debris, (b) inspections to occur once each refueling cycle, (c) acceptance criteria to limit the amount of debris, and (d) engineering to inspect the removed material/debris, provide reasonable assurance that fouling will be maintained within the current licensing basis parameters of the strainers.

Stainless Steel Components Exposed to Condensation.

In LRA Tables 3.2.2-2, 3.3.2-3, 3.3.2-6, 3.3.2-14, 3.3.2-18-4, and 3.3.2-18-16, Entergy states that stainless steel components (which include, but are not limited to, accumulators, expansion joints, flex hoses, heat exchangers, piping, pump casings, strainer housings, and valve bodies) exposed to condensation will be managed for loss of material by the External Surfaces Monitoring program. The items cite generic Note G.

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by Entergy constitute all of the applicable aging effects for this component, material, and environment combination. As amended by letter dated May 10, 2018, (see ADAMS Accession No. ML130A935) the staff notes that LRA Sections 3.2.2.2.6, 3.3.2.2.3, and 3.4.2.2.2 state that cracking of stainless steel components directly exposed to outdoor air and air recently introduced into buildings is identified as an aging effect (because of the potential chloride contamination from the cooling towers) that is managed by the External Surfaces Monitoring program and One-Time Inspection program, respectively. Based on the above, and its review of the sections of the SRP-LR corresponding to the cited LRA sections, the staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination. In addition, the staff finds Entergy's proposal to manage the effects of aging acceptable because visual inspections conducted through the External Surfaces Monitoring program and One-Time Inspection program are capable of identifying loss of material in the associated stainless steel components.

3.2.2.3.3 Residual Heat Removal System—Summary of Aging Management Review—LRA Table 3.2.2-3

Stainless Steel Strainers Exposed to Treated Water.

The staff's evaluation for stainless steel strainers exposed to treated water, which will be managed for flow blockage due to fouling by the Periodic Surveillance and Preventive Maintenance program and is identified with generic note H, is documented in SER Section 3.2.2.3.2.

3.2.2.3.4 Low-Pressure Core Spray System—Summary of Aging Management Review—LRA Table 3.2.2-4

Stainless Steel Strainers Exposed to Treated Water.

The staff's evaluation for stainless steel strainers exposed to treated water, which will be managed for flow blockage due to fouling by the Periodic Surveillance and Preventive Maintenance program and is identified with generic note H, is documented in SER Section 3.2.2.3.2.

3.2.2.3.5 Reactor Core Isolation Cooling System—Summary of Aging Management Review—LRA Table 3.2.2-5

Stainless Steel Strainers Exposed to Treated Water.

The staff's evaluation for stainless steel strainers exposed to treated water, which will be managed for flow blockage due to fouling by the Periodic Surveillance and Preventive

Maintenance program and is identified with generic Note H, is documented in SER Section 3.2.2.3.2.

3.2.2.3.6 Standby Gas Treatment System—Summary of Aging Management Review—LRA Table 3.2.2-6

Fiberglass Flex Connections, Piping, and Tanks Exposed to Indoor Air

In LRA Tables 3.2.2-6, 3.3.2-18-2, and 3.4.2-2-1, Entergy states that it will manage the fiberglass flex connections, tanks, and piping exposed internally and externally to indoor air for changes in material properties by using the External Surfaces Monitoring program. The items cite generic Note G.

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by Entergy constitute all of the applicable aging effects for this component, material, and environment combination. The staff notes that fiberglass is considered a polymeric material. Based on its review of the GALL Report for other polymeric materials in comparably deleterious environments, the staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination. In addition, the staff finds Entergy's proposal to manage the effects of aging acceptable because the visual inspections conducted through the External Surfaces Monitoring program are capable of identifying changes in material properties through the absence of discoloration, crazing, and surface cracking in the polymeric components.

3.2.2.3.7 Containment Penetrations—Summary of Aging Management Review—LRA Table 3.2.2-7

The staff reviewed LRA Table 3.2.2-7, which summarizes the results of aging management review evaluations for the containment penetrations component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.2.2.3.8 Pressure Relief System Nonsafety-Related Components Affecting Safety-Related Systems —Summary of Aging Management Review—LRA Table 3.2.2-8-1

The staff reviewed LRA Table 3.2.2-8-1, which summarizes the results of aging management review evaluations for the pressure relief system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.2.2.3.9 High-Pressure Core Spray System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review—LRA Table 3.2.2-8-2

The staff reviewed LRA Table 3.2.2-8-2, which summarizes the results of aging management review evaluations for the high-pressure core spray system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.2.2.3.10 Residual Heat Removal System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review—LRA Table 3.2.2-8-3

The staff reviewed LRA Table 3.2.2-8-3, which summarizes the results of aging management review evaluations for the residual heat removal system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.2.2.3.11 Low-Pressure Core Spray System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review—LRA Table 3.2.2-8-4

The staff reviewed LRA Table 3.2.2-8-4, which summarizes the results of aging management review evaluations for the low-pressure core spray system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.2.2.3.12 Reactor Core Isolation Cooling System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review—LRA Table 3.2.2-8-5

The staff reviewed LRA Table 3.2.2-8-5, which summarizes the results of aging management review evaluations for the reactor core isolation cooling system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

On the basis of its review, the staff finds that Entergy has appropriately evaluated the aging management review results of material, environment, aging effect requiring management, and aging management program combinations not evaluated in the GALL Report. The staff finds that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.3 Conclusion

The staff concludes that Entergy has demonstrated that it will adequately manage the effects of aging for the engineered safety features systems components within the scope of license renewal and subject to an aging management review in a way that maintains the intended functions consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3 Aging Management of Auxiliary Systems

3.3.1 Summary of Technical Information in the Application

LRA Section 3.3 provides Entergy's aging management review results for the auxiliary systems components and component groups at RBS. LRA Table 3.3.1, "Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801," provides a summary comparison of Entergy's aging management reviews with those evaluated in the GALL Report for the auxiliary systems components and component groups.

3.3.2 Staff Evaluation

Table 3.3-1 summarizes the staff's evaluation of components, aging effects or mechanisms, and aging management programs listed in LRA Section 3.3 and addressed in the GALL Report.

Table 3.3-1 Staff Evaluation for Auxiliary System Components in the GALL Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.3.1-1	Consistent with the GALL Report (see SER Section 3.3.2.2.1)
3.3.1-2	Consistent with the GALL Report (see SER Section 3.3.2.2.1)
3.3.1-3	Not Applicable to BWRs (see SER Section 3.3.2.2.2)
3.3.1-4	Consistent with the GALL Report (see SER Section 3.3.2.2.3)
3.3.1-5	Not Applicable to BWRs (see SER Section 3.3.2.2.4)
3.3.1-6	Consistent with the GALL Report (see SER Section 3.3.2.2.5)
3.3.1-7	Not Applicable to BWRs (see SER Section 3.3.2.1.1)
3.3.1-8	Not Applicable to BWRs (see SER Section 3.3.2.1.1)
3.3.1-9	Not Applicable to BWRs (see SER Section 3.3.2.1.1)
3.3.1-10	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-11	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-12	Consistent with the GALL Report
3.3.1-13	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-14	Consistent with the GALL Report
3.3.1-15	Consistent with the GALL Report
3.3.1-16	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-17	Consistent with the GALL Report
3.3.1-18	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-19	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-20	Consistent with the GALL Report
3.3.1-21	Consistent with the GALL Report
3.3.1-22	Consistent with the GALL Report (see SER Section 3.3.2.1.3)
3.3.1-23	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-24	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-25	Consistent with the GALL Report
3.3.1-26	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-27	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-28	Not Applicable to RBS (see SER Section 3.3.2.1.1)

Component Group (SRP-LR Item No.)	Staff Evaluation
3.3.1-29	Not Applicable to BWRs (see SER Section 3.3.2.1.1)
3.3.1-30	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-30.5	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-31	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-32	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-32.5	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-33	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-34	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-35	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-36	Consistent with the GALL Report
3.3.1-37	Consistent with the GALL Report
3.3.1-38	Not Applicable to RBS (see SER Section 3.3.2.1.5)
3.3.1-39	Not Applicable to RBS (see SER Section 3.3.2.1.5)
3.3.1-40	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-41	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-42	Consistent with the GALL Report (see SER Section 3.3.2.1.7)
3.3.1-43	Consistent with the GALL Report
3.3.1-44	Consistent with the GALL Report
3.3.1-45	Consistent with the GALL Report
3.3.1-46	Consistent with the GALL Report (see SER Section 3.3.2.1.3)
3.3.1-47	Consistent with the GALL Report (see SER Section 3.3.2.1.3)
3.3.1-48	Consistent with the GALL Report
3.3.1-49	Consistent with the GALL Report
3.3.1-50	Consistent with the GALL Report (see SER Section 3.3.2.1.7)
3.3.1-51	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-52	Consistent with the GALL Report
3.3.1-53	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-54	Consistent with the GALL Report
3.3.1-55	Consistent with the GALL Report
3.3.1-56	Consistent with the GALL Report
3.3.1-57	Consistent with the GALL Report
3.3.1-58	Consistent with the GALL Report
3.3.1-59	Consistent with the GALL Report
3.3.1-60	Consistent with the GALL Report
3.3.1-61	Consistent with the GALL Report
3.3.1-62	Consistent with the GALL Report (see SER Section 3.3.2.1.6)
3.3.1-63	Consistent with the GALL Report
3.3.1-64	Consistent with the GALL Report (see SER Section 3.3.2.1.4)
3.3.1-65	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-66	Consistent with the GALL Report (see SER Section 3.3.2.1.4)
3.3.1-67	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-68	Consistent with the GALL Report
3.3.1-69	Consistent with the GALL Report
3.3.1-70	Consistent with the GALL Report
3.3.1-71	Consistent with the GALL Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.3.1-72	Consistent with the GALL Report
3.3.1-73	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-74	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-75	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-76	Consistent with the GALL Report (see SER Section 3.3.2.1.2)
3.3.1-77	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-78	Consistent with the GALL Report
3.3.1-79	Consistent with the GALL Report (see SER Section 3.3.2.1.3)
3.3.1-80	Consistent with the GALL Report
3.3.1-81	Consistent with the GALL Report (see SER Section 3.3.2.1.3)
3.3.1-82	Consistent with the GALL Report
3.3.1-83	Consistent with the GALL Report (see SER Section 3.3.2.1.9)
3.3.1-85	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-86	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-88	Consistent with the GALL Report
3.3.1-89	Consistent with the GALL Report (see SER Section 3.3.2.1.3)
3.3.1-90	Consistent with the GALL Report
3.3.1-91	Consistent with the GALL Report (see SER Section 3.3.2.1.6)
3.3.1-92	Consistent with the GALL Report (see SER Section 3.3.2.1.6)
3.3.1-93	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-94	Consistent with the GALL Report
3.3.1-95	Consistent with the GALL Report (see SER Section 3.3.2.1.8)
3.3.1-96	Consistent with the GALL Report
3.3.1-97	Consistent with the GALL Report
3.3.1-98	Consistent with the GALL Report
3.3.1-99	Consistent with the GALL Report
3.3.1-100	Consistent with the GALL Report
3.3.1-101	Consistent with the GALL Report
3.3.1-102	Consistent with the GALL Report
3.3.1-103	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-104	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-105	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-106	Consistent with the GALL Report
3.3.1-107	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-108	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-109	Consistent with the GALL Report
3.3.1-109.5	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-110	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-111	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-112	Consistent with the GALL Report
3.3.1-113	Consistent with the GALL Report
3.3.1-114	Consistent with the GALL Report
3.3.1-115	Not Applicable to BWRs (see SER Section 3.3.2.1.1)
3.3.1-116	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-117	Consistent with the GALL Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.3.1-118	Consistent with the GALL Report
3.3.1-119	Consistent with the GALL Report
3.3.1-120	Consistent with the GALL Report
3.3.1-121	Consistent with the GALL Report
3.3.1-122	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-123	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-124	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-125	Consistent with the GALL Report
3.3.1-126	Consistent with the GALL Report
3.3.1-127	Consistent with the GALL Report (see SER Section 3.3.2.2.8)
3.3.1-128	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-129	Consistent with the GALL Report (see SER Section 3.3.2.1.3)
3.3.1-130	Consistent with the GALL Report (see SER Section 3.3.2.1.4)
3.3.1-131	Consistent with the GALL Report (see SER Section 3.3.2.1.4)
3.3.1-132	Consistent with the GALL Report
3.3.1-133	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-134	Consistent with the GALL Report (see SER Section 3.3.2.1.6)
3.3.1-135	Consistent with the GALL Report (see SER Section 3.3.2.1.3)
3.3.1-136	Consistent with the GALL Report
3.3.1-137	Not Applicable to RBS (see SER Section 3.3.2.1.1)
3.3.1-138	Consistent with the GALL Report (see SER Section 3.3.2.1.5)
3.3.1-139	Consistent with the GALL Report (see SER Section 3.3.2.1.5)
3.3.1-140	Consistent with the GALL Report (see SER Section 3.3.2.1.1)
…	

The staff's review of the auxiliary systems component groups followed one of three approaches.

1) One approach, documented in SER Section 3.3.2.1, reviews aging management review results for components that Entergy states are consistent with the GALL Report and require no further evaluation.

2) Another approach, documented in SER Section 3.3.2.2, reviews aging management review results for components that Entergy states are consistent with the GALL Report and for which further evaluation is recommended.

3) A third approach, documented in SER Section 3.3.2.3, reviews aging management review results for components that Entergy states are not consistent with, or not addressed in, the GALL Report.

SER Section 3.0.3 documents the staff's review of aging management programs that Entergy credits to manage or monitor aging effects of the auxiliary systems components.

3.3.2.1 Aging Management Review Results Consistent with the GALL Report

LRA Section 3.3.2.1 identifies the materials, environments, aging effects requiring management, and aging management programs for the auxiliary systems components.

LRA Table 3.3.2-1 through Table 3.3.2-17, and LRA Table 3.3.2-18-1 through Table 3.3.2-18-26, summarize Entergy's aging management reviews for the auxiliary system components and indicate aging management reviews claimed to be consistent with the GALL Report.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material in the LRA was applicable and that Entergy identified the appropriate GALL Report aging management reviews. The staff's evaluation follows.

3.3.2.1.1 Aging Management Review Results Identified as Not Applicable or Not Used

For LRA Table 3.3.1, Item 3.3.1-7 through Item 3.3.1-9, Item 3.3.1-28, Item 3.3.1-29, and Item 3.3.1-124, Entergy claims that the corresponding aging management review items in the GALL Report are not applicable to RBS (a BWR) because the associated items are only applicable to pressurized-water reactors. The staff reviewed the SRP-LR, confirmed these items only apply to pressurized-water reactors, and finds that these items are not applicable to RBS because it is a BWR.

For LRA Table 3.3.1, Item 3.3.1-10, Item 3.3.1-11, Item 3.3.1-13, Item 3.3.1-18, Item 3.3.1-23, Item 3.3.1-24, Item 3.3.1-26, Item 3.3.1-30 through Item 3.3.1-35, Item 3.3.1-38 through Item 3.3.1-41, Item 3.3.1-51, Item 3.3.1-65, Item 3.3.1-67, Item 3.3.1-85, Item 3.3.1-73 through Item 3.3.1-75, Item 3.3.1-77, Item 3.3.1-85, Item 3.3.1-93, Item 3.3.1-103 through Item 3.3.1-105, Item 3.3.1-107, Item 3.3.1-108, Item 3.3.1-109.5, Item 3.3.1-110, Item 3.3.1-115, Item 3.3.1-116, Item 3.3.1-122 through Item 3.3.1-124, Item 3.3.1-128, Item 3.3.1-133, and Item 3.3.1-137, Entergy claims that they are not applicable. The staff reviewed the LRA and USAR and confirms that Entergy's LRA does not have any aging management review results that are applicable for these items, or the items require no aging management.

For LRA Table 3.3.1, Item 3.3.1-16, Entergy claims that this item is not applicable. Entergy states the following: (1) the reactor water cleanup system piping downstream of the second containment isolation valve, which is 4-inch nominal pipe size or greater and contains reactor coolant at a temperature at 200 °F or above during power operation, is carbon steel piping, and (2) this carbon steel piping is not subject to NRC Generic Letter (GL) 88-01 inspection requirements. The staff reviewed Entergy's claim, the LRA, and the USAR and confirms that the LRA does not have any aging management review results that are applicable for this item.

Consistent with Entergy's evaluation regarding LRA Table 3.3.1, Item 3.3.1-16, LRA Table B-2 also indicates that Entergy does not use GALL Report AMP XI.M25, "BWR Reactor Water Cleanup System," for aging management. The staff finds this evaluation result acceptable based on the nonapplicability of LRA Table 3.3.1, Item 3.3.1-16 to RBS.

LRA Table 3.3.1, Item 3.3.1-19 addresses stainless steel regenerative heat exchanger components exposed to treated water > 60 °C (140 °F). Entergy states that this item is not applicable. The staff notes the following:

(a) Based on a review of the USAR, the only auxiliary system in-scope regenerative heat exchanger is located in the reactor water cleanup (RWCU) system.

(b) USAR Table 3.9B-2c, “Reactor Water Cleanup Regenerative Heat Exchanger,” states that the reactor water cleanup regenerative heat exchanger has austenitic stainless steel tubing.

(c) USAR Table 5.4-2, “Reactor Water Cleanup System Equipment Design Data,” states that the design pressure of the tube side of both the regenerative and nonregenerative heat exchangers as well as the design pressure of the demineralizers and cleanup pumps is 1410 psig.

(d) LRA Table 3.3.2-18-19, “Reactor Water Cleanup System, Nonsafety-Related Components Affecting Safety-Related Systems,” states that the heat exchanger shells are constructed of carbon steel.

(e) LRA Section 2.3.3.18 states that, “[a]lthough many components in the RWCU system are classified as Safety Class 3, the system performs no safety functions other than to support containment isolation and to isolate itself from the RCPB [reactor coolant pressure boundary]”

(f) Drawing PID 26-03A, “Engineering P&I Diagram System 601, Reactor Wtr Clnup & Filter,” Revision 38, shows that the regenerative heat exchangers are capable of being isolated from the reactor coolant pressure boundary by motor-operated valves.

The staff also notes that cracking of the heat exchanger tubes would not result in a loss of reactor coolant pressure boundary or affect a nearby safety-related component because all of the upstream and downstream components in the flow path are designed to 1410 psig. The staff evaluated Entergy’s claim and finds it acceptable because although the heat exchanger tubes are constructed of stainless steel, cracking of the tubes would not impact any component’s intended function.

For LRA Table 3.3.1, Item 3.3.1-27, Entergy claims that the corresponding items in the GALL Report are not applicable because they are addressed by other items in LRA Table 3.3.1. The staff reviewed the LRA and confirms that the aging effects will be addressed by another LRA Table 3.3.1 item, namely Item 3.3.1-17. Therefore, the staff finds Entergy’s proposal acceptable.

LRA Table 3.3.1, Item 3.3.1-53 addresses steel cranes—rails exposed to uncontrolled indoor air (external). The GALL Report recommends GALL Report AMP XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems,” to manage loss of material due to wear for this component group. Entergy states that it did not use LRA AMR Item 3.3.1-53 because loss of material due to wear is not an aging effect requiring management for crane rails exposed to uncontrolled indoor air (external) environment at RBS. However, Entergy states that it monitors the loss of material and the general condition of steel crane rails using the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program with AMR Item 3.3.1-52.

The staff reviewed Entergy’s claim of applicability and notes that LRA Table 3.3.1, Item 3.3.1-53 is not used in any of the LRA Table 2 (Tables 3.x.2-y) aging management review results. Instead, the LRA supports aging effect requiring management for loss of material through LRA Table 3.3.1, Item 3.3.1-52, which the SRP-LR recognizes as appropriate for loss of material due to general corrosion. The staff also notes that Entergy states that

LRA Table 3.3.1, Item 3.3.1-52 is consistent with the GALL Report recommendation to manage the effects of aging due to loss of material for steel crane rails and structural girders exposed to uncontrolled indoor air (external) with the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program.

The staff notes that LRA Table 3.3.1, Item 3.3.1-52 is used for aging management review results presented in LRA Table 3.5.2-1, "Reactor Building," and LRA Table 3.5.2-3, "Turbine Building, Auxiliary Building, and Yard Structures," for loss of material without any consideration to aging mechanisms triggering this aging effect. The staff also notes that both SRP-LR AMR Item 3.3.1-52 and Item 3.3.1-53 address the same aging effect requiring management (i.e., loss of material) for similar components (crane rails and girders versus crane rails, respectively). The staff further notes that the material, environment, aging effect, and program (i.e., steel, indoor air, loss of material, GALL Report AMP XI.M23) are the same for both SRP-LR AMR Item 3.3.1-52 and Item 3.3.1-53. In addition, the staff notes that SRP-LR, Section A.1, "Aging Management Review-Generic (Branch Technical Position RLSB-1)," states that although "determination of applicable aging effects is based on degradation mechanisms that have occurred and those that potentially could cause structure and component degradation…[s]pecific identification of aging mechanisms is not a requirement." The LRA states that cranes and hoists meet the provisions of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," (see ADAMS Accession No. ML070250180). NUREG-0612 discusses periodic inspection and testing of cranes including wear. NUREG-0612 also specifies conformance of cranes and hoists to the American National Standard and American Society of Mechanical Engineers safety standard (ANS/ASME) B30.2, "Overhead and Gantry Cranes," which further details procedures to address corrosion and wear of cranes. In addition, Entergy implements the ANS/ASME B30.2 standard in its enhanced Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program. SER Section 3.0.3.2.10 documents the staff's review of Entergy's enhanced Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program. Finally, the staff notes that RBS crane structural components (e.g., rails, girders) are designed to meet the design recommendations of the Crane Manufacturers Association of America Specification No. 70 (CMAA-70) for "maximum life and minimum maintenance."

During the audit, the staff verified that Entergy revised RBS plant procedures consistent with the aging management program enhancements to specify as unacceptable the following conditions:

- loss of material due to corrosion or wear that reduces the load-bearing capacity of component supports
- debris, dirt, or excessive wear that prevents or restricts sliding as intended on supports
- cracked or sheared bolts, including anchors and high-strength bolts

The staff finds Entergy's proposal acceptable because the effects of aging for loss of material due to corrosion or limited wear for the infrequently used CMAA-70 cranes are managed by LRA AMR Item 3.3.1-52 that addresses the same aging effect requiring management and material, environment, aging effect, and program as LRA AMR Item 3.3.1-53, which is consistent with the GALL Report recommendations.

LRA Table 3.3.1, Item 3.3.1-86 addresses elastomeric linings, seals, and components exposed to treated borated water, treated water, or raw water. Entergy states that this item is not applicable for components exposed to treated water and aging effects associated with components exposed to raw water are aligned with AMR Item 3.3.1-32.5. The staff evaluated Entergy's claim and finds it acceptable because: (a) based on the staff's review of components cited in LRA Table 3.3.2-5, "Standby Liquid Control System," there are no elastomeric components exposed to treated borated water, and (b) based on the staff's review of the USAR, there are no elastomeric components exposed to treated water and raw water in the in-scope auxiliary systems.

For LRA Table 3.3.1, Item 3.3.1-111, Entergy claims that the corresponding items in the GALL Report are not applicable because they are addressed by other items in LRA Table 3.5.1. The staff reviewed the LRA and confirms that the aging effects will be addressed by other LRA Table 3.5.1 items. Therefore, the staff finds Entergy's proposal acceptable. LRA Table 3.3.1, Item 3.3.1-111 is addressed by a similar item in LRA Table 3.5.1, namely Item 3.5.1-77.

LRA Table 3.3.1, Item 3.3.1-140 addresses gray cast iron piping components with internal coatings or linings exposed to closed-cycle cooling water, raw water, or treated water. Entergy states that this item was not used. The staff needed additional information and therefore issued a request for additional information. RAI 3.3.2.1.1 1, dated November 16, 2017, and Entergy's response, dated December 16, 2017, are documented in ADAMS Accession No. ML17320B099 and No. ML17347B473, respectively.

As part of its response to RAI 3.3.2.1.1 1, Entergy revised LRA Table 3.3.2-7, "Fire Protection Water System," and LRA Table 3.3.1, Item 3.3.1-140 to state that Entergy will use the Coating Integrity program to manage the loss of material due to selective leaching for internally coated gray cast iron piping and valves. The staff finds Entergy's response and corresponding changes to LRA Table 3.3.2-7 and LRA Table 3.3.1, Item 3.3.1-140 acceptable because Entergy will use the Coating Integrity program to manage the loss of material due to selective leaching. This is consistent with the GALL Report AMP XI.M42, "Internal Coatings/Linings for In Scope Piping, Piping Components, Heat Exchangers, and Tanks," as incorporated by LR-ISG-2013-01, "Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks."

3.3.2.1.2 Hardening and Loss of Strength

LRA Table 3.3.1, Item 3.3.1-76 addresses elastomeric seals and components exposed to uncontrolled indoor air (internal/external), for which Entergy will manage the aging effect of hardening and loss of strength. During its review of components associated with LRA Table 3.3.1, Item 3.3.1-76, for which Entergy cites generic Note A and Note C, the staff notes that the LRA credits the External Surfaces Monitoring program to manage cracking in addition to hardening and loss of strength. The staff finds Entergy's proposal acceptable because the External Surfaces Monitoring program includes visual inspections and physical manipulation of elastomeric surfaces, which can detect cracking of the above components.

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

LRA Table 3.3.1, Item 3.3.1-22 addresses copper alloy piping and piping components exposed to treated water, for which Entergy will manage loss of material due to general, pitting, crevice, and galvanic corrosion. During its review of components associated with LRA Table 3.3.1, Item 3.3.1-22, for which Entergy cites generic Note C, the staff notes that the LRA credits the Water Chemistry Control program and new One-Time Inspection program to manage the aging effect for copper alloy valve bodies, heat exchanger tubes, and heat exchanger tube sheets.

In its review of copper alloy components in the residual heat removal system associated with LRA Table 3.2.2-3, the staff needed additional information and therefore issued a request for additional information (RAI 3.3.2.1.Y-1) on January 22, 2018. RAI 3.3.2.1.Y-1 and Entergy's response, dated February 20, 2018, are documented in ADAMS Accession No. ML18022A941 and No. ML18051A531, respectively.

The staff finds Entergy's response to RAI 3.3.2.1.Y-1 acceptable because Entergy states that it will use eddy current testing to examine the external surfaces of the tubing to detect loss of material. Eddy current testing is an effective method to examine loss of material in heat exchanger tubing. In addition, Entergy already has existing plant-specific procedures for conducting eddy current testing.

LRA Table 3.2.1, Item 3.3.1-46 and Item 3.3.1-47 address steel, stainless steel, and copper alloy heat exchanger components exposed to closed-cycle cooling water. Entergy will manage these components for loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion. For the aging management review items that cite generic Note E, the LRA credits the Service Water Integrity program to manage the effects of aging for stainless steel heat exchanger tubesheets, channel heads, tubes, and copper alloy heat exchanger tubes.

The staff notes that Entergy's updated response to Generic Letter 89-13, dated October 21, 1998, includes the continuing commitment for periodic inspections and maintenance on the auxiliary building unit coolers, the residual heat exchanger heat exchangers, radiation monitor coolers, and the main steam positive leakage control compressor aftercoolers. Based on its review of components associated with LRA Table 3.2.1, Item 3.3.1-46 and Item 3.2.1-47, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the effects of aging using the Service Water Integrity program acceptable. The Service Water Integrity program, which implements the guidance from Generic Letter 89-13, includes sufficient inspection and testing activities to identify loss of material in the associated heat exchanger components.

LRA Table 3.3.1, Item 3.3.1-79 addresses copper alloy piping components, heat exchanger tubes, and heat exchanger tube sheets exposed to condensation, for which Entergy will manage loss of material due to general, pitting, and crevice corrosion. During its review of components associated with LRA Table 3.3.1, Item 3.3.1-79, for which Entergy cited generic Note C, the staff notes that the LRA credits the External Surface Monitoring program to manage the aging effect for copper alloy valve bodies, heat exchanger tubes, and heat exchanger tube sheets.

In its review of copper alloy components in the service water system associated with LRA Table 3.3.1, Item 3.3.1-79, the staff needed additional information and therefore issued a request for additional information. RAI 3.3.2.1.Y-2, dated January 22, 2018, and Entergy's response, dated February 20, 2018, are documented in ADAMS Accession No. ML18022A941 and No. ML18051A531, respectively.

As part of its response to RAI 3.3.2.1.Y-2, Entergy deleted the copper alloy heat exchanger tube item in question from the LRA. The staff finds Entergy's response acceptable because it is consistent with the GALL-SLR, Item AP-144, which states that for copper alloy components exposed to condensation, there is no aging affect and no aging management program that the NRC recommends.

The staff finds Entergy's proposal to manage loss of material for the piping components and heat exchanger tube sheets using the External Surfaces Monitoring program acceptable because the program includes visual inspections. Visual inspections can detect loss of material in copper alloy piping components, heat exchanger tubes, and heat exchanger tube sheets exposed to condensation.

LRA Table 3.3.1, Item 3.3.1-81 addresses aluminum alloy piping components exposed to outdoor air, for which Entergy will manage loss of material due to pitting and crevice corrosion. For the aging management review items that cite generic Note E, the LRA credits the Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage the aging effect for aluminum turbochargers and heat exchanger fins.

Based on its review of components associated with LRA Table 3.3.1, Item 3.3.1-81, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the effects of aging using the Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because other portions of the diesel generator turbocharger and heat exchanger fins in heating ventilation and air conditioning system are being managed for loss of material using either LRA Table 3.3.1 Item 3.3.1-88 or Item 3.3.1-92, which both cite the Internal Surfaces in Miscellaneous Piping and Ducting Components program as managing the same aging effect.

LRA Table 3.3.1, Item 3.3.1-89 addresses copper alloy and copper alloy > 15% zinc or > 8% aluminum piping components and heat exchanger tubes exposed internally and externally to condensation. Entergy will manage this component, material, and environment combination for loss of material due to general, pitting, and crevice corrosion. During its review of components associated with LRA Table 3.3.1, Item 3.3.1-89, for which Entergy cites generic Note C, the staff noted that the LRA credits the Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage the aging effect for copper alloy and copper alloy > 15% zinc or > 8% aluminum piping components, and heat exchanger tubes.

In its review of copper alloy heat exchanger tubes in the control building heating, ventilation, and air conditioning (HVAC) system and miscellaneous HVAC system components associated with LRA Table 3.3.1, Item 3.3.1-89, the staff needed additional information, and therefore issued a request for additional information. RAI 3.3.2.1.Y-3, dated January 22, 2018, and Entergy's response, dated February 20, 2018, are documented in ADAMS Accession No. ML18022A941 and No. ML18051A531, respectively.

As part of its response to RAI 3.3.2.1.Y-3, Entergy deleted the copper alloy heat exchanger tube item in question from the LRA. The staff finds Entergy's response acceptable because it is consistent with the GALL-SLR, Item AP-144, which states that for copper alloy components exposed to condensation, there is no aging affect and no aging program recommended by the NRC.

The staff finds Entergy's proposal to manage loss of material for the piping components and heat exchanger tube sheets with the Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because this program includes visual inspections that can detect loss of material in these above components.

LRA Table 3.3.1, Item 3.3.1-129 addresses steel tanks exposed to soil, concrete, air-indoor uncontrolled, raw water, treated water, waste water, or condensation, for which Entergy will manage for loss of material due to general, pitting, and crevice corrosion. For the aging management review items that cite generic Note E, the LRA credits the Fire Water System program to manage the aging effect for tanks exposed to concrete or soil.

Entergy states that the applicability of LRA Table 3.3.1, Item 3.3.1-129 is limited to the steel fire water storage tanks because there are no other steel tanks within the scope of GALL Report AMP XI.M29, the recommended AMP in SRP-LR Item 3.3.1-129, in the auxiliary systems. The staff evaluated Entergy's claim and finds it acceptable based on its review of the USAR.

The staff notes that LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation," AMP XI.M27, "Fire Water System," Table 4a, "Fire Water System Inspection and Testing Recommendations," Footnote 4, recommends that applicants take bottom thickness measurements on each fire water storage tank during the first 10-years of the period of extended operation. In addition, as required by NFPA 25, "Inspection, Testing and Maintenance of Water-Based Fire Protection Systems," Section 9.2.7 (cited in Table 4a), tank bottom ultrasonic inspections are conducted to detect metal loss if there is evidence of pitting or corrosion. Based on its review of components associated with LRA Table 3.3.1, Item 3.3.1-129, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the effects of aging using the Fire Water System program acceptable because the bottom thickness measurements recommended by LR-ISG-2012-02, AMP XI.M27, Table 4a can detect loss of material on the tank bottom surfaces exposed to soil or concrete.

LRA Table 3.3.1, Item 3.3.1-135 addresses stainless steel pump casings exposed internally or externally to waste water, for which Entergy will manage loss of material due to pitting, crevice, or microbiologically influenced corrosion. For the aging management review item that cites generic Note E, the LRA credits the Periodic Surveillance and Preventive Maintenance program to manage the aging effect for stainless steel pump casings.

Based on its review of components associated with LRA Table 3.3.1, Item 3.3.1-135 for which Energy cites generic Note E, the staff finds Entergy's proposal to manage the effects of aging using the Periodic Surveillance and Preventive Maintenance program acceptable because, as noted in SER Section 3.3.2.3.16, it is acceptable to manage other aging effects for these same components using this program. In addition, as noted and found to be acceptable in SER Section 3.0.3.3.1, Entergy will enhance the Periodic Surveillance and Preventive Maintenance program to incorporate activities identified in the program description, which include visual inspections of the internal and external surfaces of pump casings for both loss of material and cracking.

3.3.2.1.4 Loss of Material and Flow Blockage

LRA Table 3.3.1, Item 3.3.1-131 addresses steel, stainless steel, copper alloy, or aluminum fire water system piping, piping components and piping elements exposed to uncontrolled indoor air (internal), outdoor air (internal), or condensation (internal). Entergy will manage this component, material, and environment combination for loss of material and flow blockage due to fouling. For the aging management review items that cite generic Note E, the LRA credits the following two aging management programs:

- the Fire Protection program to manage the aging effect on carbon steel piping

- the Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage the aging effect on copper alloy (i.e., copper alloy that is > 15% zinc or > 8% aluminum) flame arrestors

Regarding the Fire Protection program, the staff notes that: (a) the carbon steel piping associated with LRA Table 3.3.1, Item 3.3.1-131, for which Entergy cites generic Note E, is installed in the fire protection halon system, (b) GALL Report Item AP-150 recommends that loss of material for steel halon piping and piping components exposed to uncontrolled indoor air be managed by GALL Report AMP XI.M26, “Fire Protection,” and (c) LRA Section B.1.19 states that the Fire Protection program will be consistent with GALL Report AMP XI.M26 with no exceptions. Based on its review of these components, the staff finds Entergy’s proposal to manage the effects of aging using the Fire Protection program acceptable because it is consistent with the GALL Report. In addition, the periodic visual inspections conducted on halon piping as part of the Fire Protection program can detect loss of material in carbon steel piping.

Regarding the Internal Surfaces in Miscellaneous Piping and Ducting Components program, the staff notes the following:

The copper alloy (i.e., > 15% zinc or > 8% aluminum) flame arrestors associated with LRA Table 3.3.1, Item 3.3.1-131, for which Entergy cites generic Note E, are exposed to outdoor air (internal).

(a) LRA Table 3.3.2-7, “Fire Protection – Water System,” does not cite any copper alloy piping exposed to outdoor air (internal).

(b) The only piping exposed to outdoor air (internal) cited in LRA Table 3.3.2-7 is constructed of carbon steel.

(c) During the audit, the staff confirmed that the flame arrestors are configured in a vertical direction such that water (e.g., condensation, rainwater) would not accumulate at the copper-to-steel junction.

Based on its review of these components, the staff finds Entergy’s proposal to manage the effects of aging using the Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because: (a) accelerated loss of material due to galvanic corrosion is not likely to occur due to the installation configuration of the flame arrestor, and (b) the periodic internal visual examinations of the flame arrestor are capable of detecting loss of material.

LRA Table 3.3.1, Item 3.3.1-64, Item 3.3.1-66, Item 3.3.1-130, and Item 3.3.1-131 address steel, copper alloy, and stainless steel piping and piping components and metallic sprinklers exposed to raw water or air environments, for which Entergy will manage loss of material. During its review of components associated with these item numbers, for which Entergy cites generic Note B and Note D, the staff notes that Entergy did not cite flow blockage due to fouling as an aging effect. This is not consistent with the recommendations of GALL Report AMP XI.M27, “Fire Water System,” as modified by LR-ISG-2012-02 "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation.” As a result, the staff issued a request for additional information. RAI 3.3.1-1, dated January 9, 2018, and Entergy’s response, dated February 7, 2018, are documented in ADAMS Accession No. ML18009A909 and No. ML18087A164, respectively.

The staff finds Entergy's RAI 3.3.1-1 response and corresponding changes to LRA Table 3.3.1, Item 3.3.1-64, Item 3.3.1-66, Item 3.3.1-130, and Item 3.3.1-131, and LRA Table 3.3.2-7 acceptable because Entergy added flow blockage as an applicable aging effect. The staff notes that Entergy did not add flow blockage to LRA Table 3.3.2-7 aging management review items that cite the Coating Integrity program. The staff finds this acceptable because the periodic visual inspections required by the Coating Integrity program can detect flow blockage as well as loss of coating integrity. In addition, by letter dated August 2, 2018 (ADAMS Accession No. ML18214A162), the staff notes that Entergy removed flow blockage as an AERM for copper alloy valve bodies exposed externally to raw water in LRA Table 3.3.2-7. The staff finds this acceptable because flow blockage is only an applicable AERM for the internal surfaces of valve bodies.

3.3.2.1.5 Loss of Coating or Lining Integrity and Loss of Material

LRA Table 3.3.1, Item 3.3.1-138 and Item 3.3.1-139 address metallic piping, piping components, heat exchangers, and tanks with internal coatings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, or fuel oil. Entergy will manage the above component, material, and environment combination for loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage, and spalling for cementitious coatings/linings or loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, respectively. For piping and piping component aging management review items that cite generic Note E, the LRA credits the Fire Water System program to manage the aging effects. However, as amended by letter dated December 12, 2017 (see ADAMS Accession No. ML17347B473), LRA Table 3.3.2-7, and LRA Table 3.3.1, Item 3.3.1-138 and Item 3.3.1-139 state that Entergy will manage the loss of material and loss of coating integrity for internally coated fire water system piping and piping components by using the Coating Integrity program instead of the Fire Water System program.

Based on its review of components associated with LRA Table 3.3.1, Item 3.3.1-138 and Item 3.3.1-139, for which Entergy cites generic Note A (instead of generic Note E), the staff finds Entergy's proposal to manage the effects of aging using the Coating Integrity program acceptable because the use of this program to manage loss of coating integrity and loss of material is consistent with GALL Report AMP XI.M42.

3.3.2.1.6 Loss of Material

LRA Table 3.3.1, Item 3.3.1-91 and Item 3.3.1-134 address carbon steel, stainless steel, copper alloy, and nickel alloy, piping, piping components, heat exchanger components, and tanks exposed to raw water (for nonsafety-related components not covered by NRC GL 89-13), waste water, or condensation. Entergy will manage this component, material, and environment combination for loss of material. For the aging management review items that cite generic Note E, the LRA credits the Periodic Surveillance and Preventive Maintenance program to manage the aging effect for carbon steel, stainless steel, and copper alloy (i.e., copper alloy that is >15% zinc or > 8% aluminum) piping, piping components, and heat exchanger components.

The staff notes that for the copper alloy valve bodies exposed to waste water, Entergy will manage the loss of material due to selective leaching by a different aging management review item in LRA Table 3.3.2-18-17. Based on its review of components associated with LRA Table 3.3.1, Item 3.3.1-91, Item 3.3.1-95, and Item 3.3.1-134, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the effects of aging using the Periodic Surveillance and Preventive Maintenance program acceptable as follows: The program requires the frequency, method of inspections, and acceptance criteria that are consistent with GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components." In addition, the periodic visual inspections that are part of the program can detect loss of material for the above components exposed to raw water or waste water.

LRA Table 3.3.1, Item 3.3.1-92 addresses aluminum piping, piping components, and piping elements exposed to condensation, for which Entergy will manage loss of material due to pitting and crevice corrosion. For the aging management review items that cite generic Note E, the LRA credits the Compressed Air Monitoring program to manage the aging effect for piping components in the compressed air system.

The staff notes that the Compressed Air Monitoring program manages loss of material in compressed air systems by periodically monitoring the air for moisture and contaminants and by periodic and opportunistic inspections of the internal surfaces of piping components. The staff also notes that GALL Report AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components,” as modified by LR-ISG-2012, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation,” recommends a periodic representative minimum sample size inspection. In contrast, GALL Report AMP XI.M24, “Compressed Air Monitoring,” does not include a recommendation for a minimum sample size. The staff further notes that: (a) GALL Report Item AP-81 recommends managing stainless steel piping components exposed to condensation for loss of material due to pitting and crevice corrosion using GALL Report AMP XI.M24, (b) GALL Report Item AP-142 recommends managing aluminum piping components exposed to condensation for loss of material due to pitting and crevice corrosion using GALL Report AMP XI.38, and (c) the GALL Report does not address aluminum components in GALL Report AMP XI.M24.

Although the Compressed Air Monitoring program does not include a minimum sample size, based on its review of components associated with LRA Table 3.3.1, Item 3.3.1-92, for which Entergy cites generic Note E, the staff finds Entergy’s proposal to manage the effects of aging using the Compressed Air Monitoring program acceptable for the following reasons:

(a) The air monitoring conducted for the Compressed Air Monitoring program can be effective at minimizing environmental impacts that could result in loss of material for aluminum piping components located in the compressed air system.

(b) As recommended by GALL Report Item AP-81, the Compressed Air Monitoring program can be effective at managing loss of material due to pitting and crevice corrosion in stainless steel.

(c) Stainless steel and aluminum are similarly impacted by pitting and crevice corrosion.

(d) The visual inspections to identify loss of material due to pitting and crevice corrosion in stainless steel can be equally effective in identifying loss of material due to pitting and crevice corrosion in aluminum components.

The staff notes that LRA Table 3.3.2-13, “Miscellaneous HVAC Systems,” states that Entergy will manage the aging effect of loss of material on aluminum heat exchanger fins exposed to condensation by using the Internal Surfaces in Miscellaneous Piping and Ducting Components program. The item cites SRP-LR Item 3.3.1-92, which is associated with piping components. Although heat exchanger fins are not within the use of the term “piping components,” the staff finds Entergy's proposal to use the Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because the program's periodic sampling-based visual inspections can detect loss of material.

3.3.2.1.7 Reduction of Heat Transfer Due to Fouling

LRA Table 3.3.1, Item 3.3.1-42 addresses copper alloy, titanium, and stainless steel heat exchanger tubes exposed to raw water, for which Entergy will manage reduction of heat transfer due to fouling. For the aging management review items that cite generic Note E, the LRA credits the Periodic Surveillance and Preventive Maintenance program to manage the aging effects for copper alloy and stainless steel heat exchanger tubes and plates. In its discussion for this item, Entergy states that there are no titanium heat exchanger tubes exposed to raw water in the auxiliary systems within the scope of license renewal.

The staff notes that, by letter dated March 26, 2018, Entergy specifically modified the Periodic Surveillance and Preventive Maintenance program to include a visual inspection of these components in order to detect evidence of reduction of heat transfer. Based on its review of components associated with LRA Table 3.3.1, Item 3.3.1-42, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the effects of aging using the Periodic Surveillance and Preventive Maintenance program acceptable for the following reasons: (1) the associated components are not within the scope of NRC Generic Letter 89-13 and are excluded from the GALL Report AMP XI.M20, "Open-Cycle Cooling Water Systems," and (2) the periodic visual inspections of the components being performed under the program can detect reduction of heat transfer due to fouling.

LRA Table 3.2.1, Item 3.3.1-50 addresses steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed-cycle cooling water, for which Entergy will manage reduction of heat transfer due to fouling. For the aging management review items that cite generic Note E, the LRA credits the Service Water Integrity program to manage the effects of aging for stainless steel and copper alloy heat exchanger tubes.

The staff notes that Entergy's updated response to GL 89-13, dated October 21, 1998, includes the continuing commitment for periodic inspections and maintenance on the auxiliary building unit coolers, the residual heat exchanger heat exchanger radiation monitor coolers, and the main steam positive leakage control compressor aftercoolers. Based on its review of components associated with LRA Table 3.2.1, Item 3.3.1-50, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the effects of aging using the Service Water Integrity program acceptable because the program, which implements the guidance from GL 89-13, includes sufficient inspection and maintenance activities to identify reduction of heat transfer due to fouling in the associated heat exchanger tubes.

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

LRA Table 3.3.1, Item 3.3.1-95 addresses copper alloy, stainless steel, nickel alloy, and steel piping, piping components, piping elements, and tanks exposed to waste water and condensation. Entergy will manage the above component, material, and environment combination for loss of material due to pitting, crevice, and microbiologically influenced corrosion. For the aging management review items that cite generic Note E, the LRA credits the Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage the aging effect for copper alloy valve bodies that are > 15% zinc or > 8% aluminum.

Based on its review of components associated with LRA Table 3.3.1, Item 3.3.1-95, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the effects of aging using the Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable for the following reasons:

a) Entergy is appropriately managing the loss of material due to pitting, crevice, and microbiologically influenced corrosion by using the Internal Surfaces in Miscellaneous Piping and Ducting Components program.

b) Entergy is appropriately managing the loss of material due to selective leaching by using the Selective Leaching program.

3.3.2.1.9 Cracking Due to Stress Corrosion Cracking

LRA Table 3.3.1, Item 3.3.1-83 addresses stainless steel diesel engine exhaust piping and piping components exposed to diesel exhaust, which will be managed for cracking due to stress corrosion cracking. As amended by its response to RAI B.1.25-1 (see ADAMS Accession No. ML18130A935) for the AMR items that cite generic note E, the LRA credits the Periodic Surveillance and Preventive Maintenance program to manage the aging effect for piping and piping components.

The staff noted that: (a) AMR Item AP-128 recommends that stainless steel piping components exposed to diesel exhaust be managed for cracking by AMP XI.M38; (b) AMP XI.M38 credits periodic visual inspections to detect aging effects; and (c) the periodicity and method of inspections, and acceptance criteria required by Entergy's programs are consistent with AMP XI.M38. Based on its review of components associated with LRA Table 3.3.1, Item 3.3.1-83, for which Entergy cited generic note E, the staff finds Entergy's proposal to manage the effects of aging using the Periodic Surveillance and Preventive Maintenance program acceptable because the periodic visual inspections conducted by the Periodic Surveillance and Preventive Maintenance program are capable of detecting cracking of stainless steel components exposed to diesel exhaust.

3.3.2.1.10 Conclusion

The staff evaluated the GALL Report aging management review items that Entergy claims are not applicable to RBS. On the basis of its review, the staff concludes that the aging management review results that Entergy claims are not applicable, are not applicable to RBS.

As discussed in SER Section 3.3.2.1, for those aging management reviews for which Entergy claims consistency with the GALL Report, the staff evaluated Entergy's claim of consistency. The staff also reviewed information pertaining to Entergy's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the aging management review results, which Entergy claims are consistent with the GALL Report, are consistent.

Therefore, the staff concludes that Entergy has demonstrated that it will adequately manage aging for these components in a way that maintains their intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2 *Aging Management Review Results Consistent with the GALL Report for Which Further Evaluation is Recommended*

In LRA Section 3.3.2.2, Entergy further evaluates aging management, as recommended by the GALL Report, for the auxiliary system components and provides information concerning how it will manage the applicable aging effects.

For component groups evaluated in the GALL Report, for which Entergy claims consistency with the report and for which the report recommends further evaluation, the staff audited and reviewed Entergy's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed Entergy's further evaluations against the criteria contained in SRP-LR Section 3.3.2.2. The staff's review of Entergy's further evaluation follows.

3.3.2.2.1 Cumulative Fatigue Damage

LRA Section 3.3.2.2.1 states that the plant-specific analyses for evaluating metal fatigue in auxiliary system components are time-limited aging analyses (TLAAs) for the LRA. Entergy states that in LRA Section 4.3.2, "Non-Class 1 Fatigue," it evaluated these TLAAs in accordance with requirements in 10 CFR 54.21(c)(1). This is consistent with SRP-LR Section 3.3.2.2.1 and is therefore acceptable. SER Section 4.3.2 documents the staff's evaluation of the metal fatigue TLAA for the auxiliary system components.

3.3.2.2.2 Cracking Due to Stress Corrosion Cracking and Cyclic Loading

LRA Section 3.3.2.2.2, associated with LRA Table 3.3.1, Item 3.3.1-3, addresses cracking in stainless steel pressurized-water reactor nonregenerative heat exchanger components exposed to treated borated water > 60 °C (140 °F). Entergy states that this item is not applicable to RBS because it pertains to PWRs only. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.3.2.2.2 and finds it acceptable because the item is not applicable to BWR plants.

3.3.2.2.3 Cracking Due to Stress Corrosion Cracking

LRA Section 3.3.2.2.3, associated with LRA Table 3.3.1, Item 3.3.1-4, addresses stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air, for which Entergy will manage cracking due to stress corrosion cracking by using the External Surfaces Monitoring program. In its review of components associated with LRA Table 3.3.1, Item 3.3.1-4, the staff needed additional information and therefore issued a request for additional information. RAI B.1.17-2, dated February 7, 2018, and Entergy's response, dated March 8, 2018, are documented in ADAMS Accession Nos. ML18038B470 and ML18067A437, respectively. The staff's evaluation of Entergy's response to RAI B.1.17-2 is documented in SER Section 3.0.3.2.6.

By letter dated May 10, 2018, Entergy amended LRA Section 3.3.2.2.3 to address stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air and air recently introduced into buildings, which Entergy will manage for cracking due to stress corrosion cracking by using the External Surfaces Monitoring program and One-Time Inspection program. The staff reviewed Entergy's proposal against the criteria in SRP-LR Section 3.3.2.2.3.

Based on its review of components associated with LRA Table 3.3.1, Item 3.3.1-4 and Entergy's response to RAI B.1.17-2, the staff finds that Entergy has met the further evaluation criteria. The staff finds Entergy's proposal to manage the effects of aging for stainless steel components exposed to outdoor air using the External Surfaces Monitoring program acceptable because the program includes visual inspections for leakage or staining due to leaking exhaust gas conducted at least once per refueling cycle. These periodic visual inspections are capable of identifying cracking prior to loss of intended functions. In addition, SER Section 3.2.2.2.3, Item 2, documents the staff's evaluation of RBS stainless steel components exposed to air recently introduced into buildings, which Entergy manages for cracking due to stress corrosion cracking using the One-Time Inspection program.

Based on the programs identified, the staff finds that Entergy's programs have met SRP-LR Section 3.3.2.2.3 criteria. For those items associated with LRA Section 3.3.2.2.3, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.4 Loss of Material Due to Cladding Breach

LRA Section 3.3.2.2.4, associated with LRA Table 3.3.1, Item 3.3.1-5, addresses loss of material due to cladding breach in pressurized-water reactor steel charging pump casings with stainless steel cladding exposed to treated borated water. Entergy states that this item is not applicable to RBS (a BWR) because it only applies to pressurized-water reactors. The staff confirms that this item is associated only with pressurized-water reactor plants; therefore, the staff finds Entergy's determination acceptable.

3.3.2.2.5 Loss of Material Due to Pitting and Crevice Corrosion

As amended by letter dated May 10, 2018, LRA Section 3.3.2.2.5, associated with LRA Table 3.3.1, Item 3.3.1-6, addresses stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air and air recently introduced into buildings. Entergy will manage this component, material, and environment combination for loss of material due to pitting and crevice corrosion by using the External Surfaces Monitoring program and One-Time Inspection program. The staff reviewed Entergy's proposal against the criteria in SRP-LR Section 3.3.2.2.5.

In its review of components associated with LRA Table 3.3.1, Item 3.3.1-6, the staff finds that Entergy has met the further evaluation criteria. The staff finds Entergy's proposal to manage the effects of aging for stainless steel components exposed to outdoor air using the External Surfaces Monitoring program acceptable because the program includes visual inspections of external surfaces, conducted at least once each refueling cycle, to identify corrosion and any other conditions that preclude the stainless steel from having a clean and shiny surface. The staff finds that these periodic visual inspections are capable of identifying loss of material prior to loss of intended functions. In addition, SER Section 3.2.2.2.3, Item 2 documents the staff's evaluation of Entergy's management for loss of material of stainless steel components exposed to air recently introduced into buildings using the One-Time Inspection program.

Based on the programs identified, the staff finds that Entergy's programs have met SRP-LR Section 3.3.2.2.5 criteria. For those items associated with LRA Section 3.3.2.2.5, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.6 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of Entergy's quality assurance program.

3.3.2.2.7 Ongoing Review of Operating Experience

SER Section 3.0.5 documents the staff's evaluation of Entergy's ongoing review of operating experience program.

3.3.2.2.8 Loss of Material Due to Recurring Internal Corrosion

LRA Section 3.3.2.2.8 is associated with LRA Table 3.3.1, Item 3.3.1-127, and addresses metallic piping and piping components exposed to raw water or waste water, for which Entergy will manage loss of material due to recurring internal corrosion. Entergy states that its review of plant operating experience did not identify conditions that meet the definition of recurring internal corrosion. However, based on its independent review of plant-specific operating experience, the staff questioned the basis for Entergy's determination. As a result, the staff issued a request for additional information. RAI 3.3.2.2.8-1, dated January 9, 2018, and Entergy's response, dated February 7, 2018, are documented in ADAMS Accession No. ML18009A909 and No. ML18087A164, respectively.

As part of its response to RAI 3.3.2.2.8-1, Entergy revised LRA Section 3.3.2.2.8 and stated that a review of plant-specific operating experience had identified recurring internal corrosion in carbon steel portions of the fire water system that are normally water filled. Neither the staff, during its independent review of plant-specific operating experience, nor Entergy noted any instances where through-wall loss of material led to a loss of intended function of the fire water system. To address this aging effect, Entergy revised its Fire Water System program in LRA Section B.1.20, revised the USAR supplement in LRA Section A.1.20, and added an aging management review item to LRA Table 3.3.2-7.

The staff finds Entergy has met the further evaluation criteria. Entergy's proposal to manage the effects of aging using the Fire Water System program is acceptable because the quantity of inspections, method of inspection, selection criteria of inspection location, acceptance criteria, and quantity of additional inspections based on extent of condition provide reasonable assurance that Entergy can detect loss of material due to recurring internal corrosion prior to a loss of intended function of the fire water system. In particular, the staff notes that: (a) the quantity of inspections in each 10-year period is consistent with the sampling recommendations in GALL Report AMP XI.M38, (b) given that leaks did not result in a loss of intended function, the inspections can provide adequate data to trend loss of material rates in the fire water system, (c) ultrasonic or radiography methods will be used to determine the wall thickness, (d) the most susceptible locations will be selected for inspection, (e) acceptance criteria will be based on a comparison of the results to nominal wall thickness, previous wall thickness measurements, and design minimum wall requirements, (f) subsequent inspections will be based on inspection results, (g) the remaining service life will be calculated where substantial corrosion is identified, and (h) additional locations will be examined in the next refueling cycle based on the results of inspections.

Based on the program identified, the staff finds that Entergy's program has met SRP-LR Section 3.3.2.2.8 criterion. For those items associated with LRA Section Table 3.3.1, Item 3.3.1-127, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL Report

For LRA Table 3.3.2-1 through Table 3.3.2-17, and LRA Table 3.3.2.18-1 through Table 3.3.2.18-26, the staff reviewed additional details of the aging management review results for material, environment, aging effect requiring management, and aging management program combinations not consistent with or not addressed in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed Entergy's evaluation to determine whether Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation. The following sections document the staff's evaluation.

3.3.2.3.1 Control Rod Drive System—Summary of Aging Management Review—LRA Table 3.3.2-1

The staff reviewed LRA Table 3.3.2-1, which summarizes the results of Entergy's aging management review evaluations for the control rod drive system component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.3.2.3.2 Component Cooling Water System—Summary of Aging Management Review—LRA Table 3.3.2-2

The staff reviewed LRA Table 3.3.2-2, which summarizes the results of Entergy's aging management review evaluations for the component cooling water system component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.3.2.3.3 Service Water System—Summary of Aging Management Evaluation—LRA Table 3.3.2-3

The staff reviewed LRA Table 3.3.2-3, which summarizes the results of Entergy's aging management review evaluations for the service water system component groups.

Titanium Heat Exchanger Tube Exposed to Externally to Lube Oil.

In LRA Table 3.3.2-3, Entergy states that titanium heat exchanger tubes exposed to lube oil will be managed for loss of material by the Oil Analysis program. The aging management review item cites generic Note G.

The staff reviewed the associated items in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and environment description. The GALL Report Section IX.C, "Selected Definitions & Use of Terms for Describing and Standardizing Materials," states that titanium and titanium alloys may be susceptible to crevice corrosion in saltwater environments at elevated temperatures. The staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination. The staff finds Entergy's proposal to manage the effects of aging acceptable because the Oil Analysis program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to loss of material or reduction of heat transfer. Additionally, the new One-Time Inspection program will verify the effectiveness of the Oil Analysis program by confirming that unacceptable loss of material is not occurring.

Stainless Steel and Carbon Steel Closure Bolting Exposed to Condensation (External)

In LRA Table 3.3.2-3, Entergy states that it will manage stainless steel and carbon steel bolting exposed to condensation (external) for loss of preload by using the Bolting Integrity program. The aging management review items cite generic Note H, for which Entergy has identified loss of preload as an additional aging effect.

The staff notes that this component, material, and environment is identified in the GALL Report, which states that carbon steel and stainless steel bolting exposed to condensation is susceptible to loss of material and recommends GALL Report AMP XI.M18, "Bolting Integrity," to manage this aging effect. The staff notes that Entergy addresses loss of material for this component, material, and environment combination in LRA Table 3.3.2-3. However, Entergy also identified loss of preload as an additional aging effect. The staff notes that the GALL Report AMP indicates that loss of preload is an aging effect that is monitored for bolting materials. The staff finds Entergy's proposal to manage loss of preload acceptable because the Bolting Integrity program includes: (1) periodic visual inspections of closure bolting for signs of leakage that are capable of detecting loss of preload before there is a loss of intended function, and (2) preventive actions such as applying proper lubricant, using proper torque, and checking the uniformity of the gasket to preclude or minimize loss of preload.

Stainless Steel and Carbon Steel Closure Bolting Exposed to Raw Water (External)

In LRA Table 3.3.2-3, Entergy states that it will manage stainless steel and carbon steel bolting exposed to raw water for loss of material by using the Bolting Integrity program. The aging management review items cites generic Note H, for which Entergy has identified loss of material as an additional aging effect.

The staff notes that this component, material, and environment is identified in the GALL Report, which states that stainless steel and carbon steel bolting exposed to raw water is susceptible to loss of preload and recommends GALL Report AMP XI.M18 to manage this aging effect. The staff notes that Entergy addresses loss of preload for this component, material, and environment combination in LRA Table 3.3.2-3. Entergy also identifies loss of material as an additional aging effect that is monitored for bolting materials, which is consistent with GALL Report AMP XI M18. The staff issued RAI B.1.2-2 to request additional information on how the Bolting Integrity program will detect loss of material for submerged bolting. RAI B.1.2-2, dated January 22, 2018, and Entergy's response, dated February 20, 2018, are documented in ADAMS Accession No. ML18022A941 and No. ML18051A531, respectively. SER Section 3.0.3.2.1 documents the staff's evaluation and resolution of this issue.

Based on its review of information provided by Entergy and revisions made to LRA Appendix A, Section A.1.2 and Appendix B, Section B.1.2 in response to RAI B.1.2-2, the staff finds Entergy's proposal to manage loss of material acceptable because: (1) the Bolting Integrity program includes inspection in each 10-year period during the period of extended operation of a sample of 20 percent, or at least 25 bolts, for each combination of bolting material and environment (including submerged environments) of the total population, and (2) this is consistent with the recommendations in the GALL-SLR Report for the inspection of submerged closure bolts.

Titanium Heat Exchanger Channel Heads, Tubesheets, and Tubes Exposed to Treated Water

In LRA Table 3.3.2-3, Entergy states that it will manage titanium heat exchanger channel heads, tubesheets, and tubes exposed to treated water for loss of material by using the Water Chemistry Control—Closed Treated Water program. The aging management review items cite generic Note G.

The staff reviewed the associated items in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and environment description. The staff reviewed EPRI 1010639, Table 4-1, "Aging Effects Summary – Stainless Steel, Nickel-Base Alloys, and Titanium and Titanium Alloys," which indicates that loss of material due to pitting and crevice corrosion may occur in a treated water environment in some circumstances, but cracking is not applicable for most common grades of titanium. As part of the audit, during its review of ME-15-0002, "Aging Management Review of the Service Water System," the staff confirmed that the associated heat exchanger components did not have intended functions of heat transfer and were fabricated with a grade of titanium that is not susceptible to cracking. Based on the above, the staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination.

Stainless Steel Components Exposed to Condensation

The staff's evaluation for stainless steel components (which include, but are not limited to, accumulators, expansion joints, flex hoses, heat exchangers, piping, pump casings, strainer housings, and valve bodies) exposed to condensation, which will be managed for loss of material by the External Surfaces Monitoring program and are associated with generic Note G, is documented in SER Section 3.2.2.3.2.

Plastic (PVDF or Polyvinylidene Fluoride) Valve Bodies Exposed to Outdoor Air

In LRA Table 3.3.2-3, Entergy states that it will manage the aging effects of polyvinylidene fluoride (PVDF) valve bodies exposed to outdoor air for change in material properties by using the External Surfaces Monitoring program. The aging management review item cites generic Note F.

The staff reviewed the associated item in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and environment combination. The staff notes that in NUREG-2190, "Safety Evaluation Report, Related to the License Renewal of Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2," the staff had previously determined that PVDF is unaffected by long-term exposure to sunlight and ultraviolet radiation, and it is also resistant to most acids and alkalis. Additionally, EPRI 1010639, Revision 4, "Non-Class 1 Mechanical Implementation Guide and Mechanical Tools," states that, conservatively, aging effects for PVDF are applicable due to exposure to ultraviolet radiation, ozone, and ionizing radiation. Based on this information, the staff finds that Entergy has conservatively identified all credible aging effects for this component, material, and environment combination. In addition, the staff finds Entergy's proposal to manage the effects of aging acceptable because the visual inspections conducted through the External Surfaces Monitoring program are capable of identifying changes in material properties through the absence of discoloration, crazing, and surface cracking in the polymeric components.

Plastic (PVDF) Valve Bodies Exposed to Treated Water

In LRA Table 3.3.2-3, Entergy states that for polyvinylidene fluoride (PDVF) valve bodies exposed to treated water, there is no aging effect and no aging management program is proposed. The aging management review item cites generic Note F.

The staff reviewed the associated item in the LRA to confirm that no credible aging effects are applicable for this component, material, and environment combination. The staff notes that in NUREG-2190, "Safety Evaluation Report, Related to the License Renewal of Byron Station, Units 1 and 2, and Braidwood Station, Units 1 and 2," the staff had previously determined that PVDF is unaffected by long-term exposure to sunlight and ultraviolet radiation, and it is also resistant to most acids and alkalis. Additionally, EPRI 1010639, Appendix A, "Treated Water," states that PVDF has a continuous heat resistance of 300 °F. The staff notes that RBS-ME-15-00012, "Aging Management Review of Service Water System," identifies the maximum operating temperatures of the service water system as less than 140 °F. Based on this information, the staff finds Entergy's proposal acceptable because PVDF material is not susceptible to aging effects when exposed to a treated water environment.

3.3.2.3.4 Compressed Air System—Nonsafety-Related Components Affecting Safety-Related Systems—LRA Table 3.3.2-4

The staff reviewed LRA Table 3.3.2-4, which summarizes the results of aging management review evaluations for the compressed air system component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.3.2.3.5 Standby Liquid Control System—Nonsafety-Related Components Affecting Safety-Related Systems—LRA Table 3.3.2-5

The staff reviewed LRA Table 3.3.2-5, which summarizes the results of aging management review evaluations for the standby liquid control system component groups. The staff's review did not identify any items with Notes F through J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.3.2.3.6 Main Steam Positive Leakage Control System—Nonsafety-Related Components Affecting Safety-Related Systems—LRA Table 3.3.2-6

The staff reviewed LRA Table 3.3.2-6, which summarizes the results of aging management review evaluations for the main steam positive leakage control system component groups.

Nickel Alloy Flex Hose Exposed to Steam (Internal)

In LRA Table 3.3.2-6, Entergy states that it will manage the nickel alloy flex hose exposed internally to steam for cracking and loss of material by using the Water Chemistry Control—BWR program. The aging management review items cite generic Note G.

The staff reviewed the associated items in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and environment description. The staff notes that Entergy addresses cracking—fatigue for this component, material, and environment combination in LRA Table 3.3.2-6, Item 3.1.1-6. Based on its review of the GALL Report (SP-157), which states that nickel alloy is vulnerable to loss of material due to general, pitting, and crevice corrosion, the staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination. The staff finds Entergy's proposal to manage cracking and loss of material using the Water Chemistry Control—BWR program acceptable as follows: the Water Chemistry Control—BWR program is capable of managing cracking and loss of material by periodic monitoring and control of corrosive impurities listed in the EPRI water chemistry guidelines. Additionally, Entergy will use the new One-Time Inspection program to verify the effectiveness of the Water Chemistry Control—BWR program.

Stainless Steel Components Exposed to Condensation

The staff's evaluation for stainless steel components (which include, but are not limited to, accumulators, expansion joints, flex hoses, heat exchangers, piping, pump casings, strainer housings, and valve bodies) exposed to condensation, which will be managed for loss of material by the External Surfaces Monitoring program and are associated with generic Note G, is documented in SER Section 3.2.2.3.2.

3.3.2.3.7 Fire Protection—Water System—Summary of Aging Management Evaluation—LRA Table 3.3.2-7

The staff reviewed LRA Table 3.3.2-7, which summarizes the results of aging management review evaluations for the fire protection—water system component groups.

Aluminum Heater Housings Exposed to Treated Water.

In LRA Table 3.3.2-7, Entergy states that it will manage the aging effects of the aluminum heater housings exposed to treated water for cracking by using the Water Chemistry Control—Closed Treated Water Systems program. The aging management review item cites generic Note H, for which Entergy has identified cracking as an additional aging effect.

The staff notes that cracking is an aging effect requiring management for aluminum components in various environments. The staff finds Entergy's proposal to manage cracking acceptable because the Water Chemistry Control—Closed Treated Water Systems program includes sufficient inspection and maintenance activities to identify cracking of aluminum components exposed to treated water.

3.3.2.3.8 Fire Protection—Halon System—Summary of Aging Management Evaluation—LRA Table 3.3.2-8

The staff reviewed the LRA Table 3.3.2-8, which summarizes the results of aging management review evaluations for the fire protection—halon system component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.3.2.3.9 Combustible Gas Control System—Summary of Aging Management Evaluation—LRA Table 3.3.2-9

The staff reviewed LRA Table 3.3.2-9, which summarizes the results of aging management review evaluations for the combustible gas control system component groups.

Aluminum, Copper Alloy, and Stainless Steel Heat Exchanger Fins, Heat Exchanger Tubes, and Coils Exposed to Indoor Air, Outdoor Air, and Condensation

As amended by letter dated May 10, 2018 (see ADAMS Accession No. ML18130A935), LRA Table 3.3.2-9, Table 3.3.2-10, Table 3.3.2-11, Table 3.3.2-12, and Table 3.3.2-13 state that aluminum, copper alloy, and stainless steel heat exchanger fins, heat exchanger tubes, and coils exposed to indoor air, outdoor air, and condensation will be managed for reduction of heat transfer by the Periodic Surveillance and Preventive Maintenance program. The aging management review items cite generic Note G or Note H.

The staff reviewed the associated items in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and environment combination. The staff notes that Entergy addresses loss of material for components exposed to condensation and outdoor air in other aging management review items. In addition, the staff notes that Entergy does not address the loss of material for components exposed to indoor air; however, the staff does not expect loss of material to occur for aluminum, copper alloy, and stainless steel exposed to indoor air. Based on its review of the GALL Report, which states that loss of material is not expected to occur for aluminum, copper alloy, and stainless steel exposed to indoor air, the staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination.

The staff finds Entergy's proposal to manage aging using the Periodic Surveillance and Preventive Maintenance program acceptable because the visual inspections required by the program, with a representative sample of components inspected at least once every 10 years, are capable of detecting reduction of heat transfer for heat exchanger surfaces (i.e., detect buildup of debris on the surfaces) prior to loss of the intended function.

Stainless Steel Accumulators, Filter Housings, Flex Hoses, Piping, Sight Glasses, Tubing, and Valve Bodies Exposed to Outdoor Air and Condensation

As amended by letter dated May 10, 2018 (ADAMS Accession No. ML18130A935), LRA Table 3.3.2-9 and Table 3.3.2-12 state that stainless steel accumulators, filter housings, flex hoses, piping, sight glasses, tubing, and valve bodies exposed to outdoor air and condensation will be managed for cracking due to stress corrosion cracking by using the Periodic Surveillance and Preventive Maintenance program. The aging management review items cite generic Note G or Note H.

The staff reviewed the associated items in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and environment combination. The staff notes that Entergy addresses loss of material for this component, material, and environment combination in other aging management review items. Based on its review of the GALL Report, which states that cracking due to stress corrosion cracking and loss of material is expected to occur for stainless steel exposed to outdoor air and condensation, the staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination.

The staff notes the following: (a) AMR Item AP-128 recommends that stainless steel piping components exposed to diesel exhaust be managed for cracking by GALL Report AMP XI.M38, (b) GALL Report AMP XI.M38 credits periodic visual inspections to detect aging effects, and (c) Entergy's program specifies periodicity, method of inspections, and acceptance criteria consistent with GALL Report AMP XI.M38. The staff finds Entergy's proposal to manage cracking acceptable because periodic visual inspections are capable of detecting cracking of stainless steel components exposed to outdoor air and condensation prior to loss of the intended function.

3.3.2.3.10 Standby Diesel Generator System—Summary of Aging Management Evaluation—LRA Table 3.3.2-10

The staff reviewed LRA Table 3.3.2-10, which summarizes the results of aging management review evaluations for the standby diesel generator system component groups.

Aluminum, Copper Alloy, and Stainless Steel Heat Exchanger Fins, Heat Exchanger Tubes, and Coils Exposed to Indoor Air, Outdoor Air, and Condensation

The staff's evaluation for aluminum, copper alloy, and stainless steel heat exchanger fins, heat exchanger tubes, and coils exposed to indoor air, outdoor air, and condensation, for which Entergy will manage reduction of heat transfer by using the Periodic Surveillance and Preventive Maintenance program and are associated with generic Note G or Note H, is documented in SER Section 3.3.2.3.9.

Aluminum, Carbon Steel, Copper Alloy, and Stainless Steel Accumulators, Ducting, Filter Housing, Flex Hoses, Heat Exchanger Fins, Heat Exchanger Housings, Heat Exchanger Tubes, Piping, Pump Casings, Sight Glasses, Silencers, Tubing, and Valve Bodies Exposed to Outdoor Air and Condensation

As amended by letter dated March 8, 2018 (see ADAMS Accession No. ML18067A437), LRA Table 3.3.2-10, Table 3.3.2-11, Table 3.3.2-12, and Table 3.3.2-13 state that aluminum, carbon steel, copper alloy, and stainless steel accumulators, ducting, filter housings, flex hoses, heat exchanger fins, heat exchanger housings, heat exchanger tubes, piping, pump casings, sight glasses, silencers, tubing, and valve bodies exposed to outdoor air and condensation will be managed for loss of material by the Internal Surfaces in Miscellaneous Piping and Ducting Components program. The aging management review items cite generic Note G.

The staff reviewed the associated items in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and environment combination. The staff notes that Entergy addressed reduction of heat transfer for heat exchanger surfaces and cracking for stainless steel components, which the staff found acceptable in SER Section 3.3.2.3.9. Based on its review of the GALL Report, which states that cracking is not expected to occur for aluminum, carbon steel, and copper alloys exposed to outdoor air or condensation, the staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination.

The staff finds Entergy's proposal to manage aging using the Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because the opportunistic visual inspections conducted by the program, with a representative sample of components inspected at least once every 10 years, are capable of detecting loss of material prior to loss of the intended function.

Elastomeric Expansion Joints and Flexible Connections Exposed to Outdoor Air.

In LRA Table 3.3.2-10, Table 3.3.2-11, and Table 3.3.2-12, Entergy states that it will manage elastomeric expansion joints and flexible connections exposed to outdoor air for cracking and changes in material properties by using the External Surfaces Monitoring program. The items cite generic Note G.

The staff reviewed the associated items in the LRA and considered whether Entergy's proposed aging effects constitute all of the applicable aging effects for this component, material, and environment combination. The staff notes that, in some cases, Entergy addressed loss of material due to wear for this component, material, and environment combination in other aging management review items. Based on its review of the GALL Report for Item VII.F3.AP-102, and Item VII.F3.AP-113, which state that elastomeric components in indoor air are susceptible to loss of material due to wear and changes in material property, the staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination. The staff notes that Entergy's External Surfaces Monitoring program includes physical manipulation to augment visual inspections to confirm the absence of elastomer hardening and loss of strength. The staff finds Entergy's proposal to manage the effects of aging acceptable because the visual inspections and physical manipulations of elastomeric components conducted through the External Surfaces Monitoring program are capable of identifying changes in material properties and cracking in these components.

3.3.2.3.11 HPCS Diesel Generator System—Summary of Aging Management Evaluation—LRA Table 3.3.2-11

The staff reviewed LRA Table 3.3.2-11, which summarizes the results of aging management review evaluations for the HPCS diesel generator system component groups.

Aluminum, Copper Alloy, and Stainless Steel Heat Exchanger Fins, Heat Exchanger Tubes, and Coils Exposed to Indoor Air, Outdoor Air, and Condensation

The staff's evaluation for aluminum, copper alloy, and stainless steel heat exchanger fins, heat exchanger tubes, and coils exposed to indoor air, outdoor air, and condensation, which will be managed for reduction of heat transfer by the Periodic Surveillance and Preventive Maintenance program and are associated with generic Note G or Note H, is documented in SER Section 3.3.2.3.9.

Aluminum, Carbon Steel, Copper Alloy, and Stainless Steel Accumulators, Ducting, Filter Housing, Flex Hoses, Heat Exchanger Fins, Heat Exchanger Housings, Heat Exchanger Tubes, Piping, Pump Casings, Sight Glasses, Silencers, Tubing, and Valve Bodies Exposed to Outdoor Air and Condensation

The staff's evaluation for aluminum, carbon steel, copper alloy, and stainless steel accumulators, ducting, filter housings, flex hoses, heat exchanger fins, heat exchanger housings, heat exchanger tubes, piping, pump casings, sight glasses, silencers, tubing, and valve bodies exposed to outdoor air and condensation, which will be managed for loss of material by using the Internal Surfaces in Miscellaneous Piping and Ducting Components program and are associated with generic Note G, is documented in SER Section 3.3.2.3.10.

Elastomeric Expansion Joints and Flexible Connections Exposed to Outdoor Air

The staff's evaluation for elastomeric expansion joints and flexible connections exposed to outdoor air, which will be managed for cracking and changes in material properties by using the External Surfaces Monitoring program and are associated with generic Note G, is documented in SER Section 3.3.2.3.10.

Carbon Steel Piping Internally Exposed to Outdoor Air

In LRA Table 3.3.2-11 and Table 3.3.2-17, Entergy states that it will manage carbon steel piping and flame arrestors internally exposed to outdoor air for loss of material by using the External Surfaces Monitoring program. The aging management review items cite generic Note G with a plant-specific note, which states that the components have openings that expose the internal surfaces to outdoor air (the same environment as the external surfaces). Consequently, the aging effects of the internal surfaces can be inferred from the external surface conditions.

Although Entergy cites generic Note G, indicating that the specified environment is not in the GALL Report for this component and material, the staff notes that Entergy currently includes AMR Item VII.A.78, which addresses the same component and material externally exposed to an outdoor air environment. Based on this, the staff finds that Entergy has identified all of the credible aging effects for this component, material, and environment combination. In addition, the staff finds Entergy's proposal to manage the effects of aging acceptable because it is reasonable to conclude that the external surface conditions of these components, as identified through the External Surfaces Monitoring program, will be representative of the conditions of internal surfaces exposed to outside air.

Stainless Steel Piping Internally Exposed to Outdoor Air.

In LRA 3.3.2-11, Entergy states that it will manage stainless steel piping internally exposed to outdoor air for loss of material and cracking. The aging management review items cite generic Note G.

Although Entergy cites generic Note G, indicating that the specified environment is not in the GALL Report for this component and material, the staff notes that Entergy currently includes AMR Item VII.H2.AP-221 and Item VII.H2-209, which address the same component and material externally exposed to an outdoor air environment. Based on this, the staff finds that Entergy has identified all of the credible aging effects for this component, material, and environment combination. The staff also notes that RBS-ME-15-00018, "Aging Management Review of the HPCS Diesel Generator System," states that where the internal and external surfaces of the same component are identical and exposed to the same environment, the external surfaces are representative of the internal surfaces for these components. The staff finds Entergy's proposal to manage the effects of aging acceptable because it is reasonable to conclude that the external surface conditions of these components, as identified through the External Surfaces Monitoring program, will be representative of the conditions of internal surfaces exposed to outside air.

3.3.2.3.12 Control Building HVAC System—Summary of Aging Management Evaluation—LRA Table 3.3.2-12

The staff reviewed LRA Table 3.3.2-12, which summarizes the results of aging management review evaluations for the control building HVAC system component groups.

Aluminum, Copper Alloy, and Stainless Steel Heat Exchanger Fins, Heat Exchanger Tubes, and Coils Exposed to Indoor Air, Outdoor Air, and Condensation.

The staff's evaluation for aluminum, copper alloy, and stainless steel heat exchanger fins, heat exchanger tubes, and coils exposed to indoor air, outdoor air, and condensation, which will be managed for reduction of heat transfer by using the Periodic Surveillance and Preventive Maintenance program and are associated with generic Note G or Note H, is documented in SER Section 3.3.2.3.9.

Stainless Steel Accumulators, Filter Housings, Flex Hoses, Piping, Sight Glasses, Tubing, and Valve Bodies Exposed to Outdoor Air and Condensation.

The staff's evaluation for stainless steel accumulators, filter housings, flex hoses, piping, sight glasses, tubing, and valve bodies exposed to outdoor air and condensation, which will be managed for cracking due to stress corrosion cracking by using the Periodic Surveillance and Preventive Maintenance program and are associated with generic Note G or Note H, is documented in SER Section 3.3.2.3.9.

Aluminum, Carbon Steel, Copper Alloy, and Stainless Steel Accumulators, Ducting, Filter Housing, Flex Hoses, Heat Exchanger Fins, Heat Exchanger Housings, Heat Exchanger Tubes, Piping, Pump Casings, Sight Glasses, Silencers, Tubing, and Valve Bodies Exposed to Outdoor Air and Condensation.

The staff's evaluation for aluminum, carbon steel, copper alloy, and stainless steel accumulators, ducting, filter housings, flex hoses, heat exchanger fins, heat exchanger housings, heat exchanger tubes, piping, pump casings, sight glasses, silencers, tubing, and valve bodies exposed to outdoor air and condensation, which will be managed for loss of material by using the Internal Surfaces in Miscellaneous Piping and Ducting Components program and are associated with generic Note G, is documented in SER Section 3.3.2.3.10.

Elastomer Flex Connections Exposed to Outdoor Air.

In LRA Table 3.3.2-12, Entergy states that elastomer flex connections exposed to outdoor air will be managed for loss of material due to wear by using the Internal Surfaces in Miscellaneous Piping and Ducting Components program. The aging management review item cites generic Note G.

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by Entergy constitute all of the credible aging effects for this component, material, and environment combination. The staff notes that Entergy addressed cracking and change in material properties for this component, material, and environment combination in other aging management review items. Based on its review of the GALL Report, which states that cracking and change in material properties are expected to occur for elastomers exposed to outdoor air, the staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination.

The staff finds Entergy's proposal to manage aging using the Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because the opportunistic visual inspections conducted as part of the program, which results in a representative sample of components inspected at least once every 10 years, are capable of detecting loss of material due to wear prior to loss of the intended function.

Elastomeric Expansion Joints and Flexible Connections Exposed to Outdoor Air.

The staff's evaluation for elastomeric expansion joints and flexible connections exposed to outdoor air, which will be managed for cracking and changes in material properties by using the External Surfaces Monitoring program and are associated with generic Note G, is documented in SER Section 3.3.2.3.10.

3.3.2.3.13 Miscellaneous HVAC System—Summary of Aging Management Evaluation—LRA Table 3.3.2-13

The staff reviewed LRA Table 3.3.2-13, which summarizes the results of aging management review evaluations for the miscellaneous HVAC System component groups.

Aluminum, Copper Alloy, and Stainless Steel Heat Exchanger Fins, Heat Exchanger Tubes, and Coils Exposed to Indoor Air, Outdoor Air, and Condensation

SER Section 3.3.2.3.9 documents the staff's evaluation for aluminum, copper alloy, and stainless steel heat exchanger fins, heat exchanger tubes, and coils exposed to indoor air, outdoor air, and condensation, which will be managed for reduction of heat transfer by using the Periodic Surveillance and Preventive Maintenance program and are associated with generic Note G or Note H.

Aluminum, Carbon Steel, Copper Alloy, and Stainless Steel Accumulators, Ducting, Filter Housing, Flex Hoses, Heat Exchanger Fins, Heat Exchanger Housings, Heat Exchanger Tubes, Piping, Pump Casings, Sight Glasses, Silencers, Tubing, and Valve Bodies Exposed to Outdoor Air and Condensation

SER Section 3.3.2.3.10 documents the staff's evaluation for aluminum, carbon steel, copper alloy, and stainless steel accumulators, ducting, filter housings, flex hoses, heat exchanger fins, heat exchanger housings, heat exchanger tubes, piping, pump casings, sight glasses, silencers, tubing, and valve bodies exposed to outdoor air and condensation, which will be managed for loss of material by using the Internal Surfaces in Miscellaneous Piping and Ducting Components program and are associated with generic Note G.

3.3.2.3.14 Chilled Water System—Summary of Aging Management Evaluation—LRA Table 3.3.2-14

The staff reviewed LRA Table 3.3.2-14, which summarizes the results of aging management review evaluations for the chilled water system component groups.

Stainless Steel Components Exposed to Condensation.

The staff's evaluation for stainless steel components (which includes, but is not limited to, accumulators, expansion joints, flex hoses, heat exchangers, piping, pump casings, strainer housings, and valve bodies) exposed to condensation, which will be managed for loss of material by using the External Surfaces Monitoring program and are associated with generic Note G, is documented in SER Section 3.2.2.3.2.

3.3.2.3.15 Fuel Pool Cooling and Cleanup System—Summary of Aging Management Evaluation—LRA Table 3.3.2-15

The staff reviewed the LRA Table 3.3.2-15, which summarizes the results of aging management review evaluations for the fuel pool cooling and cleanup system component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.3.2.3.16 Plant Drains—Summary of Aging Management Evaluation—LRA Table 3.3.2-16

The staff reviewed LRA Table 3.3.2-16, which summarizes the results of aging management review evaluations for the plant drains system component groups.

Stainless Steel Piping and Piping Components Exposed to Waste Water

In LRA Table 3.3.2-16, Entergy stated that stainless steel piping and piping components exposed to waste water will be managed for cracking by the Periodic Surveillance and Preventive Maintenance program or the Internal Surfaces in Miscellaneous Piping and Ducting Components program. The AMR items cite generic Note H, for which Entergy has identified cracking as an additional aging effect. By letter dated May 10, 2018, Entergy responded to RAI B.1.25-1 (see ADAMS Accession No. ML18130A935), and replaced the Internal Surfaces in Miscellaneous Piping and Ducting Components program, for those components that cited this program, with the Periodic Surveillance and Preventive Maintenance program to manage cracking for piping and valve bodies exposed to waste water, which cite generic Note H.

The staff noted that: (a) AMR Item AP-128 recommends that stainless steel piping components exposed to diesel exhaust be managed for cracking by AMP XI.M38, (b) AMP XI.M38 credits periodic visual inspections to detect aging effects, and (c) the periodicity and method of inspections, and acceptance criteria required by Entergy's program are consistent with AMP XI.M38. The staff finds Entergy's proposal to manage cracking acceptable because the periodic visual inspections conducted by the Periodic Surveillance and Preventive Maintenance program are capable of detecting cracking of stainless steel components exposed to waste water.

Carbon Steel (Coated) Closure Bolting Exposed to Waste Water (External)

In LRA Table 3.3.2-16, Entergy states that it will manage the carbon steel (coated) bolting exposed to waste water (external) for the aging effects of loss of preload and loss of material by using the Bolting Integrity program. The aging management review items cite generic Note G.

The staff reviewed the associated items in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and environment description. The staff notes that the GALL Report defines a waste water environment as potentially radioactive or nonradioactive waters that are collected from equipment and floor drains. The staff notes that even though the GALL Report does not specifically address carbon steel (coated) exposed to waste water, GALL Report Table IX,C, "Selected Definitions & Use of Terms for Describing and Standardizing Materials," states that carbon steel (including coated carbon steel when exposed to moisture) is generally grouped under the category of steel. The staff also notes that the GALL Report states that steel piping components exposed to waste water and bolted connections exposed to borated water leakage should be managed for loss of material. The GALL Report further states that steel closure bolts (not made of high-strength steel) exposed to any environment should be managed for loss of preload. Therefore, based on its review of the GALL Report, the staff finds that Entergy identified all credible aging effects (i.e., loss of preload and loss of material) for this component, material, and environment combination.

The staff issued RAI B.1.2-2 to request additional information on how the Bolting Integrity program will detect loss of preload and loss of material for submerged bolting. RAI B.1.2-2, dated January 22, 2018, and Entergy's response, dated February 20, 2018, are documented in ADAMS Accession No. ML18022A941 and No. ML18051A531, respectively. SER Section 3.0.3.2.1 documents the staff's evaluation and resolution of this issue.

Based on its review of information provided by Entergy and revisions made to LRA Section A.1.2 and Section B.1.2 in response to RAI B.1.2-2, the staff finds Entergy's proposal to manage loss of preload and loss of material acceptable as follows: (1) The Bolting Integrity program includes inspection in each 10-year period during the period of extended operation of a sample of 20% (or at least 25 bolts) for each combination of bolting material and environment (including submerged environments) of the total population. (2) This inspection frequency and method is consistent with the recommendations in the GALL-SLR Report for the inspection of submerged closure bolts.

Stainless Steel Strainers with a Filtration Intended Function

In LRA Table 3.3.2-16, "Plant Drains," Entergy stated that the strainers have a filtration function and will be managed for loss of material. The staff noted that there is no item citing flow blockage due to fouling as an aging effect requiring management. LRA Table 2.0-1, "Component Intended Functions: Abbreviations and Definitions," states that the filtration function is, "[p]rovide removal of unwanted material." LRA Table 2.0-1 states that the mechanical pressure boundary function is, "[p]rovide pressure boundary integrity such that adequate flow and pressure can be delivered…" However: (a) LRA Section 2.3.3.16 states that the auxiliary building crescent area sumps have the ability to pump to the suppression pool via the high pressure core spray system minimum flow line using the associated sump pumps, referred to as suppression pool pumpback; and (b) USAR Section 9.2.6.3 credits the action of the sump pumps to address a crack in the reactor core isolation cooling system suction line. In addition, as discussed in the Aging Management Programs Audit Report, dated January 29, 2018 (ADAMS Accession No. ML17346A732), condition report CR-RBS-2009-5426 (Surveillance Test Procedure – Adverse Trend Due to System Degradation in the Carbon Steel Sections of the Plant Drain Piping) identifies extensive corrosion in plant drain lines that resulted in partial flow blockage. The staff needed additional information, and therefore issued a request for additional information. RAI 3.3.2.3.16-1, dated November 16, 2017, and Entergy's response, dated December 16, 2017, are documented in ADAMS Accession Nos. ML17320B099 and ML17347B473.

In its response to RAI 3.3.2.3.16-1, Entergy stated that, "[f]ouling of strainers or filters is not an aging effect, but is an effect of system operation that is managed, both during the original license term and during the period of extended operation, through operational features and monitoring activities." The staff has determined that flow blockage due to fouling is an applicable aging effect if the accumulation of debris on the surfaces of strainers or filters could result in a reduction of flow such that the intended function of a system or component would not be met. The staff recognizes that, as stated by Entergy, operational features or monitoring activities might be effective means to manage this aging effect. The staff noted that the sump where the pumps are located has a fiberglass liner and no coating, and only debris larger than 0.28 inches would accumulate on the surface of the strainer. The staff finds Entergy's response acceptable because given that the sump is not coated and loss of coating integrity is managed for any components where loss of coating integrity could result in downstream flow blockage, there is reasonable assurance that debris from aging effects (greater than the space between the strainer plates) will not accumulate in the sump or on the strainer surfaces.

3.3.2.3.17 <u>Fuel Oil System—Summary of Aging Management Review—LRA Table 3.3.2-17</u>

The staff reviewed LRA Table 3.3.2-17, which summarizes the results of aging management review evaluations for the fuel oil system component groups.

<u>Carbon Steel Piping Internally Exposed to Outdoor Air.</u>

SER Section 3.3.2.3.11 documents the staff's evaluation for carbon steel piping and flame arrestors internally exposed to outdoor air, for which Entergy will manage for loss of material by using the External Surfaces Monitoring program and for which aging management reviews are associated with generic Note G.

3.3.2.3.18 <u>Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)—Summary of Aging Management Review—LRA Tables 3.3.2-18-1 through 3.3.2-18-26</u>

The staff reviewed LRA Tables 3.3.2-18-1 through 3.3.2-18-26, which summarize the results of aging management review evaluations for the Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

<u>For LRA Table 3.3.2.18-1 Control Rod Drive Hydraulic System—Summary of Aging Management Review</u>

The staff reviewed LRA Table 3.3.2-18-1, which summarizes the results of aging management review evaluations for the control rod drive hydraulic system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-2 Fuel Transfer Equipment System—Summary of Aging Management Review

Fiberglass Tank and Piping Exposed to Treated Water.

In LRA Table 3.3.2-18-2 and LRA Table 3.4.2-2-1, Entergy states that it will use the Water Chemistry Control—BWR program to manage for change in material properties and cracking in fiberglass tanks and piping exposed internally to treated water. The items cites generic Note G.

The staff reviewed the associated items in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and environment description. The staff finds Entergy's proposal acceptable based on its review of technical literature (e.g., Roff, W.J., *Fibres, Plastics, and Rubbers*, see Appendix D for reference details). Fiberglass-reinforced plastic piping and piping components, in the absence of specific environmental stressors such as ultraviolet light, high radiation, or ozone concentrations, will not exhibit aging effects of concern during the period of extended operation. In addition, the staff finds Entergy's proposal to manage change in material properties and cracking acceptable because the Water Chemistry Control—BWR program is capable of managing loss of material and cracking because it requires periodic monitoring and control of corrosive impurities listed in the EPRI water chemistry guidelines. Additionally, Entergy will use the new One-Time Inspection program to verify the effectiveness of the Water Chemistry Control—BWR program.

Fiberglass Flex Connections, Piping, and Tanks Exposed to Indoor Air

The staff's evaluation for fiberglass flex connections, tanks, and piping exposed internally and externally to indoor air, which will be managed for changes in material properties by the External Surfaces Monitoring program and are associated with generic Note G, is documented in SER Section 3.2.2.3.6.

For LRA Table 3.3.2.18-3 Closed Cooling Water—Reactor Plant System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-3, which summarizes the results of aging management review evaluations for the closed cooling water—reactor plant system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRATable 3.3.2.18-4 Service Water—Normal System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-4, which summarizes the results of aging management review evaluations for the service water—normal system nonsafety-related components affecting safety-related systems component groups.

Stainless Steel Components Exposed to Condensation.

The staff's evaluation for stainless steel components (which include, but are not limited to, accumulators, expansion joints, flex hoses, heat exchangers, piping, pump casings, strainer housings, valve bodies) exposed to condensation, which will be managed for loss of material by the External Surfaces Monitoring program and are associated with generic Note G, is documented in SER Section 3.2.2.3.2.

For LRATable 3.3.2.18-5 Compressed Air System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-5, which summarizes the results of aging management review evaluations for the compressed air system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRATable 3.3.2.18-6 Standby Liquid Control System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-6, which summarizes the results of aging management review evaluations for the SLC system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-7 Leak Detection System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-7, which summarizes the results of aging management review evaluations for the leak detection system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-8 Main Steam Positive Leakage Control System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-8, which summarizes the results of aging management review evaluations for the main steam positive leakage control system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-9 Fire Protection—Water System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-9, which summarizes the results of aging management review evaluations for the fire protection—water system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-10 Hydrogen Mixing, Purge, and Recombiner System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-10, which summarizes the results of aging management review evaluations for the hydrogen mixing, purge, and recombiner system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-11 Service Water—Standby System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-11, which summarizes the results of aging management review evaluations for the service water—standby system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-12 Standby Diesel Generator System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-12, which summarizes the results of aging management review evaluations for the standby diesel generator system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-13 HPCS Diesel Generator System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-13, which summarizes the results of aging management review evaluations for the HPCS diesel generator system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRATable3.3.2.18-14 HVAC—Containment Cooling System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-14, which summarizes the results of aging management review evaluations for the HVAC—containment cooling system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-15 HVAC—Auxiliary Building System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-15, which summarizes the results of aging management review evaluations for the HVAC— auxiliary building system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRATable3.3.2.18-16 HVAC—Chilled Water System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-16, which summarizes the results of aging management review evaluations for the HVAC—Chilled Water system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

Stainless Steel Components Exposed to Condensation

The staff's evaluation for stainless steel components (which includes, but is not limited to, accumulators, expansion joints, flex hoses, heat exchangers, piping, pump casings, strainer housings, and valve bodies) exposed to condensation, which will be managed for loss of material by the External Surfaces Monitoring program and are associated with generic Note G, is documented in SER Section 3.2.2.3.2.

For LRA Table 3.3.2.18-17 Radiation Monitoring System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-17, which summarizes the results of aging management review evaluations for the radiation monitoring system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-18 Containment Atmosphere and Leakage Monitoring System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-18, which summarizes the results of aging management review evaluations for the containment atmosphere and leakage monitoring system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-19 Reactor Water Cleanup System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-19, which summarizes the results of aging management review evaluations for the reactor water cleanup system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-20 Fuel Pool Cooling and Cleanup System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-20, which summarizes the results of aging management review evaluations for the fuel pool cooling and cleanup system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-21 Radwaste—Liquid System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-21, which summarizes the results of aging management review evaluations for the radwaste—liquid system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-22 Sampling System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-22, which summarizes the results of aging management review evaluations for the sampling system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-23 Drains—Floor and Equipment System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-23, which summarizes the results of aging management review evaluations for the drains—floor and equipment system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-24 Domestic Water System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-24, which summarizes the results of aging management review evaluations for the domestic water system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-25 Suppression Pool Cleanup System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-25, which summarizes the results of aging management review evaluations for the suppression pool cleanup system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.3.2.18-26 Makeup Water System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.3.2-18-26, which summarizes the results of aging management review evaluations for the makeup water system nonsafety-related components affecting safety-related systems component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

On the basis of its review, the staff finds that Entergy appropriately evaluated the aging management review results of material, environment, aging effect requiring management, and aging management program combinations not evaluated in the GALL Report. The staff finds that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.3 Conclusion

The staff concludes that Entergy has demonstrated that it will adequately manage the effects of aging for the auxiliary system components within the scope of license renewal and subject to an aging management review in a way that maintains the intended functions consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4 Aging Management of Steam and Power Conversion Systems

3.4.1 Summary of Technical Information in the Application

LRA Section 3.4 provides Entergy's aging management review results for steam and power conversion system components and component groups. LRA Table 3.4.1, "Summary of Aging Management Programs for Steam and Power Conversion Systems Evaluated in Chapter VIII of NUREG-1801," is a summary comparison of Entergy's aging management reviews with those evaluated in the GALL Report for the steam and power conversion system components and component groups.

3.4.2 Staff Evaluation

Table 3.4-1 summarizes the staff's evaluation of components, aging effects or mechanisms, and aging management programs listed in LRA Section 3.4 and addressed in the GALL Report.

Table 3.4-1 Staff Evaluation for Steam and Power Conversion Systems Components in the GALL Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.4.1-1	Consistent with the GALL Report (see SER Section 3.4.2.2.1)
3.4.1-2	Consistent with the GALL Report (see SER Section 3.4.2.2.2)
3.4.1-3	Consistent with the GALL Report (see SER Section 3.4.2.2.3)
3.4.1-4	Not Applicable to BWRs (see SER Section 3.4.2.1.1)
3.4.1-5	Consistent with the GALL Report
3.4.1-6	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-7	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-8	Consistent with the GALL Report
3.4.1-9	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-10	Consistent with the GALL Report
3.4.1-11	Consistent with the GALL Report (see SER Section 3.4.2.1.2)
3.4.1-12	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-13	Not Applicable to BWRs (see SER Section 3.4.2.1.1)
3.4.1-14	Consistent with the GALL Report
3.4.1-15	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-16	Consistent with the GALL Report
3.4.1-17	Not Applicable to BWRs (see SER Section 3.4.2.1.1)
3.4.1-18	Consistent with the GALL Report
3.4.1-19	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-20	Not Applicable to RBS (see SER Section 3.4.2.1.1)

Component Group (SRP-LR Item No.)	Staff Evaluation
3.4.1-21	Not Applicable to BWRs (see SER Section 3.4.2.1.1)
3.4.1-22	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-23	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-24	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-25	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-26	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-27	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-28	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-29	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-30	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-31	Consistent with the GALL Report
3.4.1-32	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-33	Consistent with the GALL Report
3.4.1-34	Consistent with the GALL Report
3.4.1-35	Consistent with the GALL Report
3.4.1-36	Not Applicable to BWRs (see SER Section 3.4.2.1.1)
3.4.1-37	Not Applicable to BWRs (see SER Section 3.4.2.1.1)
3.4.1-38	Not Applicable to BWRs (see SER Section 3.4.2.1.1)
3.4.1-39	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-40	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-41	Not Applicable to BWRs (see SER Section 3.4.2.1.1)
3.4.1-42	Not Applicable to BWRs (see SER Section 3.4.2.1.1)
3.4.1-43	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-44	Consistent with the GALL Report
3.4.1-45	Not Applicable to BWRs (see SER Section 3.4.2.1.1)
3.4.1-46	Not Applicable to BWRs (see SER Section 3.4.2.1.1)
3.4.1-47	Consistent with the GALL Report
3.4.1-48	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-49	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-50	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-50.5	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-51	Consistent with the GALL Report
3.4.1.52	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1.53	Not Applicable to BWRs (see SER Section 3.4.2.1.1)
3.4.1-54	Consistent with the GALL Report
3.4.1.55	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1.56	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-57	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-58	Consistent with the GALL Report
3.4.1-59	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-60	Consistent with the GALL Report
3.4.1-61	Consistent with the GALL Report (see SER Section 3.4.2.2.6)
3.4.1-62	Consistent with the GALL Report
3.4.1-63	Consistent with the GALL Report
3.4.1-64	Consistent with the GALL Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.4.1-65	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-66	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-67	Not Applicable to RBS (see SER Section 3.4.2.1.1)
3.4.1-68	Not Applicable to RBS (see SER Section 3.4.2.1.1)
…	

The staff's review of the steam and power conversion systems component groups followed one of three approaches:

1) One approach, documented in SER Section 3.4.2.1, reviews aging management review results for components that Entergy states are consistent with the GALL Report and require no further evaluation.

2) Another approach, documented in SER Section 3.4.2.2, reviews aging management review results for components that Entergy states are consistent with the GALL Report and for which further evaluation is recommended.

3) A third approach, documented in SER Section 3.4.2.3, reviewed aging management review results for components that Entergy indicated are not consistent with, or not addressed in, the GALL Report.

The staff's review of aging management programs that Entergy credits to manage or monitor aging effects on the steam and power conversion systems components is documented in SER Section 3.0.3.

3.4.2.1 Aging Management Review Results Consistent with the GALL Report

LRA Section 3.4.2.1 identifies the materials, environments, aging effects requiring management, and the programs that Entergy credits for managing aging effects on the steam and power conversion systems components at RBS.

LRA Table 3.4.2-1 through Table 3.4.2-4 summarize aging management reviews for the steam and power conversion systems components and indicate aging management reviews which Entergy claims are consistent with the GALL Report.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material in the LRA was applicable and that Entergy identified the appropriate GALL Report aging management reviews. The staff's evaluation follows.

3.4.2.1.1 Aging Management Review Results Identified as Not Applicable or Not Used

For LRA Table 3.4.1, Item 3.4.1-4, Item 3.4.1-13, Item 3.4.1-17, Item 3.4.1-21, Item 3.4.1-36 through Item 3.4.1-38, Item 3.4.1-41, Item 3.4.1-42, Item 3.4.1-45, Item 3.4.1-46, and Item 3.4.1-53, Entergy claims that the corresponding aging management review items in the GALL Report are not applicable because the associated items are only applicable to pressurized-water reactors (PWRs). The staff reviewed the SRP-LR, confirmed these items only apply to pressurized-water reactors, and finds that these items are not applicable to RBS because it is a BWR.

For LRA Table 3.4.1, Item 3.4.1-6, Item 3.4.1-7, Item 3.4.1-12, Item 3.4.1-15, Item 3.4.1-19, Item 3.4.1-20, Item 3.4.1-22 through Item 3.4.1-30, Item 3.4.1-32, Item 3.4.1-39, Item 3.4.1-40, Item 3.4.1-43, Item 3.4.1-48 through Item 3.4.1-50, Item 3.4.1-50.5, Item 3.4.1-52, Item 3.4.1-55 through Item 3.4.1-57, Item 3.4.1-59, and Item 3.4.1-65 through Item 3.4.1-68, Entergy claims that they are not applicable. The staff reviewed the LRA and the USAR and confirms that Entergy's LRA does not have any aging management review results that are applicable for these items, or the items require no aging management.

For LRA Table 3.4.1, Item 3.4.1-9, Entergy claims that the corresponding items in the GALL Report are not applicable because they are addressed by other items in LRA Table 3.4.1. The staff reviewed the LRA and confirms that Entergy will address the aging effects by other LRA Table 3.4.1 items. Therefore, the staff finds Entergy's proposal acceptable. SER Table 3.4-1 identifies the LRA Table 3.4.1 items that address these not applicable items.

3.4.2.1.2 Cracking Due to Stress Corrosion Cracking

LRA Table 3.4.1, Item 3.4.1-11 addresses stainless steel piping, piping components, and piping elements exposed to steam or treated water > 60 °C (140 °F), for which Entergy will manage for cracking due to stress corrosion cracking (SCC). During its review of components associated with LRA Table 3.4.1, Item 3.4.1-1 for which Entergy cites generic Note C, the staff notes that the LRA credits the Water Chemistry Control—BWR program and the new One-Time Inspection program to manage cracking due to stress corrosion cracking for the piping, piping components, and piping elements.

During its review of the aging management review items and related aging management, the staff needed additional information, and therefore issued a request for additional information. RAI 3.4.1.11-1 (November 29, 2017) and Entergy's response (January 10, 2018) are documented in ADAMS Accession No. ML17335A098 and No. ML18010A848, respectively. The staff evaluated Entergy's response to RAI 3.4.1.11-1, and notes that Entergy identifies an adverse trend for alarms received on the hydraulic control unit (HCU) accumulators in the control rod drive (CRD) hydraulic system. Entergy also clarifies that (a) the alarms do not indicate that the control rod drive HCU accumulators would be unable to accomplish their intended function, and (b) that they inform internal leakage through a floating piston inside the accumulator cylinder.

Entergy further states that, as described in USAR Section 4.6.1.1.2.4.3.9, the accumulator includes a free-floating piston in a hydraulic cylinder that may be associated with nitrogen pressure alarm or water leakage alarm. Entergy clarifies that the alarm conditions resulted from reduction of nitrogen pressure or water leakage past the moveable piston that separates the nitrogen and the water within the accumulator. In addition, Entergy confirms that the piston with its associated sealing features performs its function with moving parts and is, therefore, not subject to an aging management review in accordance with 10 CFR 54.21(a)(1). In its response to RAI 3.4.1.11-1, Entergy also states that loss of material from the internal surfaces of the carbon steel cylinders has been a contributor to the trend of alarms associated with the accumulators.

The staff finds Entergy's response acceptable because Entergy clarified: (1) the alarm trend did not indicate that the HCU accumulators could not perform their intended functions, (2) the moving pistons of the accumulators are not subject to the aging management review in accordance with 10 CFR Part 54.4(a), the scope for the requirements for renewal of operating licenses for nuclear power plants," (3) the accumulator alarms (discussed in

USAR Section 4.6.1.1.2.4.3.9) can reveal the potential leakage concern of sealing features of the moving pistons such that relevant corrective actions can be taken, (4) a plan was approved in 2016 to replace the remaining carbon steel accumulators with stainless steel accumulators during the next four refueling outages in order to reduce the number of accumulator alarms, and (5) the water chemistry control—BWR program in conjunction with the new One-Time Inspection program manage the aging effects (e.g., loss of material and cracking) of the HCU accumulators to maintain the passive pressure boundary function, as indicated in LRA Table 3.3.2-1.

RAI 3.3.2.1-1 (November 29, 2017) and Entergy's response (January 10, 2018) are documented in ADAMS Accession No. ML17335A098 and No. ML18010A848, respectively. During its evaluation of Entergy's response to RAI 3.3.2.1-1, the staff noted that RBS replaced the directional control valve (DCV) cap screws on all 145 hydraulic control units with cap screws fabricated of material that is not susceptible to stress corrosion cracking. Entergy also states that it performed the cap screw replacements in accordance with the vendor guidelines that account for the effect of material strength on the susceptibility of steels to stress corrosion cracking. The staff finds Entergy's response acceptable because Entergy confirms that (1) it replaced the directional control valve cap screws with cap screws made of stress corrosion cracking-resistant material and (2) the Bolting Integrity program manages loss of material and loss of preload for the directional control valve cap screw bolting, as identified in LRA Table 3.3.2-1.

3.4.2.1.3 Conclusion

The staff evaluated the GALL Report aging management review items that Entergy claims are not applicable to RBS. On the basis of its review, the staff concludes that the aging management review results that Entergy claims are not applicable are not applicable to RBS.

As discussed in SER Section 3.4.2.1, for those aging management reviews for which Entergy claims consistency with the GALL Report, the staff evaluated Entergy's claim of consistency. The staff also reviewed information pertaining to Entergy's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the aging management review results, which Entergy claims are consistent with the GALL Report, are consistent.

Therefore, the staff concludes that Entergy has demonstrated that it will adequately manage the effects of aging for these components in a way that maintains their intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2 Aging Management Review Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.4.2.2, Entergy further evaluates aging management, as recommended by the GALL Report, for the steam and power conversion systems components and provides information concerning how it will manage the applicable aging effects.

For component groups evaluated in the GALL Report, for which Entergy claims consistency with the report and for which the report recommends further evaluation, the staff audited and reviewed Entergy's evaluation to determine whether it adequately addresses the issues further evaluated. In addition, the staff reviewed Entergy's further evaluations against the criteria contained in SRP-LR Section 3.4.2.2. The staff's review of Entergy's further evaluation follows.

3.4.2.2.1 Cumulative Fatigue Damage

LRA Section 3.4.2.2.1 states that the plant-specific analyses for evaluating metal fatigue in steam and power conversion (SPC) system components are time-limited aging analyses (TLAAs) for the LRA. Entergy states that it evaluated these TLAAs in accordance with requirements in 10 CFR 54.21(c)(1) and documents the evaluations in LRA Section 4.3.2, "Non-Class 1 Fatigue." This is consistent with SRP-LR Section 3.4.2.2.1 and is therefore acceptable. SER Section 4.3.2 contains the NRC staff's evaluation of the metal fatigue TLAAs for the steam and power conversion system components.

3.4.2.2.2 Cracking Due to Stress Corrosion Cracking

As amended by letter dated May 10, 2018, LRA Section 3.4.2.2.2, associated with LRA Table 3.4.1, Item 3.4.1-2, addresses stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air and air recently introduced into buildings, for which Entergy will manage for cracking due to stress corrosion cracking by using the External Surfaces Monitoring and One-Time Inspection programs. The staff reviewed Entergy's proposal against the criteria in SRP-LR Section 3.4.2.2.2.

In its review of components associated with LRA Table 3.4.1, Item 3.4.1-2, the staff finds that Entergy has met the further evaluation criteria. The staff finds Entergy's proposal to manage the effects of aging for stainless steel components exposed to outdoor air using the External Surfaces Monitoring program acceptable because the program includes visual inspections for leakage. These visual inspections are conducted at least once per refueling cycle and are capable of identifying cracking in the relevant components prior to loss of intended functions. SER Section 3.2.2.2.3, Item 2, documents the staff's evaluation of using the One-Time Inspection program to manage for cracking due to stress corrosion cracking stainless steel components exposed to air recently introduced into buildings.

Based on the programs identified, the staff finds that Entergy's programs meet SRP-LR Section 3.4.2.2.2 criteria. For those items associated with LRA Section 3.4.2.2.2, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion

As amended by letter dated May 10, 2018, LRA Section 3.4.2.2.3, associated with LRA Table 3.3.1, Item 3.4.1-3, addresses stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air and air recently introduced into buildings, for which Entergy will manage for loss of material due to pitting and crevice corrosion by using the External Surfaces Monitoring and One-Time Inspection programs. The staff reviewed Entergy's proposal against the criteria in SRP-LR Section 3.4.2.2.3.

In its review of components associated with LRA Table 3.3.1, Item 3.4.1-3, the staff finds that Entergy has met the further evaluation criteria. The staff finds Entergy's proposal to manage the effects of aging for stainless steel components exposed to outdoor air using the External

Surfaces Monitoring program acceptable because the program includes visual inspections of external surfaces, conducted at least once per refueling cycle, to identify corrosion and any other conditions that preclude the stainless steel from having a clean and shiny surface. The staff finds that the periodic visual inspections described above are capable of identifying loss of material prior to loss of intended functions in the relevant components. SER Section 3.2.2.2.3, Item 2, documents the staff's evaluation of using the One-Time Inspection program to manage stainless steel components exposed to air recently introduced into buildings for loss of material.

Based on the programs identified, the staff finds that Entergy's programs meet SRP-LR Section 3.4.2.2.3 criteria. For those items associated with LRA Section 3.4.2.2.3, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of Entergy's quality assurance program.

3.4.2.2.5 Ongoing Review of Operating Experience

SER Section 3.0.5 documents the staff's evaluation of Entergy's ongoing review of operating experience program.

3.4.2.2.6 Loss of Material Due to Recurring Internal Corrosion

LRA Section 3.4.2.2.6, associated with LRA Table 3.4.1, Item 3.4.1-61, addresses loss of material due to recurring internal corrosion in metallic piping and components exposed to raw water or waste water. Entergy states that its review of previous plant operating experience did not identify the conditions meeting the definition of recurring internal corrosion. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.4.2.2.6 and finds it acceptable because the staff did not identify any examples of recurring internal corrosion in steam and power conversion systems during its independent review of Entergy's operating experience database.

3.4.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL Report

In LRA Table 3.4.2-1 through Table 3.4.2-2-4, the staff reviewed additional details of the aging management review results for material, environment, aging effects requiring management, and aging management program combinations not consistent with or not addressed in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed Entergy's evaluation to determine whether Entergy demonstrates that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation. The staff's evaluation is documented in the following sections.

3.4.2.3.1 Condensate Makeup, Storage, and Transfer System—Summary of Aging Management Review—LRA Table 3.4.2-1

The staff reviewed LRA Table 3.4.2-1, which summarizes the results of Entergy's aging management review evaluations for the condensate makeup, storage, and transfer system component groups.

Stainless Steel Piping Exposed to Soil.

In LRA Table 3.4.2-1, Entergy states that to manage for the effects of cracking in stainless steel piping exposed to soil, it will use the Buried and Underground Piping and Tanks Inspection program. The aging management review item cites generic Note H, for which Entergy has identified cracking as an additional aging effect. During its audit, the staff noted that that visual inspections of buried and underground piping and tanks are: (a) performed with sufficient illumination and resolution to assess the component for indications of cracking, (b) conducted by personnel having an annual eye examination and visual acuity as specified in either CEP-NDE-100, "Administration and Control of NDE," or ASME Code Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," IWA-2321, "Vision Tests," and (c) conducted by personnel who are VT-1 qualified.

The staff finds Entergy's proposal to manage cracking acceptable because inspections conducted by qualified personnel with adequate lighting and resolution can be sufficiently rigorous to assess for the impact of cracks on the pressure boundary function of the component.

3.4.2.3.2 Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)—Summary of Aging Management Review—LRA Table 3.4.2-2-1 through Table 3.4.2-2-4

The staff reviewed LRA Table 3.4.2-2-1 through Table 3.4.2-2-4, which summarize the results of Entergy's aging management review evaluations for the steam and power conversion systems in scope for 10 CFR 54.4(a)(2) component groups.

For LRA Table 3.4.2-2-1 Condensate Makeup, Storage and Transfer System—Summary of Aging Management Review

Fiberglass Piping Exposed to Treated Water

The staff's evaluation for fiberglass piping exposed to treated water, for which Entergy will manage for change in material properties and cracking by using the water chemistry control—BWR program and which is associated with generic Note G, is documented in SER Section 3.3.2.3.18 for LRA Table 3.3.2-18-2.

For LRA Table 3.4.2-2-2 Feedwater System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed the LRA Table 3.4.2.2-2, which summarizes the results of Entergy's aging management review evaluations for the feedwater system nonsafety-related components affecting safety-related systems component groups. The staff did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.4.2-2-3 Main Steam System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.4.2.2-3, which summarizes the results of Entergy's aging management review evaluations for the feedwater system nonsafety-related components affecting safety-related systems component groups. The staff did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

For LRA Table 3.4.2-2-4 Auxiliary Condensate System Nonsafety-Related Components Affecting Safety-related Systems—Summary of Aging Management Review

The staff reviewed LRA Table 3.4.2.2-4, which summarizes the results of Entergy's aging management review evaluations for the feedwater system nonsafety-related components affecting safety-related systems component groups. The staff did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

Fiberglass Flex Connections, Piping and Tanks Exposed to Indoor Air

The staff's evaluation for fiberglass flex connections, tanks, and piping exposed internally and externally to indoor air, which Energy will manage for changes in material properties by the External Surfaces Monitoring program and are associated with generic Note G, is documented in SER Section 3.2.2.3.6.

3.4.3 Conclusion

The staff concludes that Entergy has demonstrated that it will adequately manage the effects of aging for the steam and power conversion system components within the scope of license renewal and subject to an aging management review. Entergy has also demonstrated that it will do this in a way that maintains the intended functions consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5 Aging Management of Structures and Component Supports

3.5.1 Summary of Technical Information in the Application

LRA Section 3.5 provides aging management review results for the structures and component supports components and component groups. LRA Table 3.5.1, "Summary of Aging Management Programs for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801," is a summary comparison of Entergy's aging management reviews with GALL Report aging management reviews for the structures and component supports components and component groups.

3.5.2 Staff Evaluation

Table 3.5-1 summarizes the staff's evaluation of components, aging effects or mechanisms, and aging management programs listed in LRA Section 3.5 and addressed in the GALL Report.

Table 3.5-1 Staff Evaluation for Structures and Component Supports Components in the GALL Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.5.1-1	Not Applicable to RBS (see SER Section 3.5.2.2.1)
3.5.1-2	Not Applicable to RBS (see SER Section 3.5.2.2.1)
3.5.1-3	Not Applicable to RBS (see SER Section 3.5.2.2.1)
3.5.1-4	Not Applicable to RBS (see SER Section 3.5.2.2.1)
3.5.1-5	Consistent with the GALL Report (see SER Section 3.5.2.2.1)
3.5.1-6	Not Applicable to RBS (see SER Section 3.5.2.2.1)
3.5.1-7	Not Applicable to RBS (see SER Section 3.5.2.2.1)
3.5.1-8	Not Applicable to RBS (see SER Section 3.5.2.2.1)
3.5.1-9	Consistent with the GALL Report (see SER Section 3.5.2.2.1)
3.5.1-10	Consistent with the GALL Report (see SER Section 3.5.2.2.1)
3.5.1-11	Not Applicable to RBS (see SER Section 3.5.2.2.1)
3.5.1-12	Not Applicable to RBS (see SER Section 3.5.2.2.1)
3.5.1-13	Not Applicable to RBS (see SER Section 3.5.2.2.1)
3.5.1-14	Not Applicable to RBS (see SER Section 3.5.2.2.1)
3.5.1-15	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-16	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-17	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-18	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-19	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-20	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-21	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-22	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-23	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-24	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-25	Not Applicable to BWRs (see SER Section 3.5.2.1.1)
3.5.1-26	Consistent with the GALL Report (see SER Section 3.5.2.1.2)
3.5.1-27	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-28	Consistent with the GALL Report
3.5.1-29	Consistent with the GALL Report
3.5.1-30	Consistent with the GALL Report
3.5.1-31	Consistent with the GALL Report
3.5.1-32	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-33	Consistent with the GALL Report
3.5.1-34	Consistent with the GALL Report
3.5.1-35	Consistent with the GALL Report
3.5.1-36	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-37	Consistent with the GALL Report
3.5.1-38	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-39	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-40	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-41	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-42	Not Applicable to RBS (see SER Section 3.5.2.2.2)

Component Group (SRP-LR Item No.)	Staff Evaluation
3.5.1-43	Consistent with the GALL Report (see SER Section 3.5.2.2.2)
3.5.1-44	Consistent with the GALL Report (see SER Section 3.5.2.2.2)
3.5.1-45	Not Applicable to RBS (see SER Section 3.5.2.2.2)
3.5.1-46	Not Applicable to RBS (see SER Section 3.5.2.2.2)
3.5.1-47	Consistent with the GALL Report (see SER Section 3.5.2.2.2)
3.5.1-48	Not Applicable to RBS (see SER Section 3.5.2.2.2)
3.5.1-49	Not Applicable to RBS (see SER Section 3.5.2.2.2)
3.5.1-50	Consistent with the GALL Report (see SER Section 3.5.2.2.2)
3.5.1-51	Consistent with the GALL Report (see SER Section 3.5.2.2.2)
3.5.1-52	Consistent with the GALL Report (see SER Section 3.5.2.2.2)
3.5.1-53	Not Applicable to RBS (see SER Section 3.5.2.2.2)
3.5.1-54	Consistent with the GALL Report
3.5.1-55	Consistent with the GALL Report
3.5.1-56	Consistent with the GALL Report (see SER Section 3.5.2.1.3)
3.5.1-57	Consistent with the GALL Report
3.5.1-58	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-59	Consistent with the GALL Report
3.5.1-60	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-61	Consistent with the GALL Report
3.5.1-62	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-63	Consistent with the GALL Report
3.5.1-64	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-65	Consistent with the GALL Report
3.5.1-66	Consistent with the GALL Report (see SER Section 3.5.2.1.3)
3.5.1-67	Consistent with the GALL Report
3.5.1-68	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-69	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-70	Consistent with the GALL Report
3.5.1-71	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-72	Consistent with the GALL Report
3.5.1-73	Consistent with the GALL Report
3.5.1-74	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-75	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-76	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-77	Consistent with the GALL Report
3.5.1-78	Not Applicable to RBS (see SER Section 3.5.2.1.4)
3.5.1-79	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-80	Consistent with the GALL Report
3.5.1-81	Consistent with the GALL Report
3.5.1-82	Consistent with the GALL Report
3.5.1-83	Consistent with the GALL Report
3.5.1-84	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-85	Not Applicable to RBS (see SER Section 3.5.2.1.1)
3.5.1-86	Consistent with the GALL Report
3.5.1-87	Consistent with the GALL Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.5.1-88	Consistent with the GALL Report
3.5.1-89	Not Applicable to BWRs (see SER Section 3.5.2.1.1)
3.5.1-90	Consistent with the GALL Report (see SER Section 3.5.2.1.4)
3.5.1-91	Consistent with the GALL Report
3.5.1-92	Consistent with the GALL Report (see SER Section 3.5.2.1.4)
3.5.1-93	Consistent with the GALL Report (see SER Section 3.5.2.1.5)
3.5.1-94	Consistent with the GALL Report (see SER Section 3.5.2.1.6)
3.5.1-95	Consistent with the GALL Report

The staff's review of the structures and component supports component groups followed one of three approaches.

1) One approach, documented in SER Section 3.5.2.1, reviews aging management review results for components that Entergy claims are consistent with the GALL Report and require no further evaluation.

2) Another approach, documented in SER Section 3.5.2.2, reviews aging management review results for components that Entergy claims are consistent with the GALL Report and for which further evaluation is recommended.

3) A third approach, documented in SER Section 3.5.2.3, reviewed aging management review results for components that Entergy claims are not consistent with, or not addressed in, the GALL Report.

The staff's review of aging management programs credited to manage or monitor aging effects of the structures and component supports components is documented in SER Section 3.0.3.

3.5.2.1 Aging Management Review Results Consistent with the GALL Report

LRA Section 3.5.2.1 identifies the materials, environments, aging effects requiring management, and the programs that manage aging effects for the structures and component supports components.

LRA Table 3.5.2-1 through Table 3.5.2-4 summarize Entergy's aging management reviews for the structures and component supports components and list aging management reviews for which Entergy claims consistency with the GALL Report.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that Entergy identified the appropriate GALL Report aging management reviews. The staff's evaluation follows.

3.5.2.1.1 Aging Management Review Results Identified as Not Applicable

For LRA Table 3.5.1, Items 3.5.1-25 and 3.5.1-89, Entergy claims that the corresponding aging management review items in the GALL Report are not applicable because the associated items are only applicable to pressurized-water reactors. The staff reviewed the SRP-LR, confirms these items only apply to pressurized-water reactors, and finds that these items are not applicable to RBS because it is a BWR.

For LRA Table 3.5.1, Item 3.5.1-15 through Item 3.5.1-22, Item 3.5.1-32, Item 3.5.1-36, Item 3.5.1-40, Item 3.5.1-41, Item 3.5.1-58, Item 3.5.1.62, Item 3.5.1-69, Item 3.5.1-74, and Item 3.5.1-79, Entergy claims that they were not applicable. The staff reviewed the LRA and USAR and confirms that Entergy's LRA does not have any aging management review results that are applicable for these items, or the items require no aging management.

LRA Table 3.5.1, Item 3.5.1-23 addresses the aging effects of cracking, loss of bond, and loss of material (e.g., spalling, scaling) due to corrosion in the following materials and environments:

1) embedded steel in inaccessible areas of concrete foundation (e.g., in the basemat)

2) reinforcing steel exposed to uncontrolled indoor air or outdoor air.

Entergy states that this item is not applicable. The staff evaluated Entergy's claim and finds it acceptable because: (1) based on its review of the LRA and USAR Section 3.8, RBS has a steel containment vessel with a concrete basemat that is integral with the reactor building (Group 1 structure) concrete basemat, and (2) as listed in LRA Table 3.5.1, AMR Item 3.5.1-65, Entergy will manage the above aging effect for accessible and inaccessible areas of Group 1 structures (i.e., the reactor building) concrete basemat using the Structures Monitoring program. This approach is consistent with the GALL Report recommendations.

LRA Table 3.5.1, Item 3.5.1-24 addresses managing for the aging effects of increase in porosity and permeability, cracking, and loss of material (spalling, scaling) due to aggressive chemical attack on the following material and environment: inaccessible areas of concrete foundation (i.e., the basemat) exposed to groundwater or to soil. Entergy states that this item is not applicable. The staff evaluated Entergy's claim and finds it acceptable because: (1) based on its review of the LRA and USAR Section 3.8, RBS has a steel containment vessel with a concrete basemat that is integral with the reactor building (Group 1 structure) concrete basemat and (2) as listed in LRA Table 3.5.1, AMR Item 3.5.1-47, Item 3.5.1-65, and Item 3.5.1-67, for inaccessible areas of Group 1 structures (i.e., the reactor building) concrete basemat, Entergy will manage the above aging effects using the Structures Monitoring program. This approach is consistent with the GALL Report recommendations.

LRA Table 3.5.1, Item 3.5.1-27 addresses steel and stainless steel penetration sleeves, penetration bellows, torus, vent line, vent header, vent line bellows, downcomers, and suppression pool shell exposed to uncontrolled indoor air or outdoor air. Entergy states that this item is not applicable for the torus, vent line or downcomers. The staff evaluated Entergy's claim and finds it acceptable because a review of RBS USAR Section 1.2.2.4.9, "Containment Systems," confirms that RBS is a BWR Mark III with no torus, vent line, vent header, vent line bellows, or downcomers.

For the penetration sleeves (for electrical and high temperature piping), suppression pool liner (i.e., shell), and penetration bellows, Entergy states that these components have a current licensing basis fatigue analysis (i.e., a TLAA) and the aging effects are addressed under AMR Item 3.5.1-9 in LRA Table 3.5.1. The staff evaluated Entergy's claim for the penetration sleeves (for high-temperature piping) and bellows and finds it acceptable because Entergy will manage the aging effects associated with the TLAA under AMR Item 3.5.1-9 consistent with the GALL Report recommendations. However, it was not clear to the staff whether there is a current licensing basis TLAA for the electrical penetration sleeves and suppression pool liner because LRA Section 4.6 states that a fatigue analysis was not required for the electrical penetrations, and there was no TLAA disposition made for the suppression pool liner. For the electrical penetration sleeves and suppression pool liner, the staff evaluated Entergy's claim and needed additional information to verify consistency with the GALL Report. Therefore, by letter dated January 22, 2018, the staff issued RAI 3.5.1.27-1 requesting that Entergy clarify whether the RBS current licensing basis contains fatigue analyses for the electrical penetration sleeves and suppression pool liner. The staff requested that if a current licensing basis fatigue analysis exists, that Entergy state the respective TLAA disposition in accordance with 10 CFR 54.21(c). If a current licensing basis fatigue analysis does not exist, the staff requested Entergy clarify how it will manage the associated aging effects consistent with the GALL Report recommendation through GALL Report AMP XI.S1 and GALL Report AMP XI.S4.

In its response to RAI 3.5.1.27-1 dated February 20, 2018, Entergy states that the loading from the weight of the wires and cables on the electrical penetrations is very low. Based on RBS calculations, Entergy concludes that fatigue analyses were not necessary because the "maximum calculated stress was much lower than the allowable stress." Entergy states that cracking to due cyclic loading is not an aging effect requiring management for the electrical penetrations because RBS calculations show that these components are not subject to cyclic loading. Nevertheless, as part of its response to RAI 3.5.1.27-1, Entergy revised LRA Table 2.4-1 and LRA Table 3.5.2-1 to assign an item for the electrical penetrations under AMR Item 3.5.1-35 and GALL Report Item II.B3.2.CP-35. This item states that Entergy will manage the electrical penetrations using the containment Inservice Inspection—IWE and Containment Leak Rate aging management programs. This approach is consistent with the GALL Report recommendations. The staff notes that RBS USAR Table 3.10A-1 states that as part of the qualification of the electrical penetrations, Entergy subjected the assemblies to dynamic testing. The natural frequency results indicate that the electrical penetration assemblies are rigid (i.e., the natural frequency is greater than 100 Hz) and therefore not subject to cyclic loading.

For the suppression pool liner, Entergy states that the suppression pool liner consists of (1) the suppression pool outer wall liner, which is formed by the bottom portion of the steel containment vessel cylinder, and (2) the suppression pool floor liner, which is a portion of the containment basemat liner. Entergy states that the suppression pool outer wall liner "is backed by structural concrete and a metal fatigue analysis was not necessary for this composite structure." Entergy states that it provided clarification in its response to RAI 4.6-1 (dated February 6, 2018) which addresses the staff's concern regarding the evaluation of the fatigue TLAA associated with LRA Section 4.6. Entergy states that it documents the basemat liner fatigue analysis in USAR Appendix 6A.15.1 and Table 6A.15-1. Entergy also revised LRA Section A.2.4, dispositioning the basemat liner fatigue as a TLAA in accordance with 10 CFR 54.21 (c)(1)(iii) to manage the aging effects associated to the component TLAA under the Fatigue Monitoring program. SER Section 3.0.3.2.27 documents the staff's evaluation of the RBS Fatigue Monitoring program.

The staff notes based on USAR Figure 3.8-1 and USAR Section 3.8.1, that the steel containment vessel is backed by structural concrete up to elevation 94 feet and 8 inches and this encompasses the suppression pool outer wall liner (lower cylindrical portion of the steel containment vessel). The staff also notes that in its response to RAI 4.6-1, dated February 6, 2018, Entergy states that USAR Table 3.8-1 identifies the loading combinations for the steel containment vessel cylinder under design operating and test conditions. Entergy states that above the elevation of 94 feet and 8 inches, the steel containment vessel shell is free standing and analysis of the operating conditions in USAR Table 3.8-1 concludes that the freestanding steel containment vessel is not subject to fatigue and cyclic loading; therefore, Entergy did not analyze the freestanding steel containment vessel for fatigue, and there are no cycle limits or CUFs. The staff's evaluation of Entergy's response to RAI 4.6-1 is documented in SER Section 4.6. The staff notes that in USAR Section 3.8.3.2.3.1, Entergy states that it analyzes the lower cylindrical portion of the steel containment vessel for the same loads and load combinations as the upper freestanding steel containment vessel; therefore, the suppression pool outer wall liner (which is the lower cylindrical portion of the steel containment vessel) is not subject to cyclic loading. The staff notes that consistent with the GALL Report, the LRA states that Entergy will manage the suppression pool outer wall liner for loss of material using the Containment Inservice Inspection and Containment Leak Rate programs. The staff also notes that the Containment Inservice Inspection program is an aging management program with enhancements that will be consistent with the GALL Report AMP XI.S1; the Containment Leak Rate program is an aging management program with exceptions that will be consistent with the GALL Report AMP XI.S4. SER Section 3.0.3.2.14 documents the staff's evaluation of Entergy's Containment Inservice Inspection program. SER Section 3.0.3.2.15 documents that staff's evaluation of Entergy's Containment Leak Rate program.

The staff finds Entergy's response acceptable. As noted above, the following considerations resolve the staff's concerns in RAI 3.5.1.27-1:

1) Entergy clarifies that the electrical penetration sleeves and suppression pool outer wall liner have no current licensing basis TLAA.

2) The electrical penetration sleeves and suppression pool outer wall liner are not subject to cracking due to cyclic loading.

3) Entergy clarifies that the suppression pool floor liner has a current licensing basis TLAA and it dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(iii).

4) Entergy will manage the aging effects of loss of material for the electrical penetration sleeves and suppression pool outer wall liner consistent with the GALL Report recommendations.

LRA Table 3.5.1, Item 3.5.1-38 addresses managing the aging effect of stress corrosion cracking on the following material and environment: stainless steel suppression chamber shell (inner surface) exposed to uncontrolled indoor air. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim and finds it acceptable because USAR Section 3.11.1.2.3 and USAR Table 6.2-3 show that the corrosive environment (concentration of chloride or sulfate contaminants and temperature > 140 °F) required for the above aging effect to occur does not exist for the RBS suppression chamber liner; therefore, the item requires no aging management program for this aging effect.

For LRA Table 3.5.1, Item 3.5.1-39, Entergy claims it is not applicable because RBS is a BWR III with a freestanding containment vessel that does not contain a containment vent line bellow. The staff reviewed the LRA and USAR and confirms that Entergy's LRA does not have any aging management review results applicable for this item.

LRA Table 3.5.1, Item 3.5.1-60 addresses managing the aging effects of loss of material (spalling, scaling) and cracking due to freeze–thaw of the following material and environment: Group 6: concrete (accessible areas) exterior above grade and below grade; foundation, exposed to outdoor air. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim and finds it acceptable because RBS is located in a region where weathering conditions are considered negligible as shown in ASTM C33-90, Figure 1; therefore, the concrete elements are not subject to loss of material and cracking due to freeze–thaw.

LRA Table 3.5.1, Item 3.5.1-64 addresses managing the aging effects of loss of material (spalling, scaling) and cracking due to freeze–thaw in the following: accessible areas of Groups 1-3, Group 5, and Groups 7-9 structures concrete; exterior above grade and below grade; foundation exposed to outdoor air. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim and finds it acceptable because based on Figure 1 of ASTM C33-90, "Standard Specification for Concrete Aggregates," RBS is not located in a region with moderate-to-severe weathering conditions; therefore, the containment concrete components are not exposed to the environment required for loss of material and cracking due to freeze–thaw to occur.

LRA Table 3.5.1, Item 3.5.1-68 addresses high-strength structural bolting exposed to uncontrolled indoor air or outdoor air. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim and finds it acceptable because during its audit, the staff found no evidence that Entergy uses high-strength bolts in Inservice Inspection—IWF applications at RBS. The staff also notes that by letter dated March 22, 2018 (ADAMS Accession Number ML18081A021), Entergy amended its license renewal application to include an enhancement (LRA Section B.1.41). Entergy also revised its USAR supplement (LRA Section A.1.41) plant procedures to disallow procurement of bolting material greater than 1 inch in diameter with actual measured yield strength less than 150 ksi.

LRA Table 3.5.1, Item 3.5.1-71 addresses the aging effect of loss of material and cracking due to freeze–thaw for the following material and environment: masonry walls exposed to outdoor air. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim and finds it acceptable because the GALL Report notes that freeze–thaw is not an applicable aging effect for plants in what ASTM C33, "Standard Specification for Concrete Aggregates," Figure 1 calls the negligible weathering region. The staff reviewed ASTM C33 and verified that RBS is located in a negligible weathering region.

LRA Table 3.5.1, Item 3.5.1-75 addresses sliding surfaces made of Lubrite® exposed to uncontrolled indoor air or outdoor air. Entergy states that this item is not applicable to Lubrite® plates at RBS because the "listed aging mechanisms are event driven and typically can be avoided through proper design." However, the staff notes that LRA Table 3.5.1, Item 3.5.1-57 and Item 3.5.1-91 address the aging effects of loss of mechanical function and loss of material through Entergy's Inservice Inspection—IWF program. This program is consistent, with enhancement, with the recommended GALL Report AMP XI.S3. SER Section 3.0.3.2.16 documents the staff's evaluation of the Inservice Inspection—IWF program. The staff evaluated Entergy's claim and finds it acceptable for the following reasons:

1) Entergy acknowledges the applicability of the aging effects by proposing to manage aging of Lubrite® associated with component support members under

AMR Item 3.5.1-57 and Item 3.5.1-91, which address the same component supports, aging effect requiring management, and aging mechanisms of LRA Table 3.5.1, Item 3.5.1-75.

2) Entergy will manage these aging effects using the Inservice Inspection—IWF program, consistent with the recommendations in GALL Report AMP XI.S3.

LRA Table 3.5.1, Item 3.5.1-76 addresses sliding surfaces from radial beam seats in BWR drywell exposed to uncontrolled indoor air environment. Entergy states that this item is not applicable to RBS. However, the staff notes that USAR Section 3.8.3.4.7 states that at RBS, both the drywell floor beams (at the drywell end) and the containment floor beams (at the containment end) have sliding supports. To clarify whether Entergy considered these sliding supports in its disposition of LRA Table 3.5.1, Item 3.5.1-76 and whether the sliding supports identified are within scope of license renewal and subject to an aging management review, the staff issued a request for additional information. RAI 3.5.1.76-1 and Entergy's response are documented in ADAMS Accession Nos. ML17347B432, dated December 13, 2017 and ML18025B750, dated January 24, 2018, respectively.

Entergy's response to RAI 3.5.1.76-1 notes that the RBS floor beam sliding supports are within the scope of license renewal. As part of its response, Entergy updated LRA Table 3.5.1, Item 3.5.1-76 and the associated item in LRA Table 3.5.2-1 to ensure that it adequately manages the aging effects during the period of extended operation. The staff finds Entergy's response and corresponding changes to LRA Table 3.5.1, Item 3.5.1-76 and LRA Table 3.5.2-1 acceptable because (1) Entergy clarifies that sliding supports are within the scope of license renewal, and (2) the periodic visual inspections Entergy will perform under the Structures Monitoring program will adequately manage the aging effects prior to loss of function during the period of extended operation.

LRA Table 3.5.1, Item 3.5.1-84 addresses ASME Class MC stainless steel structural bolting exposed to a fluid environment. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim and finds it acceptable because the SRP-LR Item 3.5.1-84 refers to stainless steel bolting in treated water. During its audit, the staff confirmed that RBS does not use stainless steel bolting in treated water.

LRA Table 3.5.1, Item 3.5.1-85 addresses ASME Class 1, Class 2, and Class 3 stainless steel structural bolting exposed to a fluid environment. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim and finds it acceptable because SRP-LR Item 3.5.1-85 refers to stainless steel bolting in treated water. During its audit, the staff confirmed that RBS does not use stainless steel bolting in treated water.

3.5.2.1.2 Loss of Sealing

LRA Table 3.5.1, Item 3.5.1-26 addresses managing the aging effects of loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects for the following materials and environment: moisture barriers and sealants made of elastomers, rubber, or similar materials exposed to "air-indoor, uncontrolled." The GALL Report recommends GALL Report AMP XI.S1, "ASME Section XI, Subsection IWE," to provide reasonable assurance that applicants adequately manage loss of sealing for containment moisture barriers. For the aging management review items that cite generic Note E, the LRA credits the plant-specific Periodic Surveillance and Preventive Maintenance program to manage the above aging effect for the inflatable seals for spent fuel storage pool gates and the inflatable seals for upper containment pool gates. At RBS, both of these inflatable seals are made of elastomer material.

In the LRA, Entergy notes that the RBS primary containment does not use moisture barriers. The staff confirmed this in the Aging Management Programs Audit Report, dated January 29, 2018 (ADAMS Accession No. ML17346A732). Therefore, the item is being used for a different component in the reactor building or auxiliary building than a containment moisture barrier. SER Section 3.0.3.3.1 documents the staff's evaluation of Entergy's Periodic Surveillance and Preventive Maintenance program. Based on its review of components associated with LRA Table 3.5.1, Item 3.5.1-26, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the effects of aging using the Periodic Surveillance and Preventive Maintenance program acceptable as follows: The program is effective in monitoring and detecting degradation of elastomeric component surfaces and change in material properties through visual inspections that occur when plant staff manually flex the component once every 6 years. This approach is similar to the inspection method and interval in other recommended GALL Report aging management programs (e.g., Structures Monitoring) for this component material and aging effect.

3.5.2.1.3 Cracking, Loss of Bond, and Loss of Material Due to Corrosion of Embedded Steel

In LRA Table 3.5.2-1, "Reactor Building," Entergy cites the GALL Report (NUREG-1801, Item III.A4.TP-26). This item recommends the Structures Monitoring program to manage the aging effects of cracking, loss of bond, and loss of material on concrete exposed to an indoor air environment. The LRA aligns with the GALL Report guidance and cites generic Note A; however, the LRA table references Table 1, Item 3.5.1-56. This Table 1 item is associated with a different GALL Report item and a different aging management program. Based on the LRA table and the material, environment, aging effect combination in the LRA, it appears the Table 1 entry should reference Item 3.5.1-66. The licensee noted this discrepancy and by letter dated February 6, 2018, updated the item in LRA Table 3.5.2-1 to reference Table 1, Item 3.5.1-66. The staff finds the updated item acceptable because the material, environment, aging effect and aging management program align with the GALL Report recommendation.

3.5.2.1.4 Loss of Material due to General, Pitting, and Crevice Corrosion

LRA Table 3.5.1, Item 3.5.1-78 addresses managing the aging effect of loss of material for the following materials and environments: the stainless steel drywell head, finger pins, drywell liner plate inner, outer walls, suppression pool inner wall, and weir wall liner plate exposed to a fluid environment (temperature less than 140 °F). For the aging management review items that cite generic Note E, the LRA credits the Structures Monitoring program to manage the above aging effect for these stainless steel components.

Based on its review of components associated with LRA Table 3.5.1, Item 3.5.1-78, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage loss of material using the Structures Monitoring program acceptable because the program's periodic visual inspections, conducted once every 5 years, are capable of detecting loss of material prior to a loss of intended function.

LRA Table 3.5.1, Item 3.5.1-90 addresses managing the aging effect of loss of material due to general (steel only) pitting, and crevice corrosion in the following materials and environment: steel and stainless steel support members, welds, bolted connections, and support anchorage to building structure exposed to fluid environment (some at temperature <140 °F). For the aging management review item that cites generic Note E, the LRA credits the Water Chemistry Control—BWR and Inservice Inspection—IWF programs to manage loss of material due to general (steel only) pitting and crevice corrosion aging effect for the safety relief valve (SRV) quencher support and restraint. Based on its review of LRA Table 3.5.1, Item 3.5.1-90, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the noted effect of aging for this component using the Water Chemistry Control—BWR and Inservice Inspection—IWF programs acceptable because these are the GALL Report-recommended programs to manage this aging effect for such components in treated water.

LRA Table 3.5.1, Item 3.5.1-92 addresses managing the aging effect of loss of material in the following material and environment: carbon steel and galvanized steel support members, welds, bolted connections, and support anchorage to building structure exposed to air-indoor (uncontrolled) or air-outdoor. For the aging management review item that cites generic Note E, the LRA credits the Fire Water System program to manage the aging effect for carbon steel fire hose reels. Based on its review of components associated with LRA Table 3.5.1, Item 3.5.1-92, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage loss of material using the Fire Water System program acceptable for two reasons:

1) During its audit, the staff reviewed the Fire Water System program implementing documents and verified that the fire hoses and their support system includes the carbon steel fire hose reels. In addition, Entergy will inspect those components as part of the visual inspections performed under the Fire Water System program.

2) Entergy performs visual inspections of components in this program at least once every 24 months, which is more frequent than the once-every-5-years frequency stated in the GALL Report-recommended Structures Monitoring program.

3.5.2.1.5 <u>Loss of Material Due to Pitting and Crevice Corrosion</u>

LRA Table 3.5.1, Item 3.5.1-93 addresses managing the aging effect of loss of material due to pitting and crevice corrosion for the following components and environment: support members, welds, bolted connections, and support anchorage to building structures exposed to an outdoor air environment. For the aging management review item that cites generic Note E, the LRA credits the Inservice Inspection—IWF program to manage the aging effect for stainless steel structural bolting in bulk commodities. The staff notes that the LRA also includes another aging management review item in Table 3.5.2-4 with a generic Note A that manages the aging effect of loss of material due to pitting and crevice corrosion for this component, material and environment combination using the Structures Monitoring program. This approach is also recommended by the GALL Report.

Based on its review of components associated with LRA Table 3.5.1, Item 3.5.1-93, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage the aging effect of loss of material due to pitting and crevice corrosion using the Inservice Inspection—IWF program acceptable because periodic visual inspections under this program will identify any loss of material in stainless steel structural bolting before any loss of function occurs. This approach is consistent with the recommendations for the Structures Monitoring program in the GALL Report.

3.5.2.1.6 Reduction or Loss of Isolation Function

LRA Table 3.5.1, Item 3.5.1-94, addresses managing the aging effect of reduction or loss of isolation function in the following material and environment: elastomeric vibration isolators exposed to an uncontrolled indoor air environment. For the aging management review item that cites generic Note E, the LRA credits the Structures Monitoring program to manage the above aging effect for elastic vibration isolators. Based on its review of components associated with LRA Table 3.5.1, Item 3.5.1-94, for which Entergy cites generic Note E, the staff finds Entergy's proposal to manage reduction or loss of isolation function using the Structures Monitoring program acceptable because: (1) the Structures Monitoring program is enhanced to monitor elastomeric vibration isolators for cracking, loss of material, loss of sealing, and change in material properties (e.g., hardening) which will detect a reduction or loss of isolation function; and (2) the Structures Monitoring program inspection frequency is once every 5 years, which is more frequent than the Inservice Inspection—IWF program schedule.

3.5.2.1.7 Conclusion

The staff evaluated the GALL Report aging management review items that Entergy claims are not applicable. On the basis of its review, the staff concludes that the aging management review results that Entergy claims are not applicable, are not applicable to RBS.

As discussed in SER Section 3.5.2.1, for those aging management reviews for which Entergy claims consistency with the GALL Report, the staff evaluated Entergy's claim. The staff also reviewed information pertaining to Entergy's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the aging management review results, which Entergy claims to be consistent with the GALL Report, are consistent.

Therefore, the staff concludes that Entergy has demonstrated that it will adequately manage the effects of aging for these components in a way that maintains their intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2 Aging Management Review Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.5.2.2, Entergy further evaluates aging management, as recommended by the GALL Report, for the structures and component support components and provides information concerning how it will manage the applicable aging effects.

For component groups evaluated in the GALL Report, for which Entergy claims consistency with the GALL Report and for which the report recommends further evaluation, the staff audited and reviewed Entergy's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed Entergy's further evaluations against the criteria in SRP-LR Section 3.5.2.2. The staff's review of Entergy's further evaluation follows.

3.5.2.2.1 PWR and BWR Containments

The staff reviewed LRA Section 3.5.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.1, which addresses several areas:

Cracking and Distortion Due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, and Cracking due to Differential Settlement and Erosion of Porous Concrete Subfoundations.

LRA Section 3.5.2.2.1.1, associated with LRA Table 3.5.1, Item 3.5.1-1 and Item 3.5.1-2, addresses cracking and distortion due to increased stress levels from settlement and concrete foundation, subfoundation, and reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation in the following: concrete dome, wall, basemat, ring girders, and buttresses exposed to soil. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.5.2.2.1.1 and finds it acceptable because the RBS containment basemat is founded on the reactor building foundation, so it is not exposed to soil and would not be subject to increased stresses due to settlement. In addition, the RBS containment foundation's subfoundation is not constructed with porous concrete. Also, the plant's current licensing basis does not include a dewatering system to lower the site ground water level for the purposes of preventing settlement. Therefore, the GALL Report recommendation that a program verifies the continued functionality of such a system is not applicable to RBS. In its review of components associated with LRA Table 3.5.1, Item 3.5.1-1 and Item 3.5.1-2 the staff finds that Entergy has met the further evaluation criteria. Entergy's proposal not to manage the above effects of aging is acceptable because differential settlement is not expected to affect the RBS containment basemat since its containment basemat is founded on a nonporous subfoundation and is not exposed to soil.

Based on the programs identified above, the staff concludes that Entergy's programs meet the criterion in SRP-LR Section 3.5.2.2.1.1. For those items that apply to LRA Section 3.5.2.2.1.1, the staff finds that the LRA is consistent with the GALL Report and that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Reduction of Strength and Modulus Due to Elevated Temperature

LRA Section 3.5.2.2.1.2, associated with LRA Table 3.5.1, Item 3.5.1-3, addresses the aging effect of reduction of strength and modulus of elasticity due to elevated temperature in the following: concrete dome, wall, basemat, ring girders, buttresses, and/or fill annulus exposed to an uncontrolled indoor air or outdoor air environment. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.5.2.2.1.2 and finds it acceptable. Based on the staff's review of the LRA and USAR Sections 3.8.2.1.1, Section 3.8.2.1.2.1, and Section 9.4.6.2.1, the staff confirms the following:

1) RBS has a steel containment vessel with a concrete foundation (i.e., basemat).

2) Temperatures inside containment are kept below the GALL Report-recommended threshold limits of 66 °C (150 °F) for general areas and 93 °C (200 °F) for local areas; therefore, the containment concrete foundation is not exposed to the temperatures required for this aging effect to occur.

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

Item 1. LRA Section 3.5.2.2.1.3, associated with LRA Table 3.5.1, Item 3.5.1-4 and Item 3.5.1-5, addresses managing the aging effects of loss of material due to general, pitting, and crevice corrosion on the following: inaccessible areas of steel containments exposed to the environment of uncontrolled indoor air or concrete. The LRA credits the Containment Inservice Inspection—IWE and Containment Leak Rate programs to manage the above aging effect.

LRA Table 3.5.1, Item 3.5.1-4 applies only to containment drywell components. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.5.2.2.1.3, Item 1 and finds it acceptable because the portion of the further evaluation associated with LRA Table 3.5.1, Item 3.5.1-4 only applies to containment drywell shells. RBS is a Mark III containment design with a standalone steel containment that does not incorporate a drywell shell. Although the RBS design includes a drywell and a drywell head, the drywell is part of the containment internal structures and is not part of the primary containment. Additionally, Entergy inspects the stainless steel drywell and drywell head under the Structures Monitoring program.

For LRA Table 3.5.1, Item 3.5.1-5, the staff reviewed Entergy's proposal against the criteria in SRP-LR Section 3.5.2.2.1.3, Item 1. The staff notes that Entergy conducts ASME Code Section XI, Subsection IWE visual inspections of the accessible portions of containment. Entergy also conducted a review of plant operating experience and did not identify any deficiencies that indicated inaccessible portions of the containment require additional aging management. The staff conducted its own independent review of RBS operating experience and did not identify any issues indicating the need for a plant-specific aging management program. In its review of components associated with LRA Table 3.5.1, Item 3.5.1-5, the staff finds that Entergy has met the further evaluation criteria. Entergy's proposal to manage the effects of aging using the Containment Inservice Inspection—IWE and Containment Leak Rate programs is acceptable because the programs have been effective in identifying loss of material in accessible areas of the containment. In addition, neither Entergy nor the staff identified operating experience that indicates the need for additional plant-specific aging management programs for inaccessible areas of the containment.

Based on the programs identified, the staff finds that Entergy's programs meet SRP-LR Section 3.5.2.2.1.3, Item 1 criteria. For those items associated with LRA Section 3.5.2.2.1.3.1, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 2. LRA Section 3.5.2.2.1.3, associated with LRA Table 3.5.1, Item 3.5.1-6, addresses managing the aging effect of loss of material due to general, pitting, and crevice corrosion in the following: Mark I steel containment torus shells exposed to the environments of treated water or air. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.5.2.2.1.3, Item 2 and finds it acceptable because the further evaluation applies to Mark I steel containment torus shells. RBS is a Mark III steel containment design which does not have a steel torus shell.

Item 3. LRA Section 3.5.2.2.1.3, associated with LRA Table 3.5.1, Item 3.5.1-7, addresses managing the aging effect of loss of material due to general, pitting, and crevice corrosion on the following: the interior surfaces of steel suppression chambers of BWR Mark III containments exposed to the environments of treated water or air. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.5.2.2.1.3, Item 3 and finds it acceptable because the further evaluation applies to steel elements of the suppression pool interior surface, and the interior surfaces of the RBS suppression pool are clad with stainless steel. Furthermore, Entergy will inspect this component under its Containment Inservice Inspection—IWE program. This inspection provides reasonable assurance that Entergy will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation.

Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature.

LRA Section 3.5.2.2.1.4, associated with LRA Table 3.5.1, Item 3.5.1-8, addresses the aging effect of loss of prestress due to relaxation, shrinkage, creep, and elevated temperature in the following: containment prestressing systems exposed to air environments. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.2.2.2.1.4 and finds it acceptable because this item is applicable only to pressurized-water reactor and BWR prestressed concrete containments. In contrast, the RBS containment is a BWR Mark III steel containment, and it does not incorporate a prestressing system.

Cumulative Fatigue Damage

LRA Section 3.5.2.2.1.5, associated with LRA Table 3.5.1, Item 3.5.1-9, states that Entergy evaluates TLAAs in accordance with 10 CFR 54.21(c) and that the evaluation of this TLAA is addressed in LRA Section 4.6. This is consistent with SRP-LR Section 3.5.2.2.1.5 and is, therefore, acceptable. The staff's evaluation of the TLAA for RBS containment, bellows and other related commodities component is documented in SER Section 4.6.

Entergy states that for LRA Table 3.5.1, Item 3.5.1-9, the applicability is limited to the penetration sleeves, penetration bellows, and other similar steel components and elements (e.g., liner, airlock) exposed to uncontrolled indoor air or fluid environments. The staff searched the RBS USAR and technical specifications and confirms that no in-scope BWR components related to Mark I and II containments, namely torus, vent line bellows, and unbraced downcomers, exposed to uncontrolled indoor air or outdoor air environments are present in the containment except for those listed in LRA Section 3.5.2.2.1.5 and LRA Table 3.5.1, Item 3.5.1-9.

However, in its review of components associated with LRA Table 3.5.1, Item 3.5.1-9 and referenced in LRA Section 4.6, the staff needed additional information, and therefore issued two requests for additional information. RAI 3.5.1.9-1 and RAI 3.5.1.9-2, both dated December 27, 2017, are documented in ADAMS Accession No. ML17361A396. Entergy's responses, dated February 6, 2018, are documented in ADAMS Accession No. ML18038B475.

In Entergy's response to RAI 3.5.1.9-1, Entergy considered dissimilar metal welds in the fatigue analyses of applicable piping penetrations. Entergy also evaluated dissimilar metal welds for cumulative fatigue damage in LRA Section 4.6. The staff finds Entergy's response acceptable because Entergy evaluates and dispositions dissimilar metal welds, in accordance with 10 CFR 54.21(c)(1)(iii), for cumulative fatigue damage at locations where cyclic stresses were sufficient to cause fatigue effects.

During its evaluation of Entergy's response to RAI 3.5.1.9-2, the staff noted that the identified LRA Table 3.5.2-1 items disposition the polar crane, equipment hatch, drywell airlock and fuel transfer tube bellows as being managed for cracking due to cumulative fatigue damage by the Fatigue Monitoring program. As part of its response, Entergy also updated LRA Table 3.5.2-1 to include a similar disposition for the drywell head and finger pins steel components. The staff finds Entergy's response and corresponding updates to the LRA Table 3.5.2-1 acceptable because they have demonstrated that Entergy will adequately manage the effects of aging for the steel components associated with the TLAA disposition in LRA Section 4.6 in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3). In SER Section 4.6, the staff evaluates the TLAA for RBS containment, bellows, and other related commodities components.

Cracking Due to Stress Corrosion Cracking

LRA Section 3.5.2.2.1.6, associated with LRA Table 3.5.1, Item 3.5.1-10, addresses managing the aging effect of cracking due to stress corrosion cracking for the following: stainless steel penetration sleeves, penetration bellows, and dissimilar metal welds exposed to the environment of plant indoor air. Entergy credits the Containment Inservice Inspection—IWE program and Containment Leak Rate program to manage this aging effect. The criteria in SRP-LR Section 3.5.2.2.1.6 state that cracking due to stress corrosion cracking of stainless steel penetration bellows and dissimilar metal welds could occur in all types of pressurized-water reactor and BWR containments. The SRP-LR also states that the existing program relies on the ASME Section XI, Subsection IWE program and 10 CFR Part 50, Appendix J program to manage this aging effect. The GALL Report recommends further evaluation of additional appropriate examinations or evaluations implemented to manage cracking due to stress corrosion cracking for stainless steel penetration components and dissimilar metal welds.

Entergy states that stress corrosion cracking is not an applicable aging mechanism for the containment vessel carbon steel penetration sleeves, stainless steel penetration bellows, and dissimilar metal welds. Entergy states that the RBS steel containment vessel and associated penetration sleeves are carbon steel, and stress corrosion cracking is applicable to stainless steel only under certain conditions (i.e., combination of high-tensile stress, corrosive environment, and susceptible material).

Entergy also states that RBS has dissimilar metal welds associated with stainless steel bellows welded to carbon steel penetration sleeves. Entergy does not consider stress corrosion cracking of these dissimilar metal welds applicable because stress corrosion cracking requires a concentration of chloride or sulfate contaminants (which are not normally present in significant quantities for these components) as well as high stress and temperatures > 140 °F. In addition, Entergy states that, since RBS technical specifications limit the average air temperature inside the primary containment during normal plant operation to 120 °F, the environmental condition is not conducive to stress corrosion cracking. Therefore, Entergy claims that cracking due to stress corrosion cracking of these penetration components is not applicable to RBS.

Entergy also reviewed plant operating experience and did not identify cracking of these containment penetration components or containment pressure boundary functions as a concern. Entergy states that nevertheless, the existing Containment Inservice Inspection—IWE program and Containment Leak Rate program continues to manage cracking due to stress corrosion cracking of stainless steel bellows and dissimilar metal welds.

The staff evaluates Entergy's Containment Inservice Inspection—IWE program and Containment Leak Rate program in SER Section 3.0.3.2.4 and SER Section 3.0.3.1.3, respectively. In its review of components associated with LRA Table 3.5.1, Item 3.5.1-10, the staff finds that Entergy has met the further evaluation criteria. Entergy's proposal to manage the effects of aging using the Containment Inservice Inspection—IWE program and Containment Leak Rate program is acceptable because Entergy's evaluation confirms the following:

1) The normal operating temperature inside the RBS containment does not exceed 120 °F, so it is not conducive to causing stress corrosion cracking in these containment penetration components.

2) The environment without chemical contamination at RBS is not conducive to causing stress corrosion cracking in these components.

3) Entergy's review of RBS plant operating experience confirms the absence of stress corrosion cracking in these components.

4) The existing RBS Containment Inservice Inspection—IWE and Containment Leak Rate aging management programs will continue to confirm that cracking due to stress corrosion cracking does not affect the integrity of the applicable stainless steel penetration components.

Based on the programs identified, the staff finds that Entergy's programs and aging management evaluation meet the SRP-LR Section 3.5.2.2.1.6 criteria. For those items associated with LRA Section 3.5.2.2.1.6, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Loss of Material (Scaling, Spalling) and Cracking Due to Freeze-Thaw</u>

LRA Section 3.5.2.2.1.7, associated with LRA Table 3.5.1, Item 3.5.1-11, addresses managing the aging effect of loss of material (spalling, scaling) and cracking due to freeze-thaw in the following: inaccessible areas of concrete components (e.g., dome, wall, basemat, ring girders, buttresses) of containment structures exposed to the environments of outdoor air, groundwater, or soil. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.5.2.2.1.7 and finds it acceptable for the following reason: Based on Figure 1 of ASTM C33-90, "Standard Specification for Concrete Aggregates," RBS is not located in a region with moderate-to-severe weathering conditions; therefore, the containment concrete components are not exposed to the environment required for loss of material and cracking due to freeze-thaw to occur.

<u>Cracking Due to Expansion and Reaction with Aggregates</u>

LRA Section 3.5.2.2.1.8, associated with LRA Table 3.5.1, Item 3.5.1-12, addresses managing the aging effect of cracking due to expansion from reaction with aggregates in the following: inaccessible areas of concrete components (e.g., dome, wall, basemat) of the containment structure exposed to any environment. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.5.2.2.1.8, reviewed the LRA, and reviewed USAR Section 3.8. The staff finds Entergy's claim acceptable for the following reasons:

- Entergy reviewed RBS operating experience and did not identify instances of cracking due to expansion from reaction with aggregates; therefore, a plant-specific program is not necessary to manage this aging effect.

- RBS has a Mark III steel containment; therefore, this aging effect is not applicable to the RBS containment steel membrane structure.

- RBS constructed the containment concrete structures (i.e., concrete basemat) to the recommended American Concrete Institute (ACI) and American Society for Testing and Materials standards, which minimizes the possibility of this aging effect.

- Entergy proposes to inspect the accessible and inaccessible areas of the reactor building concrete basemat, which is integral with the containment concrete basemat, through the Structures Monitoring program as identified in AMR Item 3.5.1-43 and Item 3.5.1-54.

- Entergy's use of the Structures Monitoring program to manage this aging effect is acceptable because periodic visual inspections of accessible areas of concrete can detect cracking due to expansion from reaction with aggregates and will indicate degradation of inaccessible areas before there is a loss of intended function for the containment concrete basemat.

Increase in Porosity and Permeability Due to Leaching of Calcium Hydroxide and Carbonation

LRA Section 3.5.2.2.1.9, associated with LRA Table 3.5.1, Item 3.5.1-13 and Item 3.5.1-14, addresses managing the aging effects of increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation in the following: inaccessible areas of concrete of the containment, dome, wall, basemat, and ring girders, exposed to a flowing water environment. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.5.2.2.1.9, reviewed the LRA, USAR Section 3.8, and audit results, and finds Entergy's claim acceptable for the following reasons:

- RBS has a Mark III steel containment; therefore, this aging effect is not applicable to the RBS containment steel membrane structure.

- Creating a plant-specific aging management program is not necessary for RBS, because the staff reviewed plant operating experience and did not find evidence of leaching and carbonation in accessible areas of concrete, and RBS groundwater sample analyses show that the groundwater has been nonaggressive.

- Entergy proposes to inspect the accessible and inaccessible areas of the reactor building concrete basemat, which is integral with the containment concrete basemat, through the Structures Monitoring program, as identified in AMR Item 3.5.1-63 and Item 47.

- Entergy's use of the Structures Monitoring program to manage this aging effect is acceptable because Entergy enhanced the program to identify occurrences of increase in porosity and permeability in accessible areas of concrete as a precursor to these aging effects occurring in inaccessible areas.

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

The staff reviewed LRA Section 3.5.2.2.2 against the criteria in SRP-LR Section 3.5.2.2.2, which addresses several areas:

Aging Management of Inaccessible Areas.

Item 1. LRA Section 3.5.2.2.2.1, Item 1, associated with LRA Table 3.5.1, Item 3.5.1-42, addresses managing the aging effect of loss of material (spalling, scaling) and cracking due to freeze-thaw in the following: inaccessible areas of Group 1–3, Group 5, and Group 7–9 structures concrete; foundation exposed to an outdoor air environment. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.5.2.2.2.1, Item 1 and finds it acceptable as follows: Based on Figure 1 of ASTM C33-90, "Standard Specification for Concrete Aggregates," RBS is not located in a region with moderate-to-severe weathering conditions; therefore, RBS concrete components are not exposed to the environment required for this aging effect to occur.

Item 2. LRA Section 3.5.2.2.2.1, Item 2, associated with LRA Table 3.5.1, Item 3.5.1-43, addresses managing the aging effect of cracking due to expansion and reaction with aggregates for the following: inaccessible areas of all group structures (except Group 6) concrete; foundation exposed to any environment. Entergy proposes using the Structures Monitoring program to manage the above aging effect on the specified area, material, and environment. The staff reviewed Entergy's proposal against the criteria in SRP-LR Section 3.5.2.2.2.1, Item 2.

The staff notes, based on its review of the LRA and USAR Section 3.8, that the concrete used at RBS for Group 1–5 and Group 7–9 structures was designed and constructed in accordance with ACI 318 (1963 and/or 1971 edition). In addition, aggregates were tested in accordance with ASTM C295, ASTM C227, ASTM C289, and ASTM C33 for petrographic examinations and potential of alkali reactivity of the cement–aggregate combination. These ACI and ASTM standards minimize the possibility of cracking due to alkali-aggregate reaction. The staff notes, based on reviewing the LRA and reviewing documents during the audit, that there have been no occurrences of this aging effect in RBS operating experience. The staff also noted no indications of alkali-aggregate reaction during its walkdown of accessible concrete structures. Therefore, a plant-specific aging management program for the aging effect is unnecessary.

Based on industry operating experience, Entergy proposes to manage this aging effect using the Structures Monitoring program. SER Section 3.0.3.2.19 documents the staff's evaluation of Entergy's Structures Monitoring program which, with enhancements, will be consistent with the GALL Report AMP XI.S6. The staff notes that a plant-specific aging management program for this aging effect is unnecessary because (1) RBS has had no operating experience related to this aging effect and (2) RBS concrete structures were constructed to recommended ACI and American Society for Testing and Materials standards that minimize the possibility of cracking due to alkali-aggregate reaction. The staff notes that in LRA Table 3.5.1, Item 3.5.1-54, Entergy also proposes using the Structures Monitoring program to manage the same aging effect, only in this case for accessible areas of Group 1–5 and Group 7–9 concrete structures (consistent with the GALL Report). Entergy proposes using visual inspections that are part of the Structures Monitoring program to manage this aging effect for the specified inaccessible areas of concrete. Entergy will perform these visual inspections under two circumstances:

1) when these normally inaccessible areas of concrete become accessible during excavation

2) when periodic visual inspections of accessible areas of concrete (which Entergy performs at least once every 5 years under the Structures Monitoring program) indicate that degradation may be occurring in inaccessible areas of concrete

In its review of components associated with LRA Table 3.5.1, Item 3.5.1-43, the staff finds that Entergy has met the further evaluation criteria. Entergy's proposal to manage cracking due to expansion and reaction with aggregates on the specified inaccessible concrete using the Structures Monitoring program is acceptable. As noted above, the program will manage the aging effects consistent with the GALL Report recommendations, and a plant-specific program is not necessary.

Based on the program identified, the staff finds that Entergy's program meets SRP-LR Section 3.5.2.2.2.1, Item 2 criteria. For those items associated with LRA Section 3.5.2.2.2.1, Item 2, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Item 3</u>. LRA Section 3.5.2.2.2.1, Item 3 associated with LRA Table 3.5.1, Item 3.5.1-44, addresses managing the aging effect of cracking and distortion due to increased stress levels from settlement for the following: all group structures concrete exposed to a soil environment. Entergy proposes the Structures Monitoring program to manage this aging effect. LRA Section 3.5.2.2.2.1, Item 3 is also associated with LRA Table 3.5.1, Item 3.5.1-45 and Item 3.5.1-46, which address reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation in Group 1–3 and Group 5–9 structures concrete exposed to water-flowing under foundation. Entergy states that LRA Table 3.5.1, Item 3.5.1-45 and Item 3.5.1-46 are not applicable to RBS. The staff reviewed Entergy's proposal against the criteria in SRP-LR Section 3.5.2.2.2.1, Item 3.

The staff notes, based on its review of the LRA and USAR Section 3.4.1.2, that RBS structures do not rely on a dewatering systems to control settlement; therefore, LRA Table 3.5.1, Item 3.5.1-44 through Item 3.5.1-46, do not need further evaluation. The staff also notes, based on its review of the LRA and USAR Section 2.5, Appendix 2H, Figure 2.5-67 and Figure 2.5-68, that RBS structures do not have a porous concrete subfoundation. Instead, RBS structure subfoundations consist of compacted structural backfill or soil placed directly over dense sands, gravels, and clays. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.5.2.2.2.1, Item 3, for LRA Table 3.5.1, Item 3.5.1-45 and Item 3.5.1-46, and finds it acceptable because, absent a dewatering system to control settlement and a porous concrete subfoundation, the associated aging effect is not applicable to RBS.

Nevertheless, consistent with the GALL Report, Entergy proposes to manage the aging effect associated to LRA Table 3.5.1, Item 3.5.1-44 using the Structures Monitoring aging management program. With enhancements, Entergy's Structures Monitoring program will be consistent with GALL Report AMP XI.S6. SER Section 3.0.3.2.19 documents the staff's evaluation of Entergy's Structures Monitoring program. Entergy proposes using visual inspections that are part of the Structures Monitoring program to manage this aging effect for inaccessible areas of concrete in a soil environment. Entergy will perform these visual inspections under two circumstances:

1) when these normally inaccessible areas in a soil environment become accessible during excavation

2) when periodic visual inspections of <u>accessible</u> areas of concrete (which Entergy performs least once every 5 years under the Structures Monitoring program) indicate

that degradation may be occurring in inaccessible areas of concrete that are in a soil environment

In its review of components associated with LRA Table 3.5.1, Item 3.5.1-44, the staff finds that Entergy has met the further evaluation criteria. In addition, Entergy's proposal to manage the effect of cracking and distortion due to increased stress levels from settlement on the specified inaccessible concrete and environment using the Structures Monitoring program is acceptable. As noted above, the program will manage the aging effects consistent with the GALL Report recommendations, and further evaluation is not necessary.

Based on the program identified, the staff finds that Entergy's program meets SRP-LR Section 3.5.2.2.2.1, Item 3 criteria. For those items associated with LRA Section 3.5.2.2.2.1, Item 3, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 4. LRA Section 3.5.2.2.2.1, Item 4 associated with LRA Table 3.5.1, Item 3.5.1-47, addresses managing the aging effect of increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in the following: inaccessible areas of Group 1–5and Group 7–9 structures concrete: exterior above grade and below grade; foundation exposed to the environment of flowing water. Entergy proposes using the Structures Monitoring program to manage this aging effect on the specified inaccessible concrete structures and environment. The staff reviewed Entergy's proposal against the criteria in SRP-LR Section 3.5.2.2.2.1, Item 4.

Based on its audit review of plant operating experience, review of USAR Section 2.4.13, and review of site documents, the staff finds no evidence of leaching and carbonation in accessible areas of concrete at RBS. Also, groundwater sample analyses show that the groundwater at RBS has been nonaggressive; therefore, a plant-specific aging management program for this aging effect is not necessary. The staff notes, based on its review of the LRA and USAR Section 3.8, that the concrete used at RBS for Group 1–5 and Group 7–9 structures was (1) designed and constructed in accordance with ACI 201.2R-77, ACI 318 (1963 and/or 1971 edition) and (2) conforms to ASTM C150, Type II. Also, aggregates were tested in accordance with ASTM C33 and other pertinent American Society for Testing and Materials standards to produce a dense, well-cured, durable, and low permeability concrete.

Entergy proposes using the Structures Monitoring program to manage the above aging effect for the specified inaccessible concrete structures. Entergy's Structures Monitoring aging management program is consistent, with enhancements, with GALL Report AMP XI.S6, "Structures Monitoring." SER Section 3.0.3.2.19 documents the staff's evaluation of Entergy's Structures Monitoring program. Entergy enhanced its Structures Monitoring program to include inspecting and monitoring concrete compounds for signs of increase in porosity and permeability, and loss of strength. The staff notes that in LRA Table 3.5.1, Item 3.5.1-63, Entergy also proposes using the Structures Monitoring program to manage the same aging effect, only in this case for accessible Group 1–5 and Group 7–9 concrete structures (consistent with the GALL Report recommendations). Entergy proposes using visual inspections that are part of the Structures Monitoring program to manage this aging effect for inaccessible areas of concrete. Entergy will perform these visual inspections under two circumstances:

1) when these normally inaccessible areas of concrete become accessible during excavation

2) when periodic visual inspections of accessible areas of concrete (which Entergy performs at least once every 5 years under the Structures Monitoring program) indicate that degradation may be occurring in inaccessible areas of concrete

In its review of components associated with LRA Table 3.5.1, Item 3.5.1-47, the staff finds that Entergy has met the further evaluation criteria. Entergy's proposal to manage increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in the specified inaccessible concrete using the Structures Monitoring program is acceptable. As noted above, the program will manage the above aging effects consistent with the GALL Report recommendations, and a plant-specific program is not necessary.

Based on the program identified, the staff finds that Entergy's program meets SRP-LR Section 3.5.2.2.2.1, Item 4 criteria. For those items associated with LRA Section 3.5.2.2.2.1, Item 4, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Reduction of Strength and Modulus Due to Elevated Temperature.

LRA Section 3.5.2.2.2.2, associated with LRA Table 3.5.1, Item 3.5.1-48, addresses managing the aging effect of reduction of strength and modulus of elasticity in the following: Group 1–5 concrete structures exposed to elevated temperatures in an air-indoor (uncontrolled) environment. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.5.2.2.2.2 and finds it acceptable. Based on its review of the LRA, USAR Section 3.8.2.1.2.1, USAR Section 3.8.2.4.2, USAR Section 9.4, and USAR Table 9.4-1, the staff confirms the following:

1) RBS plant cooling systems maintain general area concrete temperatures below 66 °C (150 °F).

2) RBS maintains localized area concrete temperatures below 93 °C (200 °F) through the use of guard pipes and insulation.

3) Entergy age manages the reduction of thermal insulation under AMR Item 3.4.1-64 through the External Surfaces Monitoring program, consistent with the GALL Report recommendations.

Therefore, the staff finds that Group 1–5 concrete structures at RBS are not exposed to the elevated temperatures required for the reduction of strength and modulus of elasticity aging effect to occur.

Aging Management of Inaccessible Areas for Group 6 Structures.

Item 1. LRA Section 3.5.2.2.2.3, Item 1, associated with LRA Table 3.5.1, Item 3.5.1-49, addresses managing the aging effects of loss of material (spalling, scaling) and cracking due to freeze-thaw for the following: inaccessible areas of Group 6 structures concrete; exterior above grade and below grade; foundation; interior slab exposed to outdoor air environment. Entergy states that this item is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.5.2.2.2.3, Item 1 and finds it acceptable for the following reason: based on Figure 1 of ASTM C33-90, "Standard Specification for Concrete Aggregates," RBS is not located in a region with moderate-to-severe weathering conditions; therefore the specified inaccessible concrete components are not exposed to the environment required for loss of material and cracking due to freeze-thaw to occur.

Item 2. LRA Section 3.5.2.2.2.3, Item 2 associated with LRA Table 3.5.1, Item 3.5.1-50, addresses managing for the aging effect of cracking due to expansion from reaction with aggregates for the following: inaccessible areas of Group 6 structures concrete exposed to any environment. Entergy proposes using the Structures Monitoring program to manage this aging effect. The staff reviewed Entergy's proposal against the criteria in SRP-LR Section 3.5.2.2.2.3, Item 2.

The staff reviewed the LRA and USAR Section 3.8 and notes that the concrete used at RBS for Group 6 structures was designed and constructed in accordance with ACI 318 (1963 and/or 1971 edition) and that aggregates were tested in accordance with ASTM C33 for potential of alkali reactivity of the cement–aggregate combination. The ACI and American Society for Testing and Materials standards minimize the possibility of cracking due to alkali–aggregate reaction. Based on the staff's review of the LRA and review of documents during the audit, the aging effect of cracking due to expansion from reaction with aggregates has never occurred in RBS operating experience. The staff also confirmed this during its walkdown of accessible areas of the standby service water cooling tower. Because RBS has no operating experience related to cracking due to expansion from reaction with aggregates, a plant-specific aging management program for this aging effect is not necessary.

Based on industry operating experience, Entergy proposes to manage the above aging effect for inaccessible areas of Group 6 concrete structures using the Structures Monitoring program. The staff's evaluation of Entergy's Structures Monitoring program, which with enhancements, will be consistent with the GALL Report AMP XI.S6, is documented in SER Section 3.0.3.2.19. The staff notes that in LRA Table 3.5.1, Item 3.5.1-54, Entergy also proposes using the Structures Monitoring program to manage the same aging effect, only in this case for accessible areas of Group 6 concrete structures (consistent with the GALL Report recommendation). Entergy proposes using visual inspections that are part of the Structures Monitoring program to manage the above aging effect for inaccessible areas Group 6 concrete structures. Entergy will perform these visual inspections under two circumstances:

1) when these normally inaccessible areas become accessible during excavation

2) when periodic visual inspections of accessible areas of concrete (which Entergy performs at least once every 5 years under the Structures Monitoring program) indicate that degradation may be occurring in inaccessible areas of concrete

In its review of components associated with LRA Table 3.5.1, Item 3.5.1-50, the staff finds that Entergy has met the further evaluation criteria. Entergy's proposal to manage cracking due to expansion from reaction with aggregates using the Structures Monitoring program is acceptable because the program will manage the aging effects consistent with the GALL Report recommendations, and a plant-specific program is not necessary.

Based on the program identified, the staff finds that Entergy's program meets SRP-LR Section 3.5.2.2.2.3, Item 2 criteria. For those items associated with LRA Section 3.5.2.2.2.3, Item 2, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. LRA Section 3.5.2.2.2.3, Item 3 associated with LRA Table 3.5.1, Item 3.5.1-51, addresses managing the aging effect of increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in the following: inaccessible areas of Group 6 structures concrete; exterior above-grade and below-grade; foundation; interior slab exposed to a flowing water environment. Entergy proposes managing this aging effect on the specified material and environment by using the Structures Monitoring program. The staff reviewed Entergy's proposal against the criteria in SRP-LR Section 3.5.2.2.2.3, Item 3.

Based on its audit of plant operating experience, review of USAR Section 2.4.13, and review of site documents, the staff finds no evidence of leaching and carbonation in accessible areas of concrete. Groundwater sample analyses show that the groundwater at RBS has been nonaggressive; therefore, a plant-specific aging management program for this aging effect is not necessary. The staff reviewed the LRA and USAR Section 3.8, and notes that the concrete used at RBS for Group 6 structures was designed and constructed in accordance with ACI 201.2R-77, ACI 318 (1963 and/or 1971 edition); the RBS cement conforms to ASTM C150, Type II; and aggregates were tested in accordance with ASTM C33 and other pertinent American Society for Testing and Materials standards to produce a dense, well-cured, durable, and low permeability concrete.

Entergy proposes managing this aging effect using its enhanced Structures Monitoring aging management program. Entergy's Structures Monitoring program is consistent, with enhancements, with GALL Report AMP XI.S6, "Structures Monitoring." SER Section 3.0.3.2.19 documents the staff's evaluation of Entergy's Structures Monitoring program.. Entergy enhanced its Structures Monitoring program to inspect and monitor concrete components for (1) signs of increase in porosity and permeability, and (2) loss of strength. Under the Structures Monitoring program, Entergy subjects accessible areas of concrete to visual inspections at least once every 5 years. Entergy proposes using visual inspections that are part of the Structures Monitoring program to manage the above aging effect for inaccessible areas of the specified Group 6 concrete structures in a flowing water environment. Entergy will perform these visual inspections under two circumstances:

1) when these normally inaccessible areas become accessible during excavation for any reasons

2) when periodic visual inspections of accessible areas of concrete (which Entergy performs at least once every 5 years under the Structures Monitoring program) indicate that degradation may be occurring in inaccessible areas of concrete

The staff also notes that, consistent with the GALL Report recommendation, LRA Table 3.5.1, Item 3.5.1-61, manages the same aging effect, only in this case in accessible areas of Groups 6 structures concrete using the RG 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants Program." This aging management program, with enhancements, will be consistent with GALL Report AMP XI.S7. SER Section 3.0.3.2.18 documents the staff's evaluation of Entergy's RG 1.127 aging management program, In its review of components associated with LRA Table 3.5.1, Item 3.5.1-51, the staff finds that Entergy has met the further evaluation criteria. Entergy's proposal to manage the effects of aging using the Structures Monitoring program is acceptable. As noted above, the Structures Monitoring program (in conjunction with the RG 1.127 program) will manage the above aging effects consistent with the GALL Report recommendations, and a plant-specific program is not necessary.

Based on the program identified, the staff finds that Entergy's program meets SRP-LR Section 3.5.2.2.2.3, Item 3 criteria. For those items associated with LRA Section 3.5.2.2.2.3, Item 3, the staff concludes that the LRA is consistent with the GALL Report and that Entergy has demonstrated it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Cracking Due to Stress Corrosion Cracking, and Loss of Material Due to Pitting and Crevice Corrosion

LRA Section 3.5.2.2.2.4, associated with LRA Table 3.5.1, Item 3.5.1-52, addresses managing for the aging effects of cracking due to stress corrosion cracking (SCC) and loss of material due to pitting and crevice corrosion in the following: stainless steel tank liners exposed to the environment of standing water. Entergy proposes managing the above aging effects using the Structures Monitoring program. The LRA notes that there are no tanks with stainless steel liners within the structural scope of license renewal; however, the corresponding items can be compared to other components, such as the reactor cavity and containment sump. The staff reviewed Entergy's proposal against the criteria in SRP-LR Section 3.5.2.2.2.4.

The staff notes that the stainless steel components that reference this item may be exposed to a fluid environment; however, the fluid is lower than the 140 degree threshold for stress corrosion cracking. In addition, the environment does not contain a significant presence of contaminants, which is necessary for stress corrosion cracking. In its review of components associated with LRA Table 3.5.1, Item 3.5.1-52, the staff finds that Entergy has met the further evaluation criteria. Entergy's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because the environment necessary for stress corrosion cracking does not exist. Furthermore, the proposed aging management program includes adequate visual examinations that can identify loss of material.

Based on the program identified, the staff finds that Entergy's program meets SRP-LR Section 3.5.2.2.2.4 criteria. For those items associated with LRA Section 3.5.2.2.2.4, the staff concludes that the LRA is consistent with the GALL Report. Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Cumulative Fatigue Damage Due to Fatigue

LRA Section 3.5.2.2.2.5, associated with LRA Table 3.5.1, Item 3.5.1-53, addresses cumulative fatigue damage or cracking due to fatigue in component support members, anchor bolts, and welds for Groups B1.1, B1.2 and B1.3 component supports. For these types of components, SRP-LR Section 3.5.2.2.2.5 and AMR Item 53 in SRP-LR Table 3.5-1 state that the treatment of cumulative fatigue damage or cracking due to fatigue is to be evaluated as a time-limited aging analysis if a time-dependent fatigue analysis exists for the specific type of component support in the current licensing basis. Entergy states that AMR Item 53 in SRP-LR Table 3.5-1 is not applicable to RBS. The staff evaluated Entergy's claim against the criteria in SRP-LR Section 3.5.2.2.2.5 and finds it acceptable because the staff has verified that the design-basis information in the USAR does not include or reference any fatigue analyses for these types of components in the current licensing basis.

3.5.2.2.3 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of Entergy's quality assurance program.

3.5.2.2.4 Ongoing Review of Operating Experience

SER Section 3.0.5 documents the staff's evaluation of Entergy's ongoing review of operating experience program.

3.5.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL Report

In LRA Table 3.5.2-1 through Table 3.5.2-4, the staff reviewed additional details of the aging management review results for material, environment, aging effect requiring management, and aging management program combinations not consistent with or not addressed in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed Entergy's evaluation to determine whether Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation. The staff's evaluation is documented in the following sections.

3.5.2.3.1 Reactor Building—Summary of Aging Management Review—LRA Table 3.5.2-1

The staff reviewed LRA Table 3.5.2-1, which summarizes the results of aging management review evaluations for the Reactor Building component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.5.2.3.2 Water-Control Structures—Summary of Aging Management Review—LRA Table 3.5.2-2

The staff reviewed LRA Table 3.5.2-2, which summarizes the results of aging management review evaluations for the water-control structures component groups.

Ceramic Tile and Polyvinyl Chloride Cooling Tower Fill Exposed to Fluid.

As amended by letter dated May 10, 2018 (ADAMS Accession No. ML18130A935), LRA Table 3.5.2-2 states that ceramic tile and polyvinyl chloride cooling tower tile fill exposed to fluid will be managed for fouling by the Structures Monitoring program. The AMR items cite generic note J.

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by Entergy constitute all of the credible aging effects for this component, material, and environment description. Based on its review of plant-specific operating experience where fouling resulted in an increase in the fill material weight, the staff finds that Entergy has identified all credible aging effects for this component, material, and environment combination.

The staff finds Entergy's proposal to manage the effects of aging acceptable because, as discussed in SER Section 3.0.3.1.16 regarding RAI B.1.40-5, the enhancement to the Structures Monitoring program to periodically monitor fouling of the fill material can effectively manage fouling.

<u>Polyvinyl Chloride Cooling Tower Drift Eliminators Exposed to Fluid.</u>

In LRA Table 3.5.2-2, Entergy stated that polyvinyl chloride (PVC) cooling tower drift eliminators exposed to a fluid environment do not have any aging effects requiring management and no AMP is proposed. The AMR item cites generic note J.

The staff reviewed the associated item in the LRA to confirm that no credible aging effects are applicable for this component, material, and environment combination. The staff notes that although the environment is listed as fluid, the drift eliminators mainly see outdoor ambient air with entrained water droplets from air being drawn through the cooling tower fill material. In addition, these components are completely contained within the enclosed space of the concrete cooling tower structure and are not exposed to sunlight or other sources of ultraviolet radiation.

The staff finds Entergy's proposal acceptable, based on its review of GALL Report Items AP-268 and AP-269 and EPRI 1010639, "Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools," Revision 4, because changes in material properties are not anticipated when temperatures do not exceed 140°F and when components are not exposed to sunlight or other sources of ultraviolet radiation.

3.5.2.3.3 <u>Turbine Building, Auxiliary Building, and Yard Structures—Summary of Aging Management Review—LRA Table 3.5.2-3</u>

The staff reviewed LRA Table 3.5.2-3, which summarizes the results of aging management review evaluations for the Turbine Building, Auxiliary Building, and Yard Structures component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

3.5.2.3.4 <u>Bulk Commodities—Summary of Aging Management Review—LRA Table 3.5.2-4</u>

The staff reviewed LRA Table 3.5.2-4, which summarizes the results of aging management review evaluations for the bulk commodities component groups.

Fire Protection System

Cerablanket, Ceraboard, Cerafiber, Kaowool Blanket, Kaowool Bulk Fiber, and Thermo-Lag Fire Stops/Wrap Exposed to Uncontrolled Indoor Air.

In LRA Table 3.5.2-4, Entergy states that Cerablanket®, Ceraboard, Cerafiber®, Kaowool® blanket, Kaowool® bulk fiber, and Thermo-lag fire barriers exposed to uncontrolled indoor air will be managed for loss of material, change in material properties, cracking/delamination, and separation by the Fire Protection program. The aging management review items cite generic Note J, which states, "Neither the component nor the material and environment combination is evaluated in NUREG-1801."

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by Entergy constitute all of the credible aging effects for this component, material, and environment description. The staff notes that even though the GALL Report does not include aging management review items for nonmetallic fire barriers (e.g., fire stops and fire wrap), the GALL Report AMP XI.M26, "Fire Protection," includes aging management for other fire resistance materials (e.g., flamastic, 3M™ fire wrapping, spray-on fire proofing material, intumescent coating) within the scope of program. The GALL Report AMP XI.M26, "Fire Protection," recommends that these materials be managed for loss of material and cracking, increased hardness, shrinkage, and loss of strength. Based on its review of the GALL Report, the staff finds that Entergy identified all credible aging effects for this component, material, and environment combination.

SER Section 3.0.3.1.09 documents the staff's evaluation of Entergy's Fire Protection program. Entergy's Fire Protection program includes periodic visual inspections of the fire barriers within the scope of license renewal to detect aging effects (at a frequency in accordance with the NRC-approved Fire Protection program and technical requirements manual). The staff finds that Entergy's proposal to manage the effects of aging using its Fire Protection program acceptable because visual inspections conducted as part of the program can detect signs of aging effects and material integrity, such as cracking and separation. Additionally, the use of Entergy's Fire Protection program is consistent with NRC guidance (Regulatory Guide 1.189, Revision 2, "Fire Protection for Nuclear Power Plants," Section 1.7.4, "Inspection") and nuclear industry practice (as documented in NUREG-1552, "Fire Barrier Penetration Seals in Nuclear Power Plants," Supplement 1) of ensuring the integrity of fire barriers through inspections. It is also consistent with industry practice of maintaining material integrity and dimensional stability as a means to assuring material design performance[3].

Fiberglass and Calcium Silicate Insulation Components Exposed to Air-Indoor Uncontrolled

In LRA Table 3.5.2-4, Entergy states that it will use the Structures Monitoring program to manage the aging effects of loss of material and changes in material properties for the following: fiberglass and calcium silicate insulation (including jacketing, wire mesh, tie wires, straps, and clips) exposed to an uncontrolled indoor air environment. The aging management review item cites generic Note J.

The staff reviewed the associated items in the LRA and considered whether Entergy's proposed aging effects constitute all of the credible aging effects for this component, material, and

[3] Guyer, E.C., editor in chief, *the Handbook of Applied Thermal Design*, Part 3, Chapter 1 *Characteristics and Application of Thermal Insulation*, Hamilton Printing Company, Castleton, NY, 1999.

environment description. The staff notes that fiberglass and calcium silicate are commonly used at nuclear power plants in the construction of insulation components, in a dry environment, with low potential for water leakage, spray, or condensation. Fiberglass and calcium silicate are expected to be inert to environmental effects. However, the staff also notes that both fiberglass and calcium silicate insulation have potential for prolonged retention of any moisture to which they are exposed, and prolonged exposure to moisture may increase thermal conductivity, thereby degrading the insulating capacity or integrity. The staff also notes that failure of the fiberglass and calcium silicate insulation component to maintain its integrity can result in loss of function to nearby safety-related equipment. The staff expects that the loss of integrity of the fiberglass and calcium silicate insulation will result in the aging effects of loss of material and changes in material properties. These aging effects can be readily detected during a visual inspection. The aging effect of reduced thermal insulation resistance due to moisture intrusion for this component, material, and environment combination is addressed by another aging management review item in LRA Table 3.5.2-4. Entergy uses the External Surfaces Monitoring program to manage the reduced thermal insulation resistance aging effect. Based on its review of Entergy's proposed aging effects, the staff finds that Entergy identified all credible aging effects for this component, material, and environment combination.

The staff notes that the Structures Monitoring program proposes to manage the effects of aging through the use of periodic visual inspections at intervals not to exceed 5 years. The staff finds Entergy's proposal to manage the effects of aging associated with the integrity of the insulation material by using the Structures Monitoring program acceptable for the following reasons: (1) Entergy enhanced the scope of its Structures Monitoring program to include inspection of these insulation components; and (2) periodic visual inspections performed under Entergy's enhanced Structures Monitoring program can identify any loss of material and changes in material properties for the insulation material.

Electrical Structural Components

The staff reviewed LRA Table 3.5.2-4, which summarizes the results of aging management review evaluations for the Bulk Commodity Electrical Structural component groups. The staff's review did not identify any items with Note F through Note J, indicating that the combinations of component type, material, environment, and aging effect requiring management for this system are consistent with the GALL Report.

On the basis of its review, the staff finds that Entergy has appropriately evaluated the aging management review results of material, environment, aging effect requiring management, and aging management program combinations not evaluated in the GALL Report. The staff finds that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.3 Conclusion

The staff concludes that Entergy has demonstrated that for the period of extended operation, it will adequately manage the effects of aging for the structures and component supports system components within the scope of license renewal and subject to an aging management review. Furthermore, Entergy has demonstrated that it will do so in a way that maintains the intended functions consistent with the current licensing basis (as required by 10 CFR 54.21(a)(3)).

3.6 Aging Management of Electrical and Instrumentation and Controls System

3.6.1 Summary of Technical Information in the Application

LRA Section 3.6 provides aging management review results for the electrical and instrumentation and control system components and component groups. LRA Table 3.6.1, "Summary of Aging Management Programs for the Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801," is a summary comparison of Entergy's aging management reviews with those evaluated in the GALL Report for the electrical and instrumentation and control system components and component groups.

3.6.2 Staff Evaluation

Table 3.6-1 summarizes the staff's evaluation of components, aging effects or mechanisms, and aging management programs listed in LRA Section 3.6 and addressed in the GALL Report.

Table 3.6-1 Staff Evaluation for Electrical and Instrumentation and Controls in the GALL Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.6.1-1	Consistent with the GALL Report (see SER Section 3.6.2.2.1)
3.6.1-2	Consistent with the GALL Report (see SER Section 3.6.2.2.2)
3.6.1-3	Consistent with the GALL Report (see SER Section 3.6.2.2.2)
3.6.1-4	Consistent with the GALL Report (see SER Section 3.6.2.2.3)
3.6.1-5	Consistent with the GALL Report (see SER Section 3.6.2.2.3)
3.6.1-6	Consistent with the GALL Report (see SER Section 3.6.2.2.3)
3.6.1-7	Consistent with the GALL Report (see SER Section 3.6.2.2.3)
3.6.1-8	Consistent with the GALL Report
3.6.1-9	Consistent with the GALL Report
3.6.1-10	Consistent with the GALL Report
3.6.1-11	Not Applicable to RBS (see SER Section 3.6.2.1.1)
3.6.1-12	Not Applicable to RBS (see SER Section 3.6.2.1.1)
3.6.1-13	Not Applicable to RBS (see SER Section 3.6.2.1.1)
3.6.1-14	Not Applicable to RBS (see SER Section 3.6.2.1.1)
3.6.1-15	Not Applicable to RBS (see SER Section 3.6.2.1.1)
3.6.1-16	Not Applicable to RBS (see SER Section 3.6.2.1.1)
3.6.1-17	Not Applicable to RBS (see SER Section 3.6.2.1.1)
3.6.1-18	Consistent with the GALL Report
3.6.1-19	Not Applicable to BWRs (see SER Section 3.6.2.1.1)
3.6.1-20	Consistent with the GALL Report (see SER Section 3.6.2.1.2)
3.6.1-21	Consistent with the GALL Report
…	

The staff's review of the electrical and instrumentation and control system component groups follows one of several approaches.

1) One approach, documented in SER Section 3.6.2.1, reviews aging management review results for components that Entergy claims are consistent with the GALL Report and require no further evaluation.

2) Another approach, documented in SER Section 3.6.2.2, reviews aging management review results for components that Entergy claims are consistent with the GALL Report and for which further evaluation is recommended.

3) A third approach, documented in SER Section 3.6.2.3, reviews aging management review results for components that Entergy claims are not consistent with, or not addressed in, the GALL Report.

SER Section 3.0.3 documents the staff's review of aging management programs credited to manage or monitor aging effects of the electrical and instrumentation and control system components.

3.6.2.1 Aging Management Review Results Consistent with the GALL Report

LRA Section 3.6.2.1 identifies the materials, environments, and aging effects requiring management, and the programs that manage aging effects for the electrical and instrumentation and control system components.

LRA Table 3.6.2 summarizes aging management reviews for the electrical and instrumentation and control system components and indicate which aging management reviews Entergy claims to be consistent with the GALL Report.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that Entergy identified the appropriate GALL Report aging management reviews. The staff's evaluation follows.

3.6.2.1.1 Aging Management Review Results Identified as Not Applicable

For LRA Table 3.6.1, Item 3.6.1.19, Entergy claims that the corresponding aging management review items in the GALL Report are not applicable to RBS (a BWR) because the associated items are only applicable to pressurized-water reactors. The staff reviewed the SRP-LR; confirmed these items only apply to pressurized-water reactors; and finds that these items are not applicable to RBS because it is a BWR.

For LRA Table 3.6.1, Item 3.6.1-11 through Item 3.6.1-17, Entergy claims that they were not applicable. The staff reviewed the LRA and USAR and confirms that Entergy's LRA does not have any aging management review results that are applicable for the above items or the above items require no aging management.

3.6.2.1.2 Loss of conductor strength due to corrosion

LRA Table 3.6.1, Item 3.6.1-20 address the aging effect of loss of conductor strength due to corrosion in transmission conductors composed of aluminum exposed to an outdoor air environment. Entergy stated that this item is consistent with NUREG-1801 and that no aging management is required for this material and environment combination.

During its review of components associated with LRA Table 3.6.1, Item 3.6.1-20, the staff noted a discrepancy between LRA Table 3.6.1 and the corresponding item of LRA Table 3.6.2 in describing the component type. LRA Table 3.6.2 lists component type as "Transmission Connectors" while the corresponding LRA Table 3.6.1-20 correctly mentions the component as "Transmission Conductor." LRA Table 3.6.1 is consistent with the SRP LR Table 3.6.1. Therefore, the staff issued request for additional information 3.6.2.2.3-1 (ADAMS Accession No. ML18009A909) on January 9, 2018 to obtain clarification.

In its response to RAI 3.6.2.2.3-1, dated February 7, 2018 (ADAMS Accession No. ML18087A164), Entergy revised LRA Table 3.6.2, "Component Type" column to state "Transmission Conductors." With Entergy revising Table 3.6.2 to show the correct component type (i.e., transmission conductor rather than transmission connector), the staff concludes that Entergy's LRA Table 3.6.1, Item 3.6.1-20 and the corresponding Table 3.6.2 item are similar and are consistent with the SRP-LR. This resolves the staff's concern described in RAI 3.6.2.2.3-1.

3.6.2.1.3 Conclusion

The staff evaluated the GALL Report aging management review items that Entergy claims are not applicable to RBS. On the basis of its review, the staff concludes that the aging management review results that Entergy claims are not applicable, are not applicable to RBS.

As discussed in SER Section 3.3.2.1, for those aging management reviews for which Entergy claims consistency with the GALL Report, the staff evaluated Entergy's claim of consistency. The staff also reviewed information pertaining to Entergy's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the aging management review results, which Entergy claims are consistent with the GALL Report, are consistent.

Therefore, the staff concludes that Entergy has demonstrated that it will adequately manage the effects of aging for these components in a way that maintains their intended function(s) consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2 Aging Management Review Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.6.2.2, Entergy further evaluates aging management, as recommended by the GALL Report, for the electrical and instrumentation and control system components and provides information concerning how it will manage the applicable aging effects.

For component groups evaluated in the GALL Report, for which Entergy claims consistency with the report and for which the report recommends further evaluation, the staff audited and reviewed Entergy's evaluation to determine whether it adequately addresses the issues further evaluated. In addition, the staff reviewed Entergy's further evaluations against the criteria contained in SRP-LR Section 3.6.2.2. The staff's review of Entergy's further evaluation follows.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

Environmental qualification is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3, "Definitions." The NRC requires license renewal applicants to evaluate TLAAs in accordance with the regulations in 10 CFR 54.21(c)(1). The evaluation of this TLAA is addressed separately in SER Section 4.4, "Environmental Qualification (EQ) Analysis of Electric Equipment."

3.6.2.2.2 Degradation of Insulator Quality due to Presence of Any Deposits and Surface Contamination, and Loss of Material due to Mechanical Wear

High Voltage Insulators Composed of Porcelain, Malleable Iron, Aluminum, Galvanized Steel and Cement Exposed to Outdoor Air

LRA Section 3.6.2.2.2, associated with LRA Table 3.6.1, items 3.6.1-2 and 3.6.1-3, addresses loss of material due to mechanical wear (caused by wind blowing on transmission conductors) and reduced insulation resistance (due to presence of salt deposits or surface contamination) respectively, in high-voltage insulators composed of porcelain, malleable iron, aluminum, galvanized steel, and cement exposed to air outdoor. The criteria in SRP-LR Section 3.6.2.2.2 states that the GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed. The acceptance criteria for this further evaluation are described in BTP RLSB-1 (SRP-LR Appendix A.1).

For LRA Table 3.6.2 item 3.6.1-2, Entergy stated that, for high-voltage insulators, loss of material due to mechanical wear caused by wind and movement of the associated transmission conductor is not a credible aging effect at RBS and a plant-specific AMP is not required for this aging effect. Entergy stated that industry experience has shown transmission conductors do not normally swing and movement due to substantial wind will subside after a short period. Entergy further stated that wear has not been apparent during routine inspections and is not a credible aging effect at RBS. Entergy's LRA Table 3.6.2 shows that the aging effect in the GALL Report for this component, material and environmental combination is not applicable (generic note I).

For LRA Table 3.6.2 item 3.6.1-3, Entergy discussed operating experience at RBS with surface contamination due to cooling tower plumes and corrective actions taken in 2004 and 2006. Entergy stated that RBS is not located near seacoast or other sources of airborne particles and therefore concluded that reduced insulation resistance due to surface contamination is not an applicable aging effect for high-voltage insulators at RBS and a plant-specific AMP is not required. Entergy's LRA Table 3.6.2 indicates that the aging effect in the GALL Report for this component, material and environmental combination is not applicable (generic note I).

During reviews of the LRA's Table 3.6.1 items 3.6.1-2 and 3.6.1-3 as compared to the corresponding items in Table 3.6.2, the staff noted the following discrepancy: the high-voltage (HV) insulator material listed for Table 3.6.1 items 3.6.1-2 and 3.6.1-3, includes malleable iron and aluminum, which is consistent with the GALL Report for these two items, but Table 3.6.2 does not mention malleable iron and aluminum as HV insulator materials. In a letter dated January 22, 2018, documented in ADAMS Accession No. ML18022A941, the staff issued RAI 3.6.2.2.2-1 requesting Entergy to clarify the discrepancy between tables 3.6.1 and 3.6.2 regarding high-voltage insulator material.

In its response, dated February 20, 2018, documented in ADAMS Accession No. ML18051A531, Entergy stated that aluminum was not used in the construction of high-voltage insulators at RBS. Entergy noted that malleable iron is implicitly included in LRA Table 3.6.2, since it lists galvanized metal which covers malleable iron, ductile iron and drop-forged steel. Entergy also stated that LRA Table 3.6.2 will be revised to include steel and stainless steel for the two line items corresponding to the porcelain high-voltage insulators.

With Entergy's clarification that aluminum is not utilized and that malleable iron is implicitly included in the term galvanized metal, the staff concludes that Entergy's evaluation is consistent with SRP-LR Section 3.6.2.2.2 criteria for components associated with Table 3.6.1, Items 3.6.1-2 and 3.6.1-3. The staff also noted that according to EPRI 1013475, "Plant Support Engineering: License Renewal Handbook," the term galvanized metal is defined to include malleable iron as well as ductile iron and dropped forge steel. The staff's concern described in RAI 3.6.2.2.2-1 is resolved.

During the on-site audit, the staff noted that some in-scope 230 kV transmission line HV insulators are constructed of polymer material rather than porcelain, and only porcelain type HV insulators are listed in LRA Table 3.6.2. In a letter dated January 22, 2018, documented in ADAMS Accession No. ML18022A941, the staff issued RAI 3.6.2.2.2-1 requesting Entergy to justify why the polymer material used for the HV insulators is not listed in the LRA, or provide a revision to include polymer insulators, along with a discussion of the aging management aspects of these insulators. In addition, the staff noted that polymer material for HV insulators have not previously been evaluated in the GALL Report.

In its response, dated February 20, 2018, documented in ADAMS Accession No. ML18051A531, Entergy stated that the high-voltage insulators on the transmission conductor towers from RSS1 and RSS2 transformer yards to the Fancy Point 230 kV switchyard were replaced with polymer insulators in 2008. Entergy stated that LRA Table 3.6.2 will be revised to include a new line item for polymer high-voltage insulators consisting of fiberglass, silicone rubber, aluminum, aluminum alloy, steel, steel alloys, and galvanized metal (galvanized ductile iron, galvanized forged steel, and hot dip galvanized steel). Entergy also provided discussions for operating experience, surface buildup of contamination, aging studies, and the need for a site-specific aging management program for polymer high-voltage insulators. Entergy concluded that there are no aging effects requiring management (AERM) regarding polymer high-voltage insulators.

In review of Entergy's response to RAI 3.6.2.2.2-1 pertaining to HV insulator material, the staff noted some material and aging effects and mechanisms associated with typical polymer insulators were not discussed. Epoxy, silicone gel, sealants and ductile iron have been used in construction of most polymer insulators, but were not included in the list of material. Additionally the following AERMs that are associated with polymer insulators were not discussed. These include:

- stress corrosion cracking of glass fibers
- swelling of silicone rubber (SIR) layer due to chemical contamination
- sheath wetting caused by chemicals absorbed by oil from SIR compound
- brittle fracture of rods resulting from discharge activity, flashunder, and flashover
- chalking and crazing of insulator surfaces resulting in contamination, arcing, and flashover
- bonding failure at rod and sheathing interface
- water ingress through end fittings causing flashunder, corrosion and fracture of glass fibers

The staff also noted that rodent and bird excrement containing aggressive chemicals such as phosphates, uric acid, and ammonia create an environment that can cause sheath layer damage and subsequent failures of the core material and fittings. Susceptibility of these components to this environment, which has not been reviewed in the GALL Report, needed to be evaluated.

According to research results, aging studies and reference material provided by Entergy, polymer insulators have been shown to have unique failure modes with little advance indications. Aging studies also indicate that contamination can be worse for silicone-rubber material insulators (compared to porcelain insulators) due to potential absorption of surface contaminants by silicone oil, especially in late stages of service life.

In a letter dated April 30, 2018, documented in ADAMS Accession No. ML18121A029, the staff issued RAI 3.6.2.2.2-1a requesting Entergy to further explain why certain typical material, AERMs listed above, and animal excrement chemical contaminations were not discussed in Entergy's response to RAI 3.6.2.2.2-1. The staff also requested Entergy to provide a discussion of any site-specific aging management program needed to ensure that the aging effects such as reduced insulation resistance and loss of material (for these components composed of polymers, epoxy, silicone gel, sealants, and ductile iron) are adequately managed. The staff further requested Entergy to describe what parameters may be required to be monitored or inspected to detect the AERM and how the frequency of inspection will be established.

In its response, dated May 29, 2018, documented in ADAMS Accession No. ML18149A638, Entergy provided clarifications and additional discussions as follows.

- Entergy stated that according to the manufacturer's documentation (MacLean Power Systems), epoxy, silicone gel, and sealants (other than silicone based RTV), are not used in the newer modified design of the high-voltage polymer insulators installed at RBS. Galvanized ductile iron is used on the connection hardware, and is listed in the revised LRA Table 3.6.2 as galvanized metal which includes galvanized forged steel, hot dip galvanized steel, and galvanized ductile iron.

- Entergy provided a discussion of industry documents, research, operating experience, and available literature regarding the AERMs requested by staff in RAI 3.6.2.2.2-1a (listed above) associated with high-voltage insulators. Entergy stated that these aging effects and mechanisms were considered and industry operating experience was evaluated for reduced insulation resistance due to contamination, polymer degradation, as well as loss of material caused by wind blowing on transmission conductors.

- Entergy cited lack of any operating experience at RBS with chemical contamination due to bird or rodent excrements on transmission conductors and high-voltage insulators and concluded that this environment is not applicable for RBS.

- Entergy stated that LRA Table 3.6.2 will be revised to include a new line item for polymer high-voltage insulators consisting of fiberglass, silicone rubber, aluminum, aluminum alloy, steel, steel alloys, and galvanized metal (galvanized ductile iron, galvanized forged steel, and hot dip galvanized steel). The new line item includes a proposed aging management program that takes credit for periodic surveillance and preventive maintenance.

- Entergy stated that although reduced insulation resistance is not expected, RBS will include preventive maintenance activities in the periodic surveillance and preventive maintenance programs to provide assurance that the effects of aging will not prevent polymer high-voltage insulators from continuing to perform their intended functions during the period of extended operation. Preventive maintenance will include performing ultra violet corona scan and visual inspection of polymer high-voltage insulators every 6 years. LRA Appendix A and Appendix B will be revised to include commitments to perform corona scan and visual inspections.

During its evaluation of Entergy's response to RAI 3.6.2.2.2-1a, the staff noted that Entergy addressed pertinent aging effects and mechanisms, considered industry and site-specific operating experience, evaluated contamination from animal excrement, incorporated appropriate material in the new line item for LRA Table 3.6.2, and will include preventive maintenance program of corona scan and visual inspection every 6 years, for in-scope polymer high-voltage insulators. The staff finds Entergy's response and changes to the LRA Table 3.6.2, USAR supplement (LRA Appendix A), and aging management programs and activities (LRA Appendix B) acceptable because degradation and aging effects of polymer high-voltage insulators have been appropriately evaluated and considered for the site-specific environment and conditions at RBS. Furthermore, aging effects requiring management (reduced insulation resistance), although not expected, will be monitored by the revised periodic surveillance and preventive maintenance program. The staff's concerns pertaining to polymer insulators as described in RAI 3.6.2.2.2-1 and RAI 3.6.2.2.2-1a are resolved.

For the LRA Table 3.6.2 item corresponding to LRA Table 3.6.1-2, as well as the new line item in Table 3.6.2 which was added in the response to RAI 3.6.2.2.2-1a, Entergy stated that, for in-scope high-voltage insulators, mechanical wear and reduced insulation resistance and loss of material due to wind and movement of the associated transmission conductors, are not applicable and no AMP is proposed. Entergy's evaluation, based on site and industry operating experience, concluded that a plant-specific AMP is not required because mechanical wear due to wind for high-voltage insulators is not an applicable aging effect for RBS.

The staff noted that EPRI 1003057, "Plant Support Engineering License Renewal Handbook" states that mechanical wear in high-voltage insulators is an aging effect for strain and suspension insulators in that they are subject to movement. Movement of insulators can be caused by wind blowing on the supported transmission conductor, causing it to swing. If this swing is frequent enough, it could cause wear in the metal contact point of the insulator string and between an insulator and supporting hardware. EPRI 1003057 indicates this mechanism is possible, but that industry operating experience has shown that transmission conductors are designed not to normally swing, and when they do, (e.g., due to a substantial wind), transmission conductors do not continue to swing for a long period of time once the wind has subsided.

The staff evaluated Entergy's claim and finds it acceptable because Entergy's further evaluation discussion in LRA 3.6.2.2.2 was performed consistent with SRP-LR Section 3.6.2.2.2 review and acceptance criteria, demonstrating that mechanical wear due to wind is not an applicable aging effect for RBS.

In LRA Table 3.6.2 item corresponding to LRA Table 3.6.1-3, Entergy's evaluation concluded that for high-voltage insulators exposed to salt, dust, or other industrial particulates, surface contamination is not an applicable aging effect for RBS. Entergy cited operating experience with failure of high-voltage insulators at RBS in 2004 and 2006, which were found to be due to excessive cooling tower plume carrying chemicals that were deposited on the high-voltage insulators. This was determined to be caused by degraded drift eliminators in the nearby circulating water cooling towers. Operations at RBS monitors insulator arcing and corrective actions are taken per the procedural criteria (trigger points) for 230 kV insulator arcing observed. Entergy concluded in the LRA that a plant-specific AMP is not required because at RBS these are non-age related, event-driven local condition effects and the glazed surfaces of the insulators prevent significant buildup of particulates. Entergy also cites periodic corona scan and visual inspections performed at RBS for monitoring contamination build up and signs of degradation.

The staff noted that rainfall will wash away minor contamination while the glazed insulator surface of porcelain insulators and silicone-rubber material of polymer insulators also aid contamination removal. In addition, any flashover is generally caused by temporary salt build up due to local weather events and is not dependent on the age of the insulators, and it therefore is not considered an aging mechanism.

The staff evaluated Entergy's claim and finds it acceptable because Entergy's evaluation in LRA 3.6.2.2.2 was performed consistent with SRP-LR Section 3.6.2.2.2 review and acceptance criteria demonstrating that a loss of material and reduced insulation resistance aging effects due to mechanical wear, salt deposits or surface contamination of high-voltage insulators are not applicable aging effects requiring management for RBS.

Conclusion

On the basis of its review, the staff concludes that Entergy has met the SRP-LR Section 3.6.2.2.2 criteria. For those items that apply to LRA Section 3.6.2.2.2, the staff finds that the LRA is consistent with the GALL Report and that Entergy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.3 Loss of Material Due to Wind-Induced Abrasion and Fatigue, Loss of Conductor Strength Due to Corrosion, and Increased Resistance of Connection Due to Oxidation or Loss of Preload

LRA Section 3.6.2.2.3, associated with LRA Table 3.6.1, Item 3.6.1-4, Item 3.6.1-5, Item 3.6.1-6, and Item 3.6.1-7, addresses loss of conductor strength due to corrosion, increased resistance of connection due to oxidation or loss of preload, and loss of material due to wind-induced abrasion in transmission conductors and connections as well as switchyard buses and connections. The criteria in SRP-LR Section 3.6.2.2.3 state that the GALL Report recommends further evaluation of a plant-specific aging management program to ensure that the aging effects are adequately managed. A discussion of each of these aging management review items is provided as follows.

Transmission Conductors Composed of Aluminum, Steel Exposed to Air-Outdoor.

LRA Table 3.6.1, Item 3.6.1-4 addresses the aging effect of loss of strength due to corrosion in transmission conductors composed of aluminum and steel exposed to an outdoor air environment. LRA Section 3.6.2.2.3 states that loss of conductor strength is not an aging effect requiring management for RBS transmission conductors based on RBS design, RBS plant-specific operating experience, or industrywide operating experience.

Entergy references in LRA Section 3.6.2.2.3 an Ontario Hydro study that included the results of aluminum conductor steel reinforced (ACSR) transmission conductor laboratory and field tests, including the evaluation of conductor aging effects due to locations near pollution sources and major urban areas. The Ontario Hydro study results indicate acceptable loss of strength due to corrosion in areas affected by industrial pollution. Entergy states that RBS uses aluminum conductor aluminum-alloy-reinforced (ACAR) transmission conductor design that is not susceptible to environmental degradation that affects aluminum conductor steel-reinforced transmission conductors in the Ontario Hydro study. Entergy also states that RBS transmission conductors are more substantial than conductors evaluated in the Ontario Hydro study and, therefore, RBS conductors will have ample strength margin throughout the period of extended operation.

The staff notes that RBS aluminum conductor aluminum-alloy-reinforced transmission conductors of the in-scope switchyard components are not susceptible to loss of strength due to corrosion. RBS transmission conductors are bounded by the Ontario Hydro study and will have adequate strength for the period of extended operation. Therefore, the staff finds that loss of conductor strength due to corrosion of aluminum conductor aluminum-alloy-reinforced transmission conductors is not an aging effect at RBS requiring an aging management program.

<u>Transmission Connectors Composed of Aluminum and Steel Exposed to an Air-Outdoor Environment</u>

LRA Table 3.6.1, Item 3.6.1-5 addresses the aging effect of increased resistance of connection due to oxidation or loss of preload in transmission connectors composed of aluminum, steel, and steel alloy exposed to an outdoor air environment. LRA Section 3.6.2.2.3 states that oxidation and loss of preload are not applicable aging effects for RBS transmission connectors based on RBS design and operating experience.

Transmission connectors can be susceptible to increased resistance due to corrosion. The NRC staff expects minor corrosion of transmission connectors due to exposure to precipitation, but this does not affect the ability of the transmission connectors to perform their intended functions. At RBS, transmission connector surfaces are coated with antioxidant compound (grease type sealant, No-OX™ grease), providing a corrosion-resistant, low-electrical resistance connection. RBS also uses some transmission connectors that are welded. These welded transmission connectors are not susceptible to the aging effects of loss of preload or increased resistance of connection due to oxidation. The design of these connections and construction practices along with operating experience at RBS indicate that increased resistance due to general corrosion and oxidation and loss of preload are not aging effects requiring management at RBS.

The staff reviewed the associated items in the LRA and confirmed that these aging effects are not applicable for this component, material, and environmental combination at RBS. The staff finds Entergy's further evaluation acceptable because the RBS transmission connectors have not exhibited significant aging effects based on both site-specific experience and the results of routine infrared inspections that Entergy performs at least once a year. In addition, the RBS transmission connectors are mostly welded, and welded connectors are not susceptible to aging effects of loss of preload or increased resistance of connection due to oxidation. For those transmission connectors that are bolted (and not welded), bolted connections employ corrosion inhibitors and bolting practices that prevent loss of preload and corrosion of the contact surfaces.

Switchyard Bus and Connections Composed of Aluminum, Copper, Bronze, Stainless Steel, Galvanized Steel Exposed to Air-Outdoor

LRA Table 3.6.1, Item 3.6.1-6 addresses the aging effects of loss of material due to wind-induced abrasion, increased resistance of connection due to oxidation, or loss of preload in switchyard bus and connections composed of aluminum, copper, bronze, stainless steel, or galvanized steel exposed to an outdoor air environment. LRA Section 3.6.2.2.3 states that loss of material and increased resistance of connection are not applicable aging effects for RBS switchyard bus and connections.

Switchyard bus and connections can be susceptible to increased resistance due to oxidation. At RBS, switchyard connection surfaces are coated with an antioxidant compound (grease type sealant, No-OX™ grease), providing a corrosion-resistant, low-electrical resistance connection. The absence of RBS plant-specific operating experience problems with switchyard buses, as evidenced by the results of routine infrared inspection, indicates that increased connection resistance due to general corrosion and oxidation is not an aging effect requiring management at RBS.

Entergy states that because of the design of the transmission switchyard conductors and bus bolted connections, torque relaxation (loss of preload) is precluded at RBS for these components. The design calls for use of Belleville washers to preclude connection degradation due to loss of preload. The operating experience at RBS has confirmed the absence of loss of preload. Therefore, increased connection resistance due to loss of preload of switchyard connections and switchyard bus connections is not an aging effect requiring management at RBS. Entergy also states that it has not observed loss of material due to wind-induced abrasion and fatigue at RBS or in review of industry operating experience.

During the review of components associated with LRA Table 3.6.1, Item 3.6.1-6, the staff noted a discrepancy between LRA Table 3.6.1 and the corresponding items of LRA Table 3.6.2 in describing the materials for switchyard bus and connections. LRA Table 3.6.2 omits copper, bronze, stainless steel, and galvanized steel from the list of switchyard bus and connection materials. LRA Table 3.6.1 is consistent with the SRP-LR Table 3.6.1 with both tables including copper, bronze, stainless steel, and galvanized steel in material description. Therefore, the staff issued a request for additional information RAI 3.6.2.2.3-1 (ADAMS Accession No. ML18009A909) on January 9, 2018 to obtain clarification.

In its response to RAI 3.6.2.2.3-1, dated February 7, 2018 (ADAMS Accession No. ML18087A164), Entergy states that the switchyard bus and connections are made of aluminum, steel alloy, and stainless steel. The steel alloy material for the switchyard bus and connections in Table 3.6.2 corresponds to Table 3.6.1, Items 3.6.1-6, which consists of stainless steel. Therefore, the switchyard bus and connections material in Tables 3.6.1 and 3.6.2 is consistent because steel alloy includes stainless steel. RBS does not use copper, bronze, and galvanized steel for switchyard buses and connections. With Entergy citing the lack of copper, bronze, and galvanized steel at RBS, and inclusion of stainless as a steel alloy, the staff concludes that Entergy's evaluation is consistent with SRP-LR Section 3.6.2.2.3 criteria for components associated with LRA Table 3.6.1, Item 3.6.1-6. This resolves the staff's concern described in RAI 3.6.2.2.3-1.

The staff reviewed the associated items in the LRA and confirmed that these aging effects are not applicable for this component, material, and environmental combination. The staff finds Entergy's evaluation acceptable because wind-born particulates have not been shown to be a contributor to loss of material at RBS. Operating experience and periodic inspections have also demonstrated that increased connection resistance due to corrosion, oxidation, or loss of preload is not an aging effect requiring management at RBS. The staff also notes that the switchyard bus is connected to active components by short sections of flexible conductors, which dampen the vibration effects caused by wind and operation of switchyard components.

Transmission Conductors Composed of Aluminum and Steel Exposed to Air-Outdoor

LRA Item 3.6.1-7 addresses the aging effects of loss of material due to wind-induced abrasion in transmission conductors composed of aluminum and steel exposed to an outdoor air environment. LRA Section 3.6.2.2.3 states that loss of material is not an applicable aging effect for RBS transmission conductors.

Entergy reviewed plant-specific and industrywide operating experience concerning loss of material (wear) due to wind induced abrasion and concludes that these are not aging effects requiring management at RBS. The staff notes that wind-born particulates have not been shown to be a contributor to loss of material at RBS. Therefore, the staff finds that the loss of material (wear) due to wind-induced abrasion is not an aging effect requiring management for transmission conductors at RBS.

Conclusion

On the basis of its review, the staff concludes that Entergy has met the SRP-LR Section 3.6.2.2.3 criteria. For those items that apply to LRA Section 3.6.2.2.3, the staff finds that the LRA is consistent with the GALL Report and that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended functions consistent with the current licensing basis during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of Entergy's quality assurance program.

3.6.2.2.5 Ongoing Review of Operating Experience

SER Section 3.0.5 documents the staff's evaluation of Entergy's ongoing review of operating experience program.

3.6.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL Report

LRA Table 3.6.2 provides additional details on Entergy's aging management review results for material, environment, aging effect requiring management, and aging management program combinations not consistent with or not addressed in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed Entergy's evaluation to determine whether Entergy demonstrates that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation. The staff's evaluation is documented in the following sections.

3.6.2.3.1 <u>Electrical and Instrumentation and Control Components—Summary of Aging Management Evaluation—LRA Table 3.6.2</u>

The staff reviewed LRA Table 3.6.2, which summarizes the results of aging management review evaluations for the electrical and instrumentation and control component groups.

<u>Transmission Connectors Composed of Aluminum, Steel, and Steel Alloy, and Switchyard Bus and Connections Composed of Aluminum, Steel, and Steel Alloy, and Transmission Conductors Composed of Aluminum, for Station Black Out Recovery Exposed to Air-Outdoor.</u>

In LRA Table 3.6.2, Entergy states that the following component, material, and environment combinations are not applicable to RBS:

- transmission conductors composed of aluminum and steel and exposed to an outdoor air environment (Table 1, Item 3.6.1-4)
- transmission connectors composed of aluminum and steel and exposed to an outdoor air environment (Table 1, Item 3.6.1-5)
- switchyard bus and connections composed of aluminum, steel, and steel alloy and exposed to an outdoor air environment (Table 1, Item 3.6.1-6)
- transmission conductors composed of aluminum, steel, and steel alloy and exposed to an outdoor air environment (Table 1, Item 3.6.1-7)

As a result, Entergy proposes no aging management programs for the above component, material, and environment combinations. These aging management review items cite generic Note I, which states that the aging effect in the GALL Report for this component, material, and environment combination is not applicable.

The staff reviewed the associated items in the LRA to confirm that these aging effects are not applicable for these component, material, and environmental combinations. The staff finds Entergy's proposal acceptable based on Entergy's further evaluation performed consistent with the SRP-LR Section 3.6.2.2.3 criterion. The staff's evaluation of Entergy's claim is documented in SER Section 3.6.2.2.3.

On the basis of its review, the staff finds that Entergy has appropriately evaluated the aging management review results of material, environment, aging effect requiring management, and aging management program combinations not evaluated in the GALL Report. The staff finds that Entergy has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Porcelain, Galvanized Metal, and Cement High-Voltage Insulators (for SBO Recovery) Exposed to Air-Outdoor.</u>

In LRA Table 3.6.2, Entergy stated that high-voltage insulators, composed of porcelain, malleable iron, aluminum, galvanized metals, and cement exposed to an air-outdoor environment (items 3.6.1-2 and 3.6.1-3), are not applicable and no AMP is proposed. The AMR items cite generic note I, which states that "Aging effect in NUREG 1801 for this component, material, and environment combination is not applicable."

The staff reviewed the associated items in the LRA to confirm that these aging effects are not applicable for this component, material, and environmental combination. The staff finds Entergy's proposal acceptable based on its further evaluation performed consistent with the SRP-LR Section 3.6.2.2.2 criterion. The staff's evaluation of Entergy's claim is documented in SER Section 3.6.2.2.2.

Fiberglass, Silicone Rubber, Aluminum and Aluminum Alloy, Steel, and Galvanized Metals, - High-Voltage Insulators - Polymer (for SBO Recovery) Exposed to Air-Outdoor.

In LRA Table 3.6.2 (new line item per response to RAI 3.6.2.2.2-1a), Entergy stated that high-voltage insulators, composed of fiberglass, silicone rubber, aluminum, aluminum alloy, steel, and galvanized metals, exposed to an air-outdoor environment are not applicable and no AMP is proposed. The new AMR line item cites generic note F, which states that "Material is not in NUREG 1801 for this component."

The staff reviewed the new line item in the LRA Table 3.6.2 to confirm that these aging effects are not applicable for this component, material, and environmental combination. The staff finds Entergy's proposal acceptable based on its further evaluation performed consistent with the SRP-LR Section 3.6.2.2.2 criterion. The staff's evaluation of Entergy's claim is documented in SER Section 3.6.2.2.2.

3.6.3 Conclusion

The staff concludes that Entergy has demonstrated that for the period of extended operation, it will adequately manage the effects of aging for the electrical and instrumentation and controls system components within the scope of license renewal and subject to an aging management review. Further, Entergy has demonstrated that it will do so in a way that maintains the intended functions consistent with the current licensing basis (as required by 10 CFR 54.21(a)(3)).

3.7 Conclusion for Aging Management Review Results

The NRC staff reviewed LRA Section 3, "Aging Management Review Results," and LRA Appendix B, "Aging Management Programs and Activities." Based on its audit and review of Entergy's aging management review results and aging management programs, the staff concludes that Entergy has demonstrated that it will adequately manage the applicable aging effects in a way that maintain intended functions consistent with the current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed Entergy's applicable USAR supplement program summaries and concludes that, as required by 10 CFR 54.21(d), the USAR supplement adequately describes the aging management programs and activities credited for managing aging at RBS.

With regard to these matters, the staff concludes that if the NRC issues a renewed operating license for River Bend Station, Unit 1, there is reasonable assurance that Entergy will continue to conduct the activities authorized by the renewed operating license in accordance with the current licensing basis, and any changes made to the current licensing basis, in order to comply with 10 CFR 54.21(a)(3), are in accordance with the Atomic Energy Act of 1954, as amended, and NRC regulations.

4 TIME-LIMITED AGING ANALYSES

4.1 Identification of Time-Limited Aging Analyses

This safety evaluation report (SER) section provides the staff's evaluation of the license renewal applicant's basis for identifying those plant-specific or generic analyses that need to be identified as time-limited aging analyses (TLAAs) for Entergy's license renewal application (LRA) and the list of TLAAs for the LRA. TLAAs are certain plant-specific safety analyses that involve time-limited assumptions defined by the current operating term. This SER section also provides the staff's evaluation of Entergy's basis for identifying those exemptions that need to be identified in the LRA pursuant to Title 10 of the *Code of Federal Regulations* 54.21(c)(2).

Under the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) 54.21(c)(1), a license renewal applicant must list all evaluations, analyses, and calculations in the current licensing basis (CLB) that conform to the definition of a TLAA. According to 10 CFR 54.3, "Definitions," TLAAs are those licensee calculations and analyses that:

(1) involve a system, structure, or component (SCC) within the scope of license renewal application, as delineated in 10 CFR 54.4(a);

(2) consider the effects of aging;

(3) involve time-limited assumptions defined by the current operating term (e.g., 40 years);

(4) were determined to be relevant by the applicant in making a safety determination;

(5) involve conclusions or provide the basis for conclusions related to the capability of the SSC to perform its intended functions, as described in 10 CFR 54.4(b); and

(6) are contained or incorporated by reference in the current licensing basis.

The regulations at 10 CFR 54.21(c)(1) require that for the TLAAs, the applicant shall demonstrate that:

(i) The analyses remain valid for the period of extended operation;

(ii) The analyses have been projected to the end of the period of extended operation; or

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

In addition, 10 CFR 54.21(c)(2) requires applicants to list all plant-specific exemptions that the NRC Commission has granted in accordance with the exemption approval criteria in 10 CFR 50.12, "Specific Exemption," and that are based on a TLAA. For any such exemptions, the applicant must also evaluate and justify the continuation of the exemptions for the period of extended operation.

The staff's guidance recommendations for reviewing LRA Chapter 4.1 sections are given in NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), Section 4.1.

4.1.1 Summary of Technical Information in the Application

4.1.1.1 Identification of TLAAs

LRA Section 4.1 summarizes the methodology that Entergy applied to its CLB in order to identify those analyses that conform to the definition of a TLAA. Entergy provides its list of TLAAs in LRA Table 4.1-1. LRA Table 4.1-2 identifies the generic and plant-specific analyses that do or do not qualify as TLAAs. Entergy evaluates applicable TLAAs in LRA Section 4.2 through Section 4.7. These evaluations provide Entergy's bases for demonstrating that the TLAAs meet the criteria in 10 CFR 54.21(c)(1)(i), (ii), or (iii).

4.1.1.2 Identification of Regulatory Exemptions

Entergy states that it reviewed the RBS CLB as required by 10 CFR 54.21(c)(2) to identify any exemptions for the CLB that are based on a TLAA. Entergy states that it did not identify any exemptions for the CLB that are based on a TLAA.

4.1.2 Staff Evaluation

4.1.2.1 Identification of TLAAs

4.1.2.1.1 <u>Analyses in the Current Licensing Basis Conforming to 10 CFR 54.3 TLAA Criteria</u>

As stated above, in LRA Table 4.1-1, Entergy lists analyses that are TLAAs. The staff verified that each analysis listed in the table is a TLAA by confirming that each analysis meets all six criteria for defining TLAAs in 10 CFR 54.3. Therefore, the staff finds that Entergy's identification of these TLAAs is acceptable because it is in compliance with the requirement in 10 CFR 54.21(c)(1). SER Section 4.2 through Section 4.7 document the staff's evaluations of Entergy's bases for dispositioning and accepting these TLAAs.

4.1.2.1.2 <u>Absence of TLAA Bases Existing Plant Analyses in the CLB That Do Not Conform to the Definition of a TLAA or LRA Statements that a Particular Analysis Referenced in the SRP-LR Report Does Not Exist in the CLB</u>

<u>Concrete Containment Tendon Prestress Analysis</u>. In LRA Table 4.1-1, LRA Table 4.1-2, and LRA Section 4.5, Entergy states that the concrete containment tendon prestress TLAA does not apply to RBS because the RBS containment design does not include prestressed tendons. SRP-LR Section 4.5 states that the TLAA acceptance criteria and associated recommendations are applicable only to concrete containment structures that use prestressed tendons as the containment structure reinforcement basis. The staff reviewed Section 3.8 of Entergy's USAR and confirms that the containment structures at RBS do not use prestressed tendons. Therefore, the staff concludes that the LRA does not need to include a concrete containment prestress TLAA because no such analysis is contained or incorporated by reference in the plant's CLB.

<u>Inservice Local Metal Containment Corrosion Analysis</u>. In LRA Table 4.1-2, Entergy states that the inservice local metal containment corrosion analysis is not applicable because RBS uses a Mark III containment with no specific corrosion TLAA. SRP-LR Table 4.1-2 identifies a local metal containment corrosion analysis as a generic type of TLAA that may be applicable to an applicant's plant design. The staff reviewed Section 3.8 of Entergy's USAR and confirms that

RBS uses a concrete containment design and that USAR Section 3.8 does not reference any localized metal corrosion analyses for the containment structure, other seismic Category 1 structures, or their subcomponents. The staff concludes that the LRA does not need to include an inservice local metal containment corrosion TLAA because no such analysis is contained or incorporated by reference in the plant's CLB.

Analysis for Intergranular Separation in the Heat-Affected Zone of Reactor Vessel Low-Alloy Steel Under Austenitic Stainless Steel Cladding. In LRA Table 4.1-2, Entergy states that a review of the RBS CLB did not reveal an analysis associated with intergranular separation (underclad cracks or cracking) of the reactor pressure vessel. Although SRP-LR Table 4.1-3 indicates that this is a potential plant-specific TLAA, SRP-SLR Table 4.7-1 clarifies that a plant-specific reactor pressure vessel underclad cracking analysis is only applicable to PWR designs. The staff reviewed Entergy's USAR and confirmed that USAR Chapter 1 defines the RBS reactor as a General Electric BWR-6 model. Therefore, an underclad cracking analysis is not applicable to RBS. The staff concludes that the LRA does not need to include an underclad cracking TLAA because such an analysis is not contained or incorporated by reference in the plant's CLB.

Low-Temperature Overpressure Protection Analysis. In LRA Table 4.1-2, Entergy states that low-temperature overpressure analyses are not applicable to BWRs. SRP-LR Table 4.1-3 identifies that the CLB may include a plant-specific, low-temperature overpressure protection (LTOP) analysis that qualifies as a TLAA for Entergy's LRA, however these SRP-LR recommendations are only applicable to low-temperature overpressure protection systems in pressurized-water reactor designs; BWRs do not have low-temperature overpressure protection systems. The staff reviewed Entergy's USAR and confirmed that USAR Chapter 1 defines the RBS reactor as a General Electric BWR-6 model. Therefore, a low-temperature overpressure protection analysis is not applicable to RBS. The staff concludes that the LRA does not need to include a low-temperature overpressure protection TLAA because no such analysis is contained or incorporated by reference in the plant's CLB.

Fatigue Analysis for Main Steam Supply Lines to Auxiliary Feedwater Pumps. In LRA Table 4.1-2, Entergy states that RBS is a BWR that does not have a steam-driven auxiliary feedwater (AFW) pump. SRP-LR Table 4.1-3 identifies that the CLB may include a plant-specific fatigue analysis for the main steam supply lines to the auxiliary feedwater pumps that qualifies as a TLAA for Entergy's LRA. However, the analysis is only applicable to pressurized-water reactor designs with steam-driven auxiliary feedwater pumps; BWRs do not have steam-driven auxiliary feedwater pumps. The staff reviewed Entergy's USAR and confirmed that USAR Chapter 1 defines the RBS reactor as a General Electric BWR-6 model. Therefore, a fatigue analysis for the main steam supply lines to the auxiliary feedwater pumps is not applicable to RBS. The staff concludes that the LRA does not need to include a main steam supply line fatigue TLAA because no such analysis is contained or incorporated by reference in the plant's CLB.

Fatigue Analysis for Reactor Coolant Pump Flywheels. In LRA Table 4.1-2, Entergy states that RBS is a BWR and that the plant's reactor recirculation pumps do not have flywheels. SRP-LR Table 4.1-3 identifies that the CLB may include a plant-specific fatigue analysis of the reactor coolant pump (RCP) flywheels that qualifies as a TLAA for Entergy's LRA. However, that analysis is only applicable to pressurized-water reactor designs that use reactor coolant pump flywheels; BWRs do not have reactor coolant pumps with flywheels. The staff reviewed Entergy's USAR and confirmed that USAR Chapter 1 defines the RBS reactor as a General Electric BWR-6 model. Therefore, a fatigue analysis for the reactor coolant pump flywheels is not applicable to RBS. The staff concludes that the LRA does not need to include a reactor coolant pump flywheel fatigue TLAA because no such analysis is contained or incorporated by reference in the CLB.

Flow-Induced Vibration Endurance Limit Analysis for Reactor Vessel Internals. In LRA Table 4.1-2, Entergy states that flow-induced vibration evaluations for reactor vessel internal components are not based on the current operating term and are therefore not TLAAs. SRP-LR Table 4.1-3 identifies that the CLB may include a plant-specific flow-induced vibration analysis for the reactor vessel internal components that qualifies as a TLAA for Entergy's LRA. USAR Section 3.9.2.4B describes the preoperational and startup flow-induced vibration tests that Entergy uses to comply with NRC guidance in Regulatory Guide 1.20, "Comprehensive Vibration Assessment Program for Reactor Internals During Preoperational and Initial Startup Testing." USAR Section 15.0.8.3 and USAR Appendix 15B indicate that Entergy conducted the vibration tests for a single fuel cycle. Therefore the staff concludes that the LRA does not need to include or evaluate a flow-induced vibration endurance limit TLAA because the flow-induced vibration evaluations are not based on time-limited assumptions that are defined by the current 40-year operating term; thus the analysis does not meet criterion 3 of the 10 CFR 54.3(a) definition of a TLAA, "Involve time-limited assumptions defined by the current operating term, for example, 40 years."

Leak-Before-Break Analysis. In LRA Table 4.1-2, Entergy states that RBS does not credit leak-before-break (LBB). SRP-LR Table 4.1-3 identifies that the CLB may include a plant-specific, leak-before-break analysis for the reactor coolant pressure boundary (RCPB) that qualifies as a TLAA for Entergy's LRA; however, the SRP-LR recommendations are only applicable to leak-before-break analyses that were requested and approved by the staff to meet dynamic effect analysis relaxation requirements in 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 4, "Dynamic Effects." The staff notes that the relevant SRP-LR guidance is not applicable to BWR designs because the staff has not approved any leak-before-break analysis methodologies for analogous high-energy piping in BWR reactor coolant pressure boundary designs. The staff reviewed Entergy's USAR and confirms that Entergy's design basis does not include or make reference to a leak-before-break analysis requested and approved for relaxation from the dynamic effect analysis requirements in 10 CFR Part 50, Appendix A, GDC 4. Therefore, the staff concludes that the LRA does not need to include a leak-before-break TLAA because no such analysis is contained or incorporated by reference in the plant's CLB.

Entergy addresses its basis for complying with GDC 4 as part of the high-energy line break (HELB) TLAA, discussed in LRA Section 4.7.2. The staff's evaluation of Entergy's disposition of the high-energy line break TLAA is documented in SER Section 4.7.2.

Metal Corrosion Allowance Analysis. In LRA Table 4.1-2, Entergy states that the current licensing basis does not include any time-dependent metal corrosion allowance evaluations for metallic components that would need to be identified as TLAAs for the LRA. SRP-LR Table 4.1-3 identifies that the current licensing basis may include plant-specific metal component corrosion allowance analyses that qualify as TLAAs for Entergy's LRA.

The staff reviewed the USAR for relevancy to Entergy's "absence of a TLAA" basis. The staff notes that the USAR identifies corrosion allowances added for several systems, structures, and components, including the safety relief valves, components exposed to reactor coolant, main steam isolation valves, engineered safety features construction materials, normal and standby service water systems, turbine plant component cooling water, service water cooling system, diesel generator fuel oil storage tanks, condenser tubes, and holdup line. The staff notes that the USAR does not indicate that the additional metal, which was included by these corrosion allowances, was included in the designs as a result of any time-dependent analyses. Instead, the staff confirmed that Entergy included the additional corrosion allowances based on conformance with applicable non-time-dependent code provisions in the ASME Section III Code of record for the facility and not based on any analyses that are required to be a TLAA for the facility. Therefore, the staff concludes that the LRA does not need to include any corrosion allowance TLAAs because no such analyses are contained or incorporated by reference in the plant's CLB.

Inservice Flaw Growth Analyses that Demonstrate Structure Stability for 40 Years. In LRA Table 4.1-2, Entergy states that the CLB does not contain an ASME Section XI flaw growth analysis that demonstrates structure stability for 40 years. SRP-LR Table 4.1-3 identifies that the CLB may include plant-specific fatigue flaw growth or time-dependent flaw tolerance analyses that qualify as TLAAs for Entergy's LRA. These analyses may be identified by inservice (ISI) inspection findings. The staff reviewed Entergy's USAR and verified that the CLB does not include this type of analysis. Therefore the staff finds that the LRA does not need to include or evaluate a TLAA for an inservice flaw growth analysis that demonstrates structure stability because no such analysis is contained or incorporated by reference in the plant's CLB.

Analysis for Loss of Preload for Core Plate Rim Hold-Down Bolts. Entergy addresses this item in LRA Appendix C. The staff evaluates it in SER Section 3.0.3.2.3, "BWR Vessel Internals," under BWRVIP-25, Revision 1. The staff verified that, since RBS is a BWR/6 with core plate wedges, evaluation of preload on the core plate bolts is not required. Therefore, there is no associated TLAA for RBS.

Analysis for Susceptibility to Irradiation-Assisted Stress Corrosion Cracking (IASCC). Entergy addresses this item in LRA Appendix C. The applicant stated that the neutron fluence for the top guide assembly is projected to exceed the fluence threshold for initiating IASCC prior to the end of the period of extended operation. Based on this statement, the staff finds that the evaluation of fluence in the top guide assembly does not involve a TLAA because it does not: (a) involve time-dependent assumptions defined by the current operating term, or (b) conform to Criterion 3 in 10 CFR 54.3(a). Instead, the staff noted that the applicant will rely on the augmented inspections of the BWR Vessel Internals Program and the BWRVIP-26-A and BWRVIP-183 methodologies to manage IASCC in the top guide assembly. The staff evaluates this AMP in SER Section 3.0.3.2.3, "BWR Vessel Internals," under BWRVIP-26-A.

Other Potential Plant-Specific TLAAs Not Addressed in the LRA. The staff reviewed Section 4.1 of the SRP-LR as well as in Entergy's USAR to determine whether the LRA would need to include any additional TLAAs. The staff did not identify any potentially applicable plant-specific TLAAs that were not already included in the LRA.

4.1.2.2 Identification of Exemptions

The staff performed a search of the current operating license, Entergy's USAR, and the NRC staff's Agencywide Documents Access and Management System (ADAMS) database to identify any exemptions for RBS that are based on a TLAA. The staff identified the following exemptions to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," requirements:

- 10 CFR 50.54(w)(5)(i) schedular exemption from the requirements of the property insurance rule

- 10 CFR 50.60(a); 10 CFR Part 50, Appendix G, “Fracture Toughness Requirements”; and 10 CFR Part 50, Appendix H, “Reactor Vessel Material Surveillance Program Requirements,” alternative metric for determining (pressure/temperature) P/T limits

- 10 CFR Part 50, Appendix A, “General Design Criteria for Nuclear Power Plants,” schedular exemption for fuel loading for preoperational and startup testing

- 10 CFR Part 50, Appendix J, “Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors,” schedular exemption for leak testing of isolation valves

- 10 CFR Part 50, Appendix J exemption to the definition of P_a for containment leak testing

The staff finds that none of the exemptions listed above were based on the results of a TLAA. Some of the above exemptions permitted the use of alternative implementation schedules from those in the applicable regulations, while others permitted the use of licensee-proposed alternatives to regulations that were not based on time-dependent relationships. Therefore, the CLB does not include any exemptions that were granted under the criteria of 10 CFR 50.12 and are based on a TLAA. Based on this review, the staff finds that Entergy has provided a valid basis for concluding that the LRA does not need to identify or evaluate any exemptions in accordance with the criteria specified in 10 CFR 54.21(c)(2).

Conclusion

On the basis of its review, the staff concludes that Entergy has provided an acceptable list of TLAAs, as defined in 10 CFR 54.3(a). The staff also concludes that Entergy has complied with the requirements in 10 CFR 54.21(c)(2) and that there are not any exemptions in the CLB that are based on a TLAA.

4.2 Reactor Vessel Neutron Embrittlement

4.2.1 Reactor Vessel Fluence

4.2.1.1 Summary of Technical Information in the Application

LRA Section 4.2.1 describes Entergy’s TLAA for the neutron fluence evaluations of the reactor pressure vessel (RPV), as supplemented by Entergy’s letter of March 26, 2018 (ADAMS Accession No. ML18087A188). Entergy dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii).

In its March 26, 2018, letter, Entergy supplemented LRA Section 4.2.1 and amended the component-specific neutron fluence values reported in LRA Section 4.2 and LRA Section 4.7.3. The letter also provided Entergy’s responses to two NRC requests for additional information (RAIs), RAI 4.2.1-1 and RAI. 4.7.3-1.

4.2.1.2 Staff Evaluation

The staff reviewed Entergy's neutron fluence TLAA in accordance with NUREG-1800, Revision 2 (SRP-LR), Section 4.7.2.1 and Section 4.7.3.1.2.

The reactor pressure vessel component-specific neutron fluence values provided in amended LRA Table 4.2-1 are based on fluence projections through 54 effective full-power years (EFPY) of plant operations. The staff noted that this is consistent with the design basis in USAR Section 5.3.1.6.3 because the design basis assumes a 90% capacity factor for full-power operations of the reactor.

However, the staff notes that information related to fluence contained in the USAR is based on the methodology in MPM Technologies Proprietary Report No. MPM-904779, whereas the information related to fluence in the LRA is based on the methodology in proprietary General Electric-Hitachi Company (GEH) Report No. NEDC-32983P-A, Revision 2. As a result, the staff needed additional information, and therefore issued a request for additional information RAI 4.2.1-1 (ADAMS Accession No. ML18043A008) on February 8, 2018. In this RAI, the staff requested that Entergy clarify how it qualified the referenced GE-Hitachi methodology and how the methodology is consistent with criteria in Regulatory Guide (RG) 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," March 2001. Entergy's response to RAI 4.2.1-1, dated March 26, 2018, is documented in ADAMS Accession No. ML18087A188.

In its response to RAI 4.2.1-1, Entergy provided supporting proprietary information to justify that the methodology in GEH Report No. NEDC-32983P-A, Revision 2, is an acceptable basis for projecting the reactor pressure vessel neutron fluence values to 54 effective full-power years and for reporting them in LRA Section 4.2. Entergy's response also clarified that the neutron fluence model for RBS extends beyond the axial boundary for the core depicted in Figure 2-2 of the GE-Hitachi report (i.e., past the region where the calculational results remain valid for the method used).

The staff notes that Entergy's RAI response provided additional proprietary core design conservatisms that justify the neutron fluence values reported for the reactor pressure vessel, especially for components located at axial elevations outside of those depicted in Figure 2-2 of the GE-Hitachi report. Specifically, Entergy explains that its methodology accounts for potential uncertainties in the above-core water densities that can potentially impact the fluence analysis results. Entergy also explains that it used the NRC staff-approved, proprietary thermal-hydraulic code TRACG and a bounding reactor coolant density to establish the reactor coolant water density distribution for internal reactor pressure vessel regions above the reactor core.[4] Entergy applied the most limiting high-power and low-flow statepoint assumed to occur during the period of extended operation. This leads to a higher steam voiding coefficient in the reactor analysis and consequently to higher projected neutron fluence values. The staff finds that these conservatisms support the validity of the neutron fluence values reported for the reactor pressure vessel. Therefore, the staff finds Entergy's response in RAI 4.2.1-1 to be acceptable

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[4] The staff approved the proprietary General Electric-Hitachi report containing the TRACG code (GEH Report No. NEDE-33147P-A) in the staff's proprietary safety evaluation dated March 26, 2007 (ADAMS Accession No. ML070810296). The nonproprietary version of the report is available at ADAMS Accession No. ML073130046. The NRC staff's nonproprietary version of the safety evaluation is available at ADAMS Accession No. ML070810308.

because Entergy has provided sufficient conservatisms to justify the fluence values it had proposed and reported in the LRA. RAI 4.2.1-1 is resolved.

The staff finds Entergy has demonstrated that it projected the TLAA on neutron fluence to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii). Additionally, the TLAA meets the NRC acceptance criteria in SRP-LR Section 4.7.2.1 because Entergy used an acceptable neutron fluence methodology to project the reactor pressure vessel component-specific neutron fluence values to the end of the period of extended operation. This provides an adequate basis for demonstrating acceptance of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii).

By letter dated August 13, 2018 (ADAMS Accession No. ML18225A315), the applicant identified an error in the fluence calculation methodology used at the plant for their neutron fluence calculations. The applicant stated that the error was caused by a numerical transposition which caused a 0.72 EFPY error in the cumulative elapsed time for operating cycles 10 and 11 in the analysis. The applicant also stated that the neutron fluence values reported for 54 EFPY in the LRA and amended in the letter of March 26, 2018 (ADAMS Accession No. ML18087A188), included a margin for future operating cycles that ensures the reported values in the March 2018 letter are conservative.

On August 6, 2018 the NRC staff and Entergy conducted a telephone conference call to discuss the identified an error in the fluence calculation methodology (ADAMS Accession No. ML18225A215). The staff verified that the RPV neutron fluence values reported for 54 EPFY in ML18087A188 include the margin referenced in the applicant's letter of August 13, 2018, and the neutron fluence values reported in the applicant's March 2018 letter are valid and bounding estimates for 54 EFPY. Therefore, the staff finds that the RPV neutron fluence values reported for 54 EPFY in the letter of March 26, 2018, remain bounding for the RPV neutron fluence TLAA in LRA Section 4.2.1, the remaining RPV neutron embrittlement TLAAs in LRA Sections 4.2.2 – 4.2.7, and the reactor vessel internals TLAA in 4.7.3.2. The staff also finds that the applicant has taken appropriate actions to address this matter and no changes to the LRA or the applicant's March 2018 letter are necessary.

Based on this review, the neutron fluence values used to evaluate the TLAAs in amended LRA Sections 4.2 and 4.7.3 are acceptable.

4.2.1.3 Updated Safety Analysis Report Supplement

LRA Section A.2.1.1 provides the USAR supplement summarizing the TLAA on neutron fluence. The staff reviewed LRA Section A.2.1.1 consistent with the NRC staff's recommended review procedures in SRP-LR Section 4.7.3.2. The staff notes that the USAR supplement provides an adequate description of the TLAA on neutron fluence and the basis for dispositioning this TLAA in accordance with 10 CFR 54.21(c)(1)(ii).

The staff reviewed Entergy's USAR supplement and finds it meets the acceptance criteria in SRP-LR Section 4.7.2.2, and is therefore acceptable. Additionally, the staff finds that Entergy provided an adequate summary description of its actions to address, evaluate, and disposition the TLAA on reactor vessel fluence, as required by 10 CFR 54.21(d).

4.2.1.4 Conclusion

On the basis of its review, the staff concludes that Entergy has demonstrated that it projected the TLAA on neutron fluence to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii). The staff also concludes that the USAR supplement contains an appropriate summary description of Entergy's TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.2 Adjusted Reference Temperature

4.2.2.1 Summary of Technical Information in the Application

LRA Section 4.2.2 describes Entergy's TLAA for the adjusted reference temperature (ART) evaluations. The LRA states that although the TLAA for adjusted reference temperature has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii), it will be formally completed as part of the established process for generation of updated pressure and thermal (P-T) operating limits under the Reactor Vessel Surveillance Program, as described in LRA Section B.1.37.

4.2.2.2 Staff Evaluation

Following the NRC staff's review procedures in SRP-LR Section 4.7.3.1.2, the staff reviewed Entergy's TLAA for the adjusted reference temperature evaluation, including the 10 CFR 54.21(c)(1)(ii) requirement to project the analyses to the end of the period of extended operation.

The staff reviewed LRA Section 4.2.2 and LRA Table 4.2-2, which describe the 54 effective full-power years-adjusted reference temperature values of the reactor vessel beltline materials and other related data (e.g., material chemistry, chemistry factor, 54 effective full-power years fluence, initial RT_{NDT}, and ΔRT_{NDT}). The LRA states that the adjusted reference temperature values were calculated in accordance with RG 1.99, Revision 2 and used the fluence values that were determined with an NRC-approved method that complies with RG 1.190.

In its review, the staff needed additional information, and therefore issued a request for additional information RAI 4.2.1-1 (ADAMS Accession No. ML18043A008) on February 8, 2018. Entergy's nonproprietary version of its response, dated March 26, 2018, is documented in ADAMS Accession No. ML18087A188.

As part of its response to RAI 4.2.1-1, Entergy revised the LRA to provide corrected fluence values in amended LRA Table 4.2-2. These revised fluence values were a result of correcting an error in the implementation of the fluence methodology. The staff notes that the revised fluence results were not significantly different from the previous result values. The staff finds Entergy's response and corresponding changes to the TLAA and applicable tables acceptable because the revised values are based on corrected implementation of the fluence methodology.

As part of its review, the staff verified that the values in amended LRA Table 4.2.2 for beltline materials, (e.g., initial RT_{NDT}, copper content, nickel content, chemistry factors) were either consistent with other licensee-supplied documents including certified materials test reports (CMTRs) and GEH Proprietary Report 003N8442, Revision 0 or were calculated in accordance with methods acceptable to the NRC and described in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Branch Technical Position 5-3

(ADAMS Accession No. ML070850035).

The staff used the guidance in RG 1.99, Revision 2, to perform confirmatory calculations to evaluate the adequacy of the adjusted reference temperature values projected to the end of the period of extended operation for these beltline materials. Based on its review of the applicant's data, calculational methods, and calculation results, the NRC staff finds that the applicant has acceptably projected the adjusted reference temperature values of the reactor vessel beltline and extended beltline materials to 54 EFPY.

The staff finds Entergy has demonstrated that it projected the TLAA for the adjusted reference temperature evaluation to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii). Staff finds that the TLAA meets the acceptance criteria in SRP-LR Section 4.7.2.1 because Entergy's analysis adequately evaluates the effects of neutron irradiation embrittlement associated with the adjusted reference temperature, in accordance with RG 1.99, Revision 2, for the period of extended operation.

4.2.2.3 Updated Safety Analysis Report Supplement

LRA Section A.2.1.2 provides the USAR supplement summarizing the TLAA for the adjusted reference temperature evaluation. The staff reviewed LRA Section A.2.1.2 following the NRC staff's review procedures in SRP-LR Section 4.7.3.2.

The staff reviewed the USAR supplement and finds it meets the acceptance criteria in SRP-LR Section 4.7.2.2, and is therefore acceptable. Additionally, the staff determined that Entergy has provided an adequate summary description of its actions to address TLAA for the adjusted reference temperature evaluation, as required by 10 CFR 54.21(d).

4.2.2.4 Conclusion

On the basis of its review, the staff concludes that Entergy has provided an acceptable demonstration, pursuant 10 CFR 54.21(c)(1)(ii), that the TLAA for the adjusted reference temperature evaluation has been projected to the end of the period of extended operation.

The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.3 Pressure-Temperature Limits

4.2.3.1 Summary of Technical Information in the Application

LRA Section 4.2.3 describes Entergy's TLAA for pressure-temperature (P-T) limit evaluations. Entergy dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that it will adequately manage the effects associated with the P-T limits through the period of extended operation. The LRA states that Entergy will maintain and update the P-T limit analyses as necessary, consistent with 10 CFR Part 50 regulations and in conjunction with the Reactor Vessel Surveillance program described in LRA Section B.1.37.

4.2.3.2 Staff Evaluation

The staff reviewed Entergy's TLAA for the P-T limits and the corresponding disposition of 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.2.3.1.3.3.

The staff reviewed Entergy's CLB and confirmed that Entergy controls updates of its P-T limits through updates of the limiting conditions of operations (LCOs) in the plant technical specifications in accordance with the 10 CFR Part 50.90, "Amendment of License or Construction Permit at Request of Holder," license amendment process.

The staff finds that Entergy has demonstrated that it will adequately manage the aging effects associated with the TLAA on P-T limits for the period of extended operation (as required by 10 CFR 54.21(c)(1)(iii)). The TLAA on P-T limits meets the NRC staff's acceptance criteria in SRP-LR Section 4.2.2.1.3.3 because: (a) Entergy will update its P-T limits prior to the expiration of the current 32 effective full power year P-T limits located in its technical specifications, and (b) Entergy will update its P-T limit curves as needed for the period of extended operation in accordance with Entergy's regulatory process for submitting 10 CFR 50.90 license amendment requests.

4.2.3.3 Updated Safety Analysis Report Supplement

LRA Section A.2.1.3 provides the USAR supplement summarizing the TLAA for P-T limits. The staff reviewed LRA Section A.2.1.3 consistent with the review procedures in SRP-LR Section 4.2.3.2.

Based on its review, the staff finds the USAR supplement meets the acceptance criteria in SRP-LR Section 4.2.2.2 and is therefore acceptable. Additionally, the staff determined that the USAR supplement provides an adequate summary description of Entergy's actions to address the TLAA for P-T limits, as required by 10 CFR 54.21(d).

4.2.3.4 Conclusion

On the basis of its review, the staff concludes that Entergy has demonstrated that it will adequately manage the aging effects associated with the TLAA on P-T limits for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.4 Upper Shelf Energy

4.2.4.1 Summary of Technical Information in the Application

LRA Section 4.2.4 describes Entergy's TLAA for upper shelf energy (USE) evaluations for the reactor vessel beltline materials. Entergy dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii) to demonstrate that it has projected the analysis to the end of the period of extended operation.

4.2.4.2 Staff Evaluation

Following the NRC staff's review procedures in SRP-LR Section 4.2.3.1.1.2, the staff reviewed Entergy's TLAA for upper shelf energy and its corresponding disposition of 10 CFR 54.21(c)(1)(ii).

Appendix G of 10 CFR Part 50 contains the acceptance criteria that establish limits on the minimum upper shelf energy values for the reactor vessel materials subject to neutron irradiation embrittlement. The regulation requires that the value of upper shelf energy be greater than 50 ft-lbs in the irradiated condition throughout the licensed life. Appendix G of 10 CFR Part 50 provides that upper shelf energy values that are less than 50 ft-lbs may be acceptable if Entergy can demonstrate that these lower values will provide margins of safety against brittle fracture, which are equivalent to those required by ASME Code Section XI, Appendix G.

The predicted decrease in upper shelf energy values due to neutron embrittlement during plant operation is dependent upon the type of material (weld or base plate), the amount of copper in the material, and the predicted neutron fluence for the material, as described in RG 1.99, Revision 2. This guide also addresses two acceptable approaches to project the upper shelf energy values for ferritic steels. In accordance with RG 1.99, Revision 2, Regulatory Position 1.2, Entergy may use the curves of percent decrease in upper shelf energy as a function of the material type, copper content, and neutron fluence, which are provided in Figure 2 of RG 1.99, Revision 2 (in the absence of credible reactor vessel surveillance data). Alternatively, Entergy may determine the percent decrease in upper shelf energy based on the reactor vessel surveillance data if credible surveillance data are available, in accordance with Regulatory Position 2.2.

In LRA Table 4.2-3, Entergy indicates that plate Heat No. C3054-2 and weld Heat No. 5P6756/Linde 124/0342 are the only materials for which surveillance test data is available, and Entergy used these data to determine their upper shelf energy values for RPV components made from these heats of material.

In its review, the staff used the guidance in RG 1.99, Revision 2 to confirm the adequacy of the upper shelf energy values projected at the end of the period of extended operation. The staff finds that Entergy adequately projected 54 effective full-power year, upper shelf energy values at 1/4T. The staff also finds that the projected upper shelf energy values are greater than 50 ft-lbs in compliance with Appendix G to 10 CFR Part 50, with the exception of the materials identified by Entergy and evaluated in this section.

Due to a lack of information concerning the unirradiated upper shelf energy of Shell Plate #1 (Heats C2904-1 and C28979-1), the applicant based the upper shelf energy values for this plate on 50% shear results and reduced the upper shelf energy value by 10% to provide conservative results. When calculated in this manner and projected to 54 EFPY, upper shelf energy values for the heats of interest are 48.3 and 48.1 ft-lb, respectively. Due to the fact that these values do not meet the 50 ft-lb acceptance criteria contained in 10 CFR Part 50, Appendix G, Entergy performed an equivalent margins analysis (EMA) in accordance with BWRVIP-74-A, "BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal" and RG 1.99, Revision 2. Amended LRA Table 4.2-4 provides the result of the EMA performed for the Shell Plate #1 materials. Based on the limiting copper content (Heat C2879-1), the EMA indicates the upper shelf energy decrease is 19% for the plate at 54 effective full-power years. The maximum permitted reduction for the limiting BWR/3-6 plates per BWRVIP-74-A is 23.5%. The NRC staff reviewed the EMA and determined that it was performed in accordance with NRC-accepted methods and that the results were within the NRC-accepted acceptance criteria contained in BWRVIP-74-A. As a result, the NRC staff finds that the Entergy's projections of upper shelf energy are acceptable and that Entergy has demonstrated that it will maintain adequate protection for ductile failure through the period of extended operation, in accordance with 10 CFR Part 50, Appendix G.

Amended LRA Table 4.2-4 also provides the results to address Renewal Applicant Action Item 10 from the staff's safety evaluation for BWRVIP-74-A, which requires the applicant to demonstrate that the percent reduction in Charpy USE for their beltline materials are less than those specified for the limiting BWR/3-6 plate. The EMA discussion above describes the applicant's evaluation to address this action item for Shell Plate #1. Also, LRA Table 4.2-4 states that the percent reduction in the Charpy upper shelf energy for the surveillance plate (integrated surveillance program surveillance plate Heat C3054-2) was -5.6%, since the upper shelf energy actually increased after irradiation. The projected percent reduction using the methodology in RG 1.99, Revision 2, was determined to be 10.2%. Since this measured percent reduction is less than the projected value for both the beltline materials and surveillance plate, the staff finds that Entergy has adequately addressed Renewal Applicant Action Item 10.

The staff finds that Entergy has projected the TLAA for upper shelf energy to the end of the period of extended operation the TLAA for upper shelf energy, as required by 10 CFR 54.21(c)(1)(ii). Additionally, the TLAA meets the acceptance criteria in SRP-LR Section 4.2.2.1.1.2 because: 1) Entergy used RG 1.99, Revision 2, to project the upper shelf energy to the end of the period of extended operation, 2) Entergy performed the EMA methods for Shell Plate #1 materials that are projected to be less than 50 ft-lbs at 60 years of operation, 3) the upper shelf energy and EMA evaluations meet the requirements of the staff-approved criteria in BWRVIP-74-A, 4) the neutron fluence at the 1/4T locations was identified for each beltline material at the end of the period of extended operation, 5) the staff-approved methodology used to determine neutron fluence adheres to RG 1.190, 6) the beltline materials were evaluated in accordance with Renewal Applicant Action Item 10 in the staff's SER for BWRVIP-74-A, and 7) the staff has determined that Entergy's projected USE values or EMA results are in compliance with the requirements for USE or EMA analyses specified in 10 CFR Part 50, Appendix G.

4.2.4.3 Updated Safety Analysis Report Supplement

LRA Section A.2.1.4 provides the USAR supplement summarizing the TLAA for upper shelf energy. The staff reviewed LRA Section A.2.1.4 using the NRC review procedures in SRP-LR Section 4.2.3.2.

Based on its review, the staff finds the USAR supplement meets the NRC staff's acceptance criteria in SRP-LR Section 4.2.2.2, and is therefore acceptable. Additionally, the staff determines that Entergy has provided an adequate summary description of its actions to address the TLAA for upper shelf energy, as required by 10 CFR 54.21(d).

4.2.4.4 Conclusion

On the basis of its review, the staff concludes that Entergy has demonstrated that it projected the TLAA for upper shelf energy to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii).

The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.5 Reactor Vessel Circumferential Weld Inspection Relief

4.2.5.1 Summary of Technical Information in the Application

LRA Section 4.2.5, as amended in Entergy's letter of March 26, 2018 (ADAMS Accession No. ML18087A188), describes Entergy's TLAA for the reactor vessel circumferential weld inspection relief analysis. Entergy dispositioned the TLAA for the reactor pressure vessel (RPV) circumferential weld components in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of loss of fracture toughness due to neutron irradiation embrittlement on the intended functions will be adequately managed. Entergy stated that circumferential weld inspection relief, if necessary for the period of extended operation, will be requested through implementation of the regulatory process for submitting inservice inspection relief requests in accordance with 10 CFR 50.55a(z), “Alternatives to Codes and Standards Requirements.”

4.2.5.2 Staff Evaluation

The staff reviewed Entergy’s TLAA for the reactor pressure vessel circumferential welds and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the NRC staff’s acceptance criteria in SRP-LR Section 4.2.2.1.4.1 and review procedures in SRP-LR Section 4.2.3.1.4. These NRC criteria establish the staff’s position that if a BWR applicant indicates that it will use the relief request process in 10 CFR 50.55a(z) to resubmit a BWRVIP-05-based relief request for the reactor pressure vessel circumferential welds during the period of extended operation, the process forms an acceptable basis for dispositioning the TLAA in accordance with 10 CFR 54.21(c)(1)(iii).

The methodology for dispositioning this type of TLAA is based on the probability of failure (PoF) and mean RT_{NDT} analysis methods for BWR pressure vessel circumferential welds, as defined in Electric Power Research Institute (EPRI) technical report (TR) 105697, “BWR Vessel and Internals Project [BWRVIP], BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations (BWRVIP-05).” The methodology compares the mean RT_{NDT} values for the components to the corresponding EPRI-established and staff-approved values for these types of assessments, as given in the BWRVIP-05 report and approved in the staff’s safety evaluation (SE) on the BWRVIP-05 methodology dated July 28, 1998 (NRC Legacy Library Microfiche Accession No. 9806030081). The calculations and analysis results addressed in this TLAA form the basis for requesting 10 CFR 50.55a, “Codes and Standards,” reliefs from the performance of the ASME Code Section XI inservice inspection (ISI) volumetric examination requirements that would otherwise apply to the circumferential welds during scheduled 10-year inservice inspection intervals.

The staff notes that Chicago, Bridge and Iron Works Company fabricated the reactor pressure vessel at RBS. In LRA Table 4.2-5, as amended by Entergy’s letter of March 26, 2018, Entergy provides its updated mean RT_{NDT} values for reactor pressure vessel circumferential weld AB and weld AC at 54 effective full-power years. The staff performed independent calculations of the mean RT_{NDT} values for these welds and verified that the mean RT_{NDT} values cited in amended LRA Table 4.2-5 for the welds at 54 effective full-power years (i.e., -20 ºF and -7.2 ºF, are valid and less than the limiting mean RT_{NDT} value of 70.6 ºF cited for Chicago, Bridge and Iron Works Company-designed reactor pressure vessel circumferential welds in the staff’s safety evaluation for the BWRVIP-05 report. The staff also notes that the mean RT_{NDT} values in LRA Table 4.2-5 for reactor pressure vessel circumferential weld AB and weld AC support Entergy’s basis for dispositioning this TLAA in accordance with 10 CFR 54.21(c)(1)(iii), where Entergy may use its regulatory option (under the requirements in 10 CFR 50.55a(z)) to submit a BWRVIP-05-based inservice inspection alternative for the reactor pressure vessel circumferential welds during the period of extended operation at RBS.

Based on this review, the staff finds that Entergy has demonstrated it will adequately manage the effects of cracking and loss of fracture toughness due to neutron irradiation embrittlement on the intended functions of the reactor pressure vessel circumferential welds for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). Additionally, the TLAA meets the acceptance criteria in SRP-LR Section 4.2.2.1.4.1 because if inservice inspection relief is desired for the period of extended operation, Entergy will use its 10 CFR 50.55a(z) relief request process to submit and request staff approval of an ASME Section XI ISI alternative for the reactor pressure vessel circumferential welds.

4.2.5.3 Updated Safety Analysis Report Supplement

LRA Section A.2.1.5 provides the USAR supplement summarizing the TLAA for the reactor vessel circumferential weld inspection relief. The staff reviewed LRA Section A.2.1.5 consistent with the acceptance criteria in SRP-LR Section 4.2.2.2 and the review procedures in SRP-LR Section 4.2.3.2. The staff notes Entergy's USAR supplement summary description provided in LRA Section A.2.1.5 is consistent with NRC staff's SRP-LR Table 4.2-1 guidance for these types of TLAAs.

Based on its review, the staff finds the USAR supplement meets the acceptance criteria in SRP-LR Section 4.2.2.2, and is therefore acceptable. Additionally, the staff determines that Entergy has provided an adequate summary description of its actions to address the TLAA for the reactor vessel circumferential weld inspection relief as required by 10 CFR 54.21(d).

4.2.5.4 Conclusion

On the basis of its review, the staff concludes that Entergy has demonstrated it will adequately manage the effects of cracking and loss of fracture toughness due to neutron irradiation embrittlement on the intended functions of the reactor pressure vessel circumferential welds through Entergy's implementation of the 10 CFR 50.55a(z) relief request process during the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.6 Reactor Vessel Axial Weld Failure Probability

4.2.6.1 Summary of Technical Information in the Application

LRA Section 4.2.6, as amended in Entergy's letter dated March 26, 2018 (ADAMS Accession No. ML18087A188), describes Entergy's TLAA for the reactor pressure vessel axial weld failure probability analysis. Entergy dispositioned the TLAA for the reactor pressure vessel axial weld components in accordance with 10 CFR 54.21(c)(1)(ii) to demonstrate that it projected the analysis to the end of the period of extended operation. Entergy provided the specific input values and calculations in LRA Table 4.2-6, which include the mean RT_{NDT} calculations for the reactor pressure vessel axial welds in reactor pressure vessel Shells 1, 2, and 3 (i.e., in the reactor pressure vessel lower, lower-intermediate, and upper-intermediate shells) through 54 EFPY.

4.2.6.2 Staff Evaluation

The staff reviewed Entergy's TLAA for the reactor pressure vessel axial weld components and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the acceptance criteria in SRP-LR Section 4.2.2.1.5 and the review procedures in SRP-LR Section 4.2.3.1.5. The Staff also supplemented the above guidance with the general review procedures in SRP-LR Section 4.7.3.1.2 for dispositioning TLAAs in accordance with 10 CFR 54.21(c)(1)(ii).

The methodology for these types of TLAAs is based on and applies the probability of failure (PoF) and mean RT_{NDT} analysis methods for BWR pressure vessel (RPV) axial welds, as defined in Electric Power Research Institute (EPRI) proprietary report technical report-105697, “BWR Vessel and Internals Project [BWRVIP], BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations (BWRVIP-05).” The methodology compares the mean RT_{NDT} values for the reactor pressure vessel axial weld components to the staff-approved limiting RT_{NDT} values in the staff’s updated safety evaluation on the methodology, as issued by letter dated March 7, 2000 (ADAMS ML031430372). Applicants of BWRs that meet these mean RT_{NDT} assessment criteria may conclude that the probability of failure values for the reactor pressure vessel axial welds will be less than the probability of failure value established for the component analysis in the BWRVIP-05 report (i.e., less than a probability of failure of 5×10^{-6} per reactor-year).

The staff notes that Chicago, Bridge and Iron-Works Company fabricated the reactor pressure vessel at RBS. Amended LRA Table 4.2-6 provides Entergy’s updated mean RT_{NDT} values for the reactor pressure vessel beltline axial welds (including those in reactor pressure vessel Shells 1, 2, and 3) at 54 EPFY. Entergy calculated these values using the analysis methods in Regulatory Guide (RG) 1.99, Revision 2, as modified by the staff-approved basis in BWRVIP-05 that eliminates the inclusion of a margin term in the mean RT_{NDT} calculations for the components. The staff notes that Entergy appropriately projected the mean RT_{NDT} values to the end of the period of extended operation.

During its review, the staff needed additional information and, therefore, issued a request for additional information RAI 4.2.6-1 (ADAMS Accession No. ML18043A008), on February 8, 2018. Entergy’s response, dated March 26, 2018, is documented in ADAMS Accession No. ML18087A188.

In its response to RAI 4.2.6-1, Entergy amended the mean RT_{NDT} calculation reported in LRA Table 4.2-6 for the limiting reactor pressure vessel axial welds (i.e., for the mean RT_{NDT} calculations of the axial welds in reactor pressure vessel Shell 2) based on the use of applicable reactor pressure vessel surveillance data for weld heat No. 5P6756 from the integrated surveillance program and an updated limiting inside surface neutron fluence of 8.34×10^{18} n/cm^2 (E is > 1.0 MeV) for the components at 54 effective full-power years. Entergy also amended the reported copper and nickel alloying contents for the weld heat to be 0.08 weight percent and 0.94 weight percent, respectively. Based on these changes, Entergy calculated an updated mean RT_{NDT} value for the Shell 2 axial welds of 96.2 ºF at 54 effective full-power years.

The staff verified the accuracy of Entergy’s mean RT_{NDT} calculations for reactor pressure vessel Shell 1, Shell 2, and Shell 3 axial weld components through independent mean RT_{NDT} value calculations of the components. The staff determines that the amended calculations continue to demonstrate that the mean RT_{NDT} values for the reactor pressure vessel axial welds at 54 effective full-power years will remain bounded by the limiting mean RT_{NDT} value of 114 ºF that was established and approved for the limiting Chicago, Bridge and Iron-Works Company fabricated reactor pressure vessel axial weld in the staff’s safety evaluation for the BWRVIP-05 report. Therefore, staff finds Entergy’s response and amendment of the mean RT_{NDT} calculations in LRA Table 4.2-6 acceptable because Entergy has adequately projected the mean RT_{NDT} values for the reactor pressure vessel axial welds to the end of the period of extended operation (i.e., to 54 effective full-power years) and has demonstrated that the projected mean RT_{NDT} values for the weld will remain bounded by the mean RT_{NDT} acceptance limit of 114 ºF. This resolves the issue raised in RAI 4.2.6-1.

Therefore, based on this review, the staff finds that Entergy has demonstrated that it projected to the end of the period of extended operation (i.e., to 54 effective full-power years) the mean RT_{NDT} calculations for the reactor pressure vessel beltline axial welds in the TLAA, as required by 10 CFR 54.21(c)(1)(ii). Additionally, the TLAA meets the acceptance criteria in SRP-LR Section 4.2.2.1.5 for the following reasons: (a) Entergy has projected the mean RT_{NDT} values for the axial welds in the lower, lower-intermediate, and upper-intermediate shells of the reactor pressure vessel to the end of the period of extended operation (i.e. to 54 EFPY), (b) Entergy has appropriately incorporated the credible reactor pressure vessel surveillance data available for Weld Heat No. 5P6756 into Entergy's mean RT_{NDT} calculation for the reactor pressure vessel lower-intermediate shell axial welds, and (c) Entergy has demonstrated that the projected mean RT_{NDT} values for all reactor pressure vessel beltline axial welds are within the acceptance criterion of 114 ºF in the staff's safety evaluation for the BWRVIP-05 report.

4.2.6.3 Updated Safety Analysis Report Supplement

LRA Section A.2.1.6 provides the USAR supplement summarizing the TLAA for the reactor vessel axial weld failure probability assessment. The staff reviewed LRA Section A.2.1.6 consistent with the acceptance criteria in SRP-LR Section 4.2.2.2 and the review procedures in SRP-LR Section 4.2.3.2.

Based on its review, the staff finds the USAR supplement meets the acceptance criteria in SRP-LR Section 4.2.2.2, and is therefore acceptable. Additionally, the staff determines that Entergy provided an adequate summary description of its actions to address the performance and projection of the mean RT_{NDT} values for the reactor pressure vessel axial welds to the end of the period of extended operation (i.e., to 54 effective full-power years) in accordance with 10 CFR 54.21(c)(1)(ii), as required by 10 CFR 54.21(d).

4.2.6.4 Conclusion

On the basis of its review, the staff concludes that Entergy has demonstrated that it projected to the end of the period of extended operation the probability of failure and mean RT_{NDT} analysis for the reactor pressure vessel beltline axial welds, as required by 10 CFR 54.21(c)(1)(ii). The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.7 Reactor Pressure Vessel Core Reflood Thermal Shock Analysis

4.2.7.1 Summary of Technical Information in the Application

LRA Section 4.2.7 describes Entergy's TLAA for the reactor pressure vessel core reflood thermal shock analysis (henceforth referred to as the reactor pressure vessel reflood analysis). Entergy dispositioned the TLAA for the reactor pressure vessel (RPV) in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that it projected the analysis to the end of the period of extended operation.

Entergy states that the original analysis, as referenced in USAR Section 5.3, was based on General Electric Report NEDO-10029, but stated that a more recent analysis presented as part of the Fifth International Conference on Structural Mechanics in Reactor Technology titled, "Fracture Mechanics Evaluation of a Boiling Water Reactor Vessel Following a Postulated Loss of Coolant Accident," (the S. Ranganath report),[5] is appropriate for the evaluation of the reactor pressure vessel reflood thermal shock event. The LRA states that the S. Ranganath report is more appropriate because it evaluates the bounding loss of coolant accident event for BWR-6 vessel design, which is a postulated main steam line break. Entergy provided the following additional information to support its basis for dispositioning the TLAA in accordance with 10 CFR 54.21(c)(1)(ii):

> This analysis shows that when the peak stress intensity occurs at approximately 300 seconds after the LOCA, the temperature inside the vessel wall is approximately 380°F. The maximum ART value calculated for the RBS RPV beltline material is 110.7°F. Using the equation for K_{IC} (material resistance to fracture) presented in Appendix A of ASME Section XI and the maximum ART value, the material reaches upper shelf at 215°F. The minimum 380°F temperature predicted for the thermal shock event at the time of peak stress intensity remains well above the 215°F value at which the material would transition from the upper shelf. Therefore, the revised analysis has projected the TLAA through the period of extended operation.

4.2.7.2 Staff Evaluation

The staff reviewed Entergy's TLAA for the reactor pressure vessel reflood analysis and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the acceptance criteria for plant-specific TLAAs in SER Section 4.7.2.1 and review procedures in SRP-LR Section 4.7.3.1.2.

The staff notes that the design basis assumes that the limiting pressurized-thermal shock event for the reactor pressure vessel is that associated with a reactor pressure vessel main steam line break after core reflooding has been initiated by Entergy as an emergency operating procedure action. The staff also notes that the analysis assumes that pressurized-thermal shock of the reactor pressure vessel will not be an issue if the reactor pressure vessel during the event was to behave in a ductile failure mode. Entergy's analysis is based on plant-specific reactor pressure vessel Charpy-impact data and Entergy's limiting adjusted reference temperature analysis for the reactor pressure vessel (i.e., the RT_{NDT} analysis for the reactor pressure vessel Shell #2 axial welds). This supports a conclusion that the reactor pressure vessel will transition to a fully ductile deformation mode of behavior at reactor pressure vessel shell temperatures below the minimum temperature of the postulated event.

Given that Entergy's limiting RT_{NDT} analysis demonstrates that the reactor pressure vessel will continue to behave in a ductile failure mode at reactor pressure vessel metal temperatures greater than or equal to 215 ºF and since the design basis calculation demonstrates that the minimum metal temperature of the reactor pressure vessel will be 380 ºF during the postulated pressurized-thermal shock event, Entergy's projected RT_{NDT} evaluation provides sufficient demonstration that the reactor pressure vessel will continue to behave in a ductile failure mode when subjected to the postulated event.

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[5] The updated analysis is given in the following reference: Ranganath, S., "Fracture Mechanics Evaluation of a Boiling Water Reactor Vessel Following a Postulated Loss of Coolant Accident," Fifth International Conference on Structural Mechanics in Reactor Technology, Berlin, Germany, August 1979 (NRC Microfiche Accession No. 9110110105 in the NRC staff's Public Legacy Library). Henceforth, this will referred to as the S. Ranganath report in this evaluation.

Based on this review, the staff finds that Entergy has provided an adequate basis for dispositioning this TLAA in accordance with 10 CFR 54.21(c)(1)(ii) because Entergy has projected the reactor pressure vessel RT_{NDT} analysis to the end of the period of extended operations. Entergy has also demonstrated that the reactor pressure vessel at 54 effective full-power years will behave in a ductile manner at temperatures above 215 ºF, which bounds the minimum reactor pressure vessel metal temperature (i.e., 380 ºF) evaluated for the postulated pressurized thermal shock event.

4.2.7.3 Updated Safety Analysis Report Supplement

LRA Section A.2.1.7 provides the USAR supplement summarizing the reactor pressure vessel reflood analysis. The staff reviewed LRA Section A.2.1.7 consistent with the acceptance criteria in SRP-LR Section 4.7.2.2 and the review procedures in SRP-LR Section 4.7.3.2.

Based on its review, the staff finds the USAR supplement meets the acceptance criteria in SRP-LR Section 4.7.2.2, and is therefore acceptable. Additionally, the staff determines that Entergy has provided an adequate summary description of its actions to evaluate this TLAA and disposition the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), as required by 10 CFR 54.21(d).

4.2.7.4 Conclusion

On the basis of its review, the staff concludes that Entergy has demonstrated that it projected the reactor pressure vessel reflood analysis to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii),. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3 Metal Fatigue

4.3.1 Class 1 Metal Fatigue

4.3.1.1 Summary of Technical Information in the Application

LRA Section 4.3.1 describes Entergy's TLAA for metal fatigue of the ASME Code Class 1 components that are included in the plant design. Entergy stated that fatigue evaluations involving cumulative usage factor (CUF) calculations were performed for the current licensing basis (CLB) in accordance with the AMSE Section III design requirements for the Class 1 components and that the ASME-required evaluations are contained in plant-specific design analyses and stress reports. Entergy stated that the CUF evaluations apply to the following Class 1 components: (a) reactor pressure vessel (RPV) components, (b) reactor vessel internal (RVI) components designed to ASME Code Class 1 requirements, (c) reactor recirculation pumps (RRPs), (d) ASME Code Class 1 pressure retaining portions of the control rod drive (CRD) system, and (e) ASME Code Class 1 piping and in-line components.

Entergy stated that because the fatigue evaluations are based on a number of transient cycles assumed for a 40-year operating term, these evaluations are TLAAs. Entergy also stated that the original design specifications provided the specific set of design transients that were assessed in the original CUF calculations for the components.

For the CUF analyses that apply to the RPV components, RRPs, ASME Code Class 1 portions of the CRD system, and ASME Code Class 1 piping and in-line components, Entergy stated that the CUF analyses for the RPV components are acceptable in accordance with the acceptance criterion in 10 CFR 54.21(c)(1)(iii) and that implementation of LRA AMP B.1.18, "Fatigue Monitoring Program" will be used to demonstrate that the effects of metal fatigue on the intended functions of these components will be adequately managed during the period of extended operation. LRA Table 4.3-1 provides design transients that will be monitored in accordance with LRA AMP B.1.18, "Fatigue Monitoring Program," with their cycle projections for the transients through the end of the period of extended operation.

For the CUF analysis that applies to the RPV feedwater nozzles, Entergy indicated that the CUF analysis used stress-based analysis methods. Entergy stated that the Fatigue Monitoring Program will also be used to demonstrate that the effects of metal fatigue on the intended functions of the feedwater nozzles will be adequately managed during the period of extended operation.

For the CUF analyses that apply to the RVI components, Entergy stated that the TLAA is acceptable in accordance with the acceptance criterion in 10 CFR 54.21(c)(1)(iii) and that implementation of LRA AMP B.1.10, "BWR Vessel Internals Program" will be used to demonstrate that the effects of metal fatigue on the intended functions of the RVI components will be adequately managed during the period of extended operation.

4.3.1.2 Staff Evaluation

The staff reviewed the Class 1 metal fatigue TLAAs, and their corresponding disposition of the TLAAs using the criterion in 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.3.2.1.1.3. This SRP-LR section provides the staff's guidelines and basis for using an applicant's Fatigue Monitoring Program to disposition a metal fatigue analysis in accordance with the acceptance criterion in 10 CFR 54.21(c)(1)(iii).

During its audit of the metal fatigue TLAAs for the RRPs, ASME Code Class 1 pressure retaining portions of the CRD system, and Class 1 piping and in-line components, the staff verified that Entergy's current CUF values for the components are less than the design-basis acceptance criterion of 1.0. The staff also noted that, consistent with the guidance in SRP-LR Section 4.3.2.1.1.3, Entergy credits the implementation of its Fatigue Monitoring Program as the basis for accepting the metal fatigue TLAAs of the RRPs, ASME Code Class 1 portions of the CRD system, and ASME Code Class 1 piping in accordance with the criterion in 10 CFR 54.21(c)(1)(iii).

During the staff's audit of the metal fatigue TLAA for the RPV components, the staff noted that Entergy did not specify which of the specific components in the RPV were analyzed in the design basis with a CUF analysis, other than the specific stress-based CUF analysis performed for the RPV feedwater nozzles. Therefore, for this TLAA, the staff needed additional information, and therefore issued a request for additional information RAI 4.3.1-1 (ADAMS Accession No. ML18043A008) on February 8, 2018. Entergy's response, dated March 26, 2018, is documented in ADAMS Accession No. ML18087A188.

During its evaluation of Entergy's response to RAIs 4.3.1-1, the staff noted that Entergy identified the specific components in the RPV that were analyzed with a CUF analysis in the CLB and provided the design basis CUF values for the components. The staff noted that the response provided sufficient information to verify that the RPV components with CUF analyses are within the scope of Entergy's Fatigue Monitoring Program (LRA AMP B.1.18) and will be subjected to either the cycle-based or stress-based monitoring activities of the AMP. Therefore, the staff finds the response acceptable because Entergy has clarified which RPV components, nozzles, and support components were analyzed in the CUF analyses and, therefore, has provided sufficient demonstration that these components are the RPV components that are within the scope of the Fatigue Monitoring Program. RAI 4.3.1-1 is resolved.

During its audit of the metal fatigue TLAAs for the RVI components, the staff determined that Entergy was using the BWR Vessel Internals Program to disposition the TLAAs in accordance with 10 CFR 54.12(c)(1)(iii). This AMP is different from that referenced in SRP-LR Section 4.3.2.1.1.3 for this type of TLAA disposition basis, which is the Fatigue Monitoring Program (refer to GALL Report AMP X.M1 and AMP B.1.18 in the LRA). Therefore, the staff reviewed Entergy's TLAA on Class 1 Fatigue of the RVI components and corresponding disposition of the TLAA using the criterion in 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.7.3.1.3, which provides the staff's guidelines for reviewing plant-specific TLAA dispositions in accordance with the criterion in 10 CFR 54.21(c)(1)(iii).

During the audit of the metal fatigue TLAA that applies to the RVI components, the staff noted that Entergy did not specify which of the RVI components in the plant design were specifically analyzed in accordance with a design basis CUF analysis. As a result, the staff could not determine which RVI components were within the scope of Entergy's TLAA and the scope of Entergy's BWR Vessel Internals Program, such that Entergy would be using the AMP to manage the effects of metal fatigue during the period of extended operation. The staff also noted that Entergy did not define specific BWRVIP-defined inspection or evaluation (I&E) methods that would be applied to those RVI components in order to demonstrate the AMP's procedure for implementing the BWRVIP-defined I&E methods would be capable of managing the effects of metal fatigue in the components during the period of extended operation. Therefore, for this TLAA, the staff needed additional information, and therefore issued a request for additional information RAI 4.3.1-2 (ADAMS Accession No. ML18043A008) on February 8, 2018. Entergy's response, dated March 26, 2018, is documented in ADAMS Accession No. ML18087A188.

During its evaluation of Entergy's response to RAI 4.3.1-2, the staff noted that Entergy identified the specific RVI components that were analyzed with a CUF analysis in the current licensing basis (CLB) and provided the specific EPRI BWRVIP I&E reports that applied to the components. Of these components, the staff verified that the collective set of BWRVIP I&E reports referenced in the RAI response would prompt Entergy to perform augmented inspections of all RBS RVI component or component assemblies having CUF analyses in the CLB, with the exception of the core plate and core plate stiffener beam that are included in the plant's RVI design. Specifically, the staff determined that the EPRI I&E methodology in BWRVIP-25 does not identify any inspections of BWR-6 core plate assembly components (including those for RBS) because the core plate assemblies in these types of BWRs rely on structural wedge restrainers that are sufficient to maintain the core plates in place during postulated design basis loading conditions and events, without any need for inspecting any of component locations in the core plate assemblies (including the wedge restrainer locations).

As a result, the staff determined that the BWR Vessel Internals Program may not be a sufficient programmatic basis for managing the effects of metal fatigue in the core plate and core plate stiffener beam in accordance with requirement in 10 CFR 54.21(c)(1)(iii). Therefore, for this TLAA, the staff needed supplemental information, and therefore issued a followup request for additional information RAI 4.3.1-2a (ADAMS Accession No. ML18121A029) on April 30, 2018.

Entergy's response, dated May 29, 2018, is documented in ADAMS Accession No. ML18149A638.

During its evaluation of Entergy's response to RAI 4.3.1-2a, the staff noted that Entergy amended LRA Section 4.3.1.2 to indicate that the Fatigue Monitoring Program will be used as the applicable programmatic basis for dispositioning the CUF analyses for the core plate and core plate stiffener beam in accordance with 10 CFR 54.21(c)(1)(iii).

The staff finds Entergy's response and amendment of the RVI metal fatigue TLAA to be acceptable based on the following TLAA disposition bases:

(a) For the core plate and core plate stiffener beam, the enhanced Fatigue Monitoring Program is appropriately designed to perform monitoring of the cumulative cycles for all design basis transients that apply to the components. The program is also designed to take appropriate corrective action before the design limits on transient cycles are exceeded. During its review of the enhanced Fatigue Monitoring Program, the staff verified that the program will be consistent with the AMP defined in GALL Report Section X.M1, "Fatigue Monitoring" during the period of extended operation. Thus, for these components, the Fatigue Monitoring Program provides an acceptable basis for managing the effects of metal fatigue because the staff has verified that the enhanced program will be consistent with the program defined in GALL AMP X.M1, "Fatigue Monitoring." The staff's evaluation of the Fatigue Monitoring Program is provided in SER Section 3.0.3.2.7.

(b) For all other RVI components with CUF analyses, the BWR Vessel Internals Program is designed to implement staff-approved and BWRVIP-defined augmented inspection methods that will monitor for potential cracking in the components during the period of extended operation. The program is also designed to implement appropriate evaluations or other corrective actions if cracking is detected in the components. During its review of the BWR Vessel Internals Program, the staff verified that the enhanced program will be consistent with the AMP defined in GALL Section XI.M9, "BWR Vessel Internals," during the period of extended operation. Thus, for these components, the BWR Vessel Internals Program provides an acceptable basis for managing the effects of metal fatigue because the staff has verified that the program, as subject to the enhancements, will be consistent with the program defined in GALL AMP XI.M9, "BWR Vessel Internals." The staff's evaluation of the BWR Vessel Internals Program is provided in SER Section 3.0.3.2.3.

RAIs 4.3.1-2 and 4.3.1-2a are resolved.

Based on this review and Entergy's bases for resolving RAIs 4.3.1-1, 4.3.1-2, and 4.3.1-2a, the staff finds Entergy has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of metal fatigue on the intended functions of the Class 1 RVI components will be adequately managed during the period of extended operation. Additionally, with the exception of Entergy's basis for dispositioning the metal fatigue TLAAs (i.e. CUF analyses) for the RVI core plate and core plate stiffener beam, the staff finds that the aging management approach for the other Class 1 RVI components meets the acceptance criteria in SRP-LR Section 4.7.2.1 because, consistent with the SRP-LR guidance, Entergy has demonstrated that the BWR Vessel Internals Program is capable of managing the impacts of cumulative fatigue damage or cracking due to fatigue or cyclical loading on the intended functions of the RVI components during the period of extended operation.

For the metal fatigue TLAAs (i.e., CUF analyses) that apply to the core plate and core plate stiffener beam, the staff finds that Entergy's TLAA disposition basis meets the acceptance criteria in SRP-LR Section 4.3.2.1.1.3 because Entergy has demonstrated that the Fatigue Monitoring Program will be capable of managing the effects of metal fatigue on the intended functions of the components during the period of extended operation.

4.3.1.3 Updated Safety Analysis Report Supplement

LRA Section A.2.2.1, as supplemented and amended in Entergy's letter of May 29, 2018 (ML18149A638), provides the USAR supplements summarizing the TLAAs on metal fatigue of Class 1 components, including those for the RPV, RVI components, RRPs, CRDs, and Class 1 piping and in-line components. For the portions of the USAR supplement that applies to the metal fatigue TLAAs for the RPV, RVI core plate and core plate stiffener beam, RRPs, CRDs, and Safety Class 1 piping, the staff reviewed the USAR supplement description of the TLAAs in accordance with the review procedures in SRP-SLR Section 4.3.3.2 and noted that Entergy provided a sufficient summary description of the metal fatigue TLAAs for the components and of how the Fatigue Monitoring Program will be used to accept the metal fatigue TLAAs for the components in accordance with 10 CFR 54.21(c)(1)(iii).

For the portions of the USAR supplement that applies to the metal fatigue TLAAs for the RVI components (other than those that apply to the core plate and core plate stiffener beam), the staff reviewed the USAR supplement description of the TLAAs in accordance with the review procedures in SRP-SLR Section 4.7.3.2. The staff noted that USAR supplement summary description for the Class 1 fatigue TLAA of the RVI components appropriately discussed and summarized how the BWR Vessel Internals Program will be used to accept the metal fatigue TLAAs for the RVI components in accordance with 10 CFR 54.21(c)(1)(iii) and to manage the effects of metal fatigue on the components during the period of extended operation.

Based on its review of the USAR supplement, the staff finds it meets the acceptance criteria in SRP-LR Section 4.3.2.2, and is therefore acceptable. Additionally, the staff finds that Entergy provided an adequate summary description of its actions to address the TLAAs on metal fatigue of Class 1 components, as required by 10 CFR 54.21(d).

4.3.1.4 Conclusion

On the basis of its review, the staff concludes that Entergy has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of metal fatigue damage on the intended functions of the Class 1 components will be adequately managed by one of the following AMPs during the period of extended operation: (a) the Fatigue Monitoring Program for those RPV components, RRPs, CRD housings, and Class 1 piping and in-line components that have CUF analyses in the CLB, and for the CUF analyses that apply to the RVI core plate and core plate stiffener beam, or (b) the BWR Vessel Internals Program for all other RVI components that have been analyzed with CUF analyses in the CLB. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluations for these components, as required by 10 CFR 54.21(d).

4.3.2 Non-Class 1 Fatigue

4.3.2.1 Summary of Technical Information in the Application

LRA Section 4.3.1 describes Entergy's TLAA for metal fatigue of the ASME Code non-Class 1 components that are included in the plant design. Entergy identified that the TLAA applies to the following groupings of non-Class 1 components: (1) piping and in-line components (e.g., tubing, piping, traps, thermowells, and valve bodies) that have been analyzed with an expansion stress analysis per the ASME Code, Section III, NC or ND for Class 2 or Class 3 components, or ANSI B31.1 requirements to Non-Class 2 or 3 components; and (2) non-piping components analyzed with applicable CUF fatigue analyses if they were designed and built to design codes requiring these types of fatigue analyses (e.g., ASME Code, Section III, NC-3200 or ASME Code, Section VIII, Division 2).

4.3.2.1.1 Non-Class 1 Piping and In-Line Components

Entergy states that the applicable expansion stress analyses (implicit fatigue TLAAs) apply to non-Class 1 piping and in-line components in the emergency safety feature (ESF) systems, auxiliary (AUX) systems, and steam and power conversion (SPC) systems of the plant. Entergy states that the TLAAs will remain valid to the end of the period of extended operation and that the TLAAs for these components are acceptable in accordance with the acceptance criterion in 10 CFR 54.21(c)(1)(i).

4.3.2.1.2 Non-Class 1 Non-Piping Components

Entergy stated that the applicable CUF analyses (explicit CUF TLAAs) apply to the following non-Class 1, non-piping components (i.e., flex hoses, expansion joints, or strainers) in the plant design: (1) emergence core cooling system (ECCS) suction strainers in the high pressure core spray (HPCS), low pressure core spray (LPCS), and residual heat removal (RHR) systems, and (2) flex hoses or expansion joints in the non-Class 1 systems evaluated in the AMR tables of LRA Section 3 that identify a metal fatigue analysis is applicable to the components. For these TLAAs, Entergy said that the CUF analyses for the components are acceptable in accordance with the TLAA acceptance criterion in 10 CFR 54.21(c)(1)(iii) and that implementation of Entergy's Fatigue Monitoring Program (LRA Section B.1.18) will ensure that the effects of metal fatigue damage on the intended functions of the components will be adequately managed during the period of extended operation.

4.3.2.2 Staff Evaluation

4.3.2.2.1 Non-Class 1 Piping and In-Line Components

The staff reviewed Entergy's expansion stress analyses (implicit fatigue TLAAs for the non-Class 1 piping and in-line components) and the corresponding disposition of the TLAAs in accordance with 10 CFR 54.21(c)(1)(i), consistent with the acceptance criteria in SRP-LR Section 4.3.2.1.2.1 and the review procedures in SRP-LR Section 4.3.3.1.2.1. The NRC staff's review procedures in SRP-LR Section 4.3.3.1.2.1 require staff to review of the operating plant transient history in order to verify that Entergy will not exceed the allowable limits on transient inputs used in the analyses during the period of extended operation. The NRC review procedures also require the staff to verify that the analyses will remain valid for the period of extended operation.

Based on its review of the transient projection results in LRA Table 4.3-1, the staff verified that Entergy's projected number of cycles for plant transients in the table defined as full thermal range transients (e.g., plant heatup and cooldown transients, full thermal range scrams) would not exceed a cycle-based limit of 7000 cycles for all full thermal range transient types, as defined in the ASME Section III design analyses for ASME Code Class 2 or 3 components or the design analyses for balance of plant components subject to ANSI B31.1 design requirements.

However, during its audit and review of LRA Section 4.3.1.2, the staff noted that Entergy did not specify which of the non-Class 1 systems were within the scope of the expansion stress TLAA in LRA Section 4.3.2.1. Entergy also did not specify which of the non-Class 1 systems it screened out from the scope of the TLAA based on the fatigue-screening methodology in EPRI Mechanical Tools. Therefore, the staff could not determine which of the non-Class 1 systems were within the scope of the TLAA in LRA Section 4.3.2.1 such that it could be demonstrated that the TLAA would remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). As a result, the staff issued a request for additional information RAI 4.3.1-2 (ADAMS Accession No. ML18043A008), on February 8, 2018. Entergy's response, dated March 26, 2018, is documented in ADAMS Accession No. ML18087A188.

In its response to RAI 4.3.1-2, Entergy provided a general discussion of its methodology for determining whether a certain non-Class 1 system is within the scope of the implicit fatigue TLAA in LRA Section 4.3.2.1. Entergy also clarified that a TLAA for metal fatigue is identified if the operating temperature exceeds a temperature threshold of 220 ºF for carbon steel components and 270 ºF for stainless steel for specific non-Class 1 piping and in-line components, which are identified in the LRA Chapter 3 aging management review tables. Based on this information and the aging management review tables for emergency safety feature, auxiliary and steam and power conversion systems in the LRA, the staff verified that Entergy has appropriately identified that the following non-Class 1 systems have piping or in-line components (e.g., piping, valve bodies, orifices, flow elements) that are within the scope of the implicit fatigue TLAA addressed in LRA Section 4.3.2.1:

Emergency safety feature system

- pressure relief system
- residual heat removal system
- reactor core isolation system
- containment penetrations system

Auxiliary System:

- control rod drive system
- fire protection system
- combustible gas control system
- standby diesel generator system
- high pressure core spray diesel generator system
- reactor water cleanup system
- sampling system

The staff finds Entergy's response acceptable because staff verified that these systems are non-Class 1 systems that operate at service temperatures high enough to be included in the scope of the implicit fatigue TLAA in LRA Section 4.3.2.1. Therefore, RAI 4.3.2-1 is resolved.

Based on its review for the emergency safety feature, auxiliary, and steam and power conversion systems and associated components within the scope of the implicit metal fatigue TLAA, the staff finds Entergy has demonstrated that the analyses will remain valid during the period of extended operation, as required by 10 CFR 54.21(c)(1)(i). Additionally, the staff finds that the TLAA meets the NRC staff's acceptance criteria in SRP-LR Section 4.3.2.1.2.1 because Entergy has demonstrated that the implicit fatigue TLAAs for the non-Class 1 piping and in-line components will remain valid during the period of extended operation and are in compliance with the TLAA acceptance criterion in 10 CFR 54.21(c)(1)(i).

4.3.2.2.2 Non-Class 1 Non-Piping Components

The staff reviewed Entergy's metal fatigue TLAAs for the non-Class 1, non-piping components (i.e., non-Class 1 flex hoses, expansion joints, or strainers in the plant design) and the corresponding disposition of the TLAAs in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the acceptance criteria in SRP-LR Section 4.3.2.1.1.3 and review procedures in SRP-LR Section 4.3.3.1.1.3 for plant components that have been analyzed with a CUF analysis. These SRP-LR review procedures require staff to review Entergy's Fatigue Monitoring program to verify that the aging management program (1) will be capable of monitoring the plant transients that are within the scope of the component-specific CUF analyses, and (2) will be capable of ensuring that the impacts of cumulative fatigue damage or cracking due to fatigue on the intended functions of the components will be adequately managed during the period of extended operation in accordance with the requirement in 10 CFR 54.21(c)(1)(iii).

Based on its review of the TLAA and the program elements for implementing the Fatigue Monitoring program (LRA AMP Section B.1.18), the staff verified that Entergy has a valid aging management program in place to monitor the cumulative number of design transient cycles that apply to plant components (i.e., both Class 1 and non-Class 1 components) with ASME Code Section III-defined CUF analyses. Therefore, for the non-Class 1, non-piping components in the emergency safety feature, auxiliary, and steam power conversion systems that are within the scope of the metal fatigue TLAA in LRA Section 4.3.2.2, the staff finds Entergy has demonstrated that it will adequately manage the impacts of cumulative fatigue damage or cracking due to fatigue on the structural integrity of components through implementation of the Fatigue Monitoring program during the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). Additionally, the TLAA meets the acceptance criteria in SRP-LR Section 4.3.2.1.1.3 because Entergy will use the Fatigue Monitoring program to demonstrate that it will adequately manage the effects of metal fatigue on the intended functions of the non-Class 1, non-piping components, during the period of extended operation. Also, the TLAA is acceptable in accordance with the TLAA acceptance criterion in 10 CFR 54.21(c)(1)(iii).

SER Section 3.0.3.2.7 documents the staff's evaluation of the Fatigue Monitoring program.

4.3.2.3 Updated Safety Analysis Report Supplement

LRA Section A.2.2.2 provides the USAR supplement summarizing the metal fatigue TLAA for non-Class 1 components. For the subsection of LRA Section A.2.2.2 that applies to the basis for dispositioning the applicable TLAAs for non-Class 1 piping and in-line components with implicit fatigue analysis under 10 CFR 54.21(c)(1)(i), the staff reviewed the LRA Section A.2.2.2 subsection consistent with the review procedures in SRP-LR Section 4.3.3.1.2.1. For the subsection of LRA Section A.2.2.2 that applies to the basis for dispositioning the applicable TLAAs for non-Class 1 components with time-dependent CUF analysis under

10 CFR 54.21(c)(1)(iii), the staff reviewed the LRA Section A.2.2.2 subsection consistent with the review procedures in SRP-LR Section 4.3.3.1.1.3.

4.3.2.3.1 Non-Class 1 Piping and In-Line Components

The staff notes that Entergy provides a sufficient summary description of the metal fatigue TLAAs for the non-Class 1 piping and in-line components and the basis for dispositioning these TLAAs in accordance with 10 CFR 54.21(c)(1)(i), which requires demonstration that the TLAAs will remain valid during the period of extended operation. The staff verifies that the USAR supplement appropriately describes how Entergy projected the cumulative number of full thermal range transients to the end of the period of extended operation. Entergy's projection demonstrates that the cumulative number of transients will remain lower than the 7,000 cycles assessed in the implicit fatigue analyses for the components and their non-Class 1 systems. As a result, the original analyses will remain valid for the period of extended operation.

Based on its review of the USAR supplement, the staff finds it meets the NRC staff's acceptance criteria in SRP-LR Section 4.3.2.1.2.1, and is therefore acceptable. Additionally, the staff determines that Entergy has provided an adequate summary description of its actions to address the implicit fatigue analysis for non-Class 1 piping and in-line components, as required by 10 CFR 54.21(d).

4.3.2.3.2 Non-Class 1, Non-Piping Components

The staff notes that Entergy provides a sufficient summary description of the metal fatigue TLAAs for the non-Class 1, non-piping components, and the basis for dispositioning these TLAAs in accordance with 10 CFR 54.21(c)(1)(iii), which requires demonstration that the impacts of cracking due to fatigue on the intended structural integrity functions of non-Class 1, non-piping components, will remain valid during the period of extended operation. The staff verifies that the USAR supplement appropriately describes how Entergy uses the implementation of its Fatigue Monitoring program to demonstrate that it will adequately manage the impacts of cracking due to fatigue on the intended functions of the components during the period of extended operation and why this meets the acceptance criteria in SRP-LR Section 4.3.2.1.1.3 for dispositioning these types of TLAAs in accordance with 10 CFR 54.21(c)(1)(iii).

Based on its review, the staff finds the USAR supplement meets the acceptance criteria in SRP-LR Section 4.3.2.1.1.3, and is therefore acceptable. Additionally, the staff determines that Entergy has provided an adequate summary description of its actions to address the metal fatigue TLAA for non-Class 1, non-piping components, as required by 10 CFR 54.21(d).

4.3.2.4 *Conclusion*

On the basis of its review, the staff concludes that Entergy has demonstrated that the metal fatigue analysis for the non-Class 1 piping and in-line components will remain valid during the period of extended operation, as required by 10 CFR 54.21(c)(1)(i). The staff also concludes that the USAR supplement contains an appropriate summary description of the metal fatigue TLAA evaluation for the non-Class 1 piping and in-line components, as required by 10 CFR 54.21(d).

The staff also concludes that Entergy has demonstrated that it will use the Fatigue Monitoring program to adequately manage the impacts of cumulative fatigue damage or cracking due to fatigue on the intended functions of the non-Class 1, non-piping components during the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also concludes that the USAR supplement contains an appropriate summary description of the metal fatigue TLAA evaluation for the non-Class 1, non-piping, as required by 10 CFR 54.21(d).

4.3.3 Effects of Reactor Water Environment on Fatigue Life

4.3.3.1 Summary of Technical Information in the Application

LRA Section 4.3.3, "Effects of Reactor Water Environment on Fatigue Life," describes Entergy's TLAA for evaluating environmentally assisted fatigue (EAF) in the ASME Code Class 1 components of the facility. Entergy dispositioned the TLAA on EAF in accordance with 10 CFR 54.21(c)(1)(iii). Entergy states it will use the Fatigue Monitoring Program (as enhanced in LRA Section B.1.18) to demonstrate that it will adequately manage the impacts of EAF on the intended functions of the components during the period of extended operation.

The staff's acceptance review letter to Entergy dated July 10, 2017 (ML17186A159) included a Question 2, which discussed the EAF analysis methodology. To answer Question 2, Entergy supplemented LRA Section 4.3.3 with a letter dated August 1, 2017 (ADAMS Accession No. ML17213A064).

In addition, Entergy supplemented LRA Section 4.3.3 by letter dated March 26, 2018 (ADAMS Accession No. ML18087A188).

4.3.3.2 Staff Evaluation

The staff reviewed Entergy's TLAA on EAF, and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the following guidelines that permit Fatigue Monitoring programs to be used as a basis for accepting these types of analyses in accordance with 10 CFR 54.21(c)(1)(iii): (1) the acceptance criteria in SRP-LR Section 4.3.2.1.3, (2) the review procedures in SRP-LR Section 4.3.3.1.3, and (3) the program statements in GALL Report AMP X.M1, "Fatigue Monitoring." The guidance in SRP-LR Section 4.3.3.1.3 provides the guidelines for reviewing EAF analyses in accordance with the staff's methodologies in NUREG/CR-6260 and the additional NUREG reports for carbon steel, alloy steel, stainless steel, or nickel alloy material types referenced in SRP-LR Section 4.3.2.1.3. These SRP-LR sections also allow license renewal applicants to propose alternative methods of EAF assessment from those defined for analysis in the referenced NUREG reports.

In its letter dated August 1, 2017, Entergy provided additional information regarding the process that it would use to determine if additional EAF calculations (CUF_{en} calculations) would be needed for potentially more limiting RCPB component locations than those specified for analysis in the EAF methodology of NUREG/CR-6260. The LRA supplement states that Entergy will use a thermal zone analysis approach as its basis for determining whether additional RCPB locations will yield more limiting values of CUF_{en} than those calculated for generic reactor pressure vessel component locations defined in NUREG/CR-6260. Entergy addresses its need for performing these evaluations and calculations in License Renewal Commitment No. 11 (as described in the USAR supplement for this TLAA). The staff evaluates the adequacy of this commitment in SER Section 4.3.3.3. However, based on its review, the staff identified the need for additional information regarding the details of this thermal zone methodology, and therefore issued a request for additional information RAI 4.3.3-1 (ADAMS Accession No. ML18043A008) on February 8, 2018, Parts 1 to Part 3, and Entergy's response, dated March 26, 2018 is documented in ADAMS Accession No. ML18087A188. The staff's basis for this RAI is also described in the staff's Aging Management Programs Audit Report, dated January 29, 2018 (ADAMS Accession No. ML17346A732) chapter for LRA Section 4.3.3, "Effects of Reactor Water Environment on Fatigue Life."

In its response to RAI 4.3.3-1, Part 1, Entergy clarified that the CUF value of Class 1 piping in one thermal zone can be used to bound the CUF values of Class 1 piping in other thermal zones when the following criteria are met: (1) a bounding temperature is used for the thermal zone assessments, (2) the piping in the non-bounding thermal zones is made from the same material of fabrication as that for the piping assessed in the bounding thermal zone, and (3) the transients for piping in the other zones are either the same as or a subset of the transients that apply to the piping in the bounding thermal zone. Entergy also explains that this basis only applies to the EAF assessment of Class 1 piping in the plant design. It cannot be used for the EAF assessments of other types of Class 1 pressure boundary components (e.g., reactor pressure vessel components).

In its response to RAI 4.3.3-1, Part 2, Entergy clarified that it considers all plant transients that apply to components in a given thermal zone. The component with the highest CUF is considered bounding for the EAF assessment when calculated based on the same set of transients and a bounding temperature.

In its response to RAI 4.3.3-1, Part 3, Entergy clarifies it selects the piping locations for the EAF analysis with a thermal zone as follows: (1) the specific Class 1 piping location with the highest CUF value, (2) the piping location with the second highest CUF value if the value is at least 50% of the CUF value of the piping component with the highest CUF, and (3) the piping location with the third highest CUF value if the value is at least 75% of the CUF value of the piping component with the highest CUF.

The staff notes that Entergy's basis demonstrates that Entergy is applying a conservative component selection basis in the EAF methodology because the component selection aspect of the methodology is based on the following factors: (1) use of component locations defined in NUREG/CR-6260 for the plant design that is applicable to RBS, and (2) use of a well-defined and conservative thermal zone methodology for determining potential Class 1 component locations that may be more limiting than those specified for EAF analysis in NUREG/CR-6260 and that may need to be included in the EAF analysis of the plant. Therefore, the staff finds Entergy's basis (as supplemented in the letters dated August 1, 2017, and March 26, 2018) acceptable because Entergy will be using a conservative approach to select specific ASME Code Class 1 components for inclusion in the EAF analysis (i.e., CUF_{en} calculations) of the reactor unit. This resolves the requests in RAI 4.3.3-1, Parts 1–3.

The staff notes that Entergy's basis for accepting the TLAA on EAF is consistent with the acceptance criteria in SRP-LR Section 4.3.1.2.3 and the programmatic criteria given in GALL AMP X.M1, "Fatigue Monitoring," which permit fatigue monitoring programs to be used as a basis for dispositioning these types of analyses in accordance with regulation in 10 CFR 54.21(c)(1)(iii). Therefore, the staff finds Entergy has demonstrated that it will adequately manage the effects of EAF damage or cracking due to fatigue on the intended functions of the components for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). Additionally, the TLAA meets the acceptance criteria in SRP-LR Section 4.3.2.1.3 and the staff's guidance in GALL Report AMP X.M1 because Entergy will use its Fatigue Monitoring program as the basis for accepting the TLAA on EAF in accordance with 10 CFR 54.21(c)(1)(iii) and for managing the impacts of environmentally-assisted fatigue damage or cracking on the intended functions of the RCPB components during the period of extended operation.

4.3.3.3 Updated Safety Analysis Report Supplement

LRA Section A.2.2.3, as amended in the letter of March 26, 2018, provides the USAR supplement summarizing the TLAA on EAF. The staff reviewed LRA Section A.2.2.3 consistent with the review procedures in SRP-LR Section 4.3.3.2. The staff also compared the USAR supplement to that provided for these types of TLAAs in SRP-LR Table 4.3-2. The staff notes that the USAR supplement description identifies that Entergy will perform CUF_{en} calculations of those RBS-specific component locations that are based on those designated for these types of calculations in NUREG/CR-6260 or that have been selected for analysis using Entergy's thermal zone methodology for component selection. The staff also notes that the USAR supplement for the TLAA appropriately references the programmatic enhancement of the Fatigue Monitoring program in LRA Section A.1.18 that will be used to perform the appropriate CUF_{en} calculations of selected RCPB locations prior to the period of extended operation (i.e., prior to August 29, 2023). Specifically, this enhancement is appropriately reflected in Commitment No 11, as given in LRA USAR Supplement Table A.4, "Commitment Tracking List."

Based on its review of the USAR supplement, the staff finds that it meets the acceptance criteria in SRP-LR Section 4.3.2.2, and is therefore acceptable. Additionally, the staff determines that Entergy has provided an adequate summary description of its actions to address the TLAA on EAF, as required by 10 CFR 54.21(d).

4.3.3.4 Conclusion

On the basis of its review, the staff concludes that Entergy has demonstrated that it will adequately manage the effects of environmentally assisted fatigue or cracking induced by fatigue on the intended functions of the components in the RCPB for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.4 Environmental Qualification of Electric Equipment

The 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," environmental qualification (EQ) program is a TLAA for purposes of license renewal. The TLAA of the environmental qualification electrical components includes all long-lived, passive, and active electrical and instrumentation and control components that are important to safety and are located in a harsh environment. The harsh environments of the plant are those areas subject to environmental effects by loss-of-coolant accidents or high-energy line breaks. Environmental qualification equipment comprises safety-related and Q-list equipment, nonsafety-related equipment (the failure of which could prevent satisfactory accomplishment of any safety-related function), and necessary post-accident monitoring equipment.

As required by 10 CFR 54.21(c)(1), Entergy's license renewal application must include a list of TLAAs, including environmental qualification TLAAs. As required by 10 CFR 54.21(c)(1), Entergy shall demonstrate that for each type of environmental qualification equipment, one of the following is true: (i) the analyses remain valid for the period of extended operation, (ii) the analyses have been projected to the end of the period of extended operation, or (iii) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

4.4.1 Summary of Technical Information in the Application

LRA Section 4.4 summarizes Entergy's evaluation of environmental qualification of electric equipment for the period of extended operation. In the LRA, Entergy states that all operating plants must meet the requirements of 10 CFR 50.49, which defines the scope of electrical components to be included in an environmental qualification program and also provides the requirements an environmental qualification program must meet. Qualification is based on environmental and service conditions during normal plant operation and also on those conditions postulated for plant accidents. A record of qualification for in-scope components must be prepared and maintained in auditable form. Entergy also states that equipment qualification evaluations for environmental qualification components that specify a qualification of at least 40 years, but less than 60 years, are considered TLAAs for license renewal. The RBS Environmental Qualification (EQ) of Electric Components program (Environmental Qualification program) manages component thermal, radiation, and cyclic aging, as applicable, through aging evaluations based on 10 CFR 50.49(f) qualification methods.

As required by 10 CFR 50.49, environmental qualification components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the age limits established in their evaluation. LRA Section B.1.16 evaluates the component reanalysis attributes, including analytical models, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions referenced in SRP-LR Table 4.4-1. Entergy states that the RBS environmental qualification program ensures that environmental qualification components are maintained in accordance with their qualification basis. Entergy dispositioned the TLAAs for the environmental qualification components in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that it will use the environmental qualification program to adequately manage the effects of thermal, radiation, and cyclic aging on the intended function for the period of extended operation. The LRA states that this program is consistent with the GALL Report (NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electric Components").

4.4.2 Staff Evaluation

The staff reviewed Entergy's TLAA for environmental qualification of electrical components and corresponding disposition of 10 CFR 54.21(c)(1)(iii), consistent with the review procedure in SRP-LR Section 4.4.2.1.

The staff reviewed LRA Section 4.4 and the associated program basis documents to determine if Entergy's environmental qualification program meets the requirement of 10 CFR 54.21(c)(1). Entergy's environmental qualification program is implemented per the requirements of 10 CFR 54.21(c)(1)(iii) to show that components evaluated under Entergy's TLAA evaluation are adequately managed during the period of extended operation. The staff reviewed Entergy's environmental qualification program conformance to the requirements of 10 CFR 50.49, including the management of aging effects, to confirm that Entergy will continue to operate electric equipment requiring environmental qualification consistent with the current licensing basis during the period of extended operation.

The staff also conducted an audit of LRA Section B.1.16 and the program basis documents, including reports provided to the staff during the audit. Based on the staff review of LRA Section B.1.16 and audit results, the staff concluded that Entergy's environmental qualification program elements are consistent with the GALL Report AMP X.E1.

The staff also reviewed Entergy's environmental qualification program reanalysis attributes evaluation and concluded that it is consistent with SRP-LR Section 4.4.2.1.3 and SRP-LR Table 4.4-1. No exemptions were identified based on a TLAA.

The staff finds that Entergy has demonstrated it will adequately manage the effect of thermal, radiation and cyclic aging on the intended function of the environmental qualification electrical components for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii).

Additionally, the TLAA for environmental qualification of electrical components meets the NRC staff's acceptance criteria in SRP-LR Section 4.4 because the environmental qualification program is capable of programmatically managing the qualified life of components within the scope of program for license renewal. Also, Entergy's continued implementation of the environmental qualification program provides assurance that the aging effects will be managed and that environmental qualified electric components will continue to perform their intended functions for the period of extended operation.

4.4.3 Updated Safety Analysis Report Supplement

LRA Section A.1.16 provides the USAR supplement summarizing the environmental qualification of electric components TLAA. The environmental qualification program manages the effects of thermal, radiation, and cyclic aging through the use of aging evaluation based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, environmental qualified components are refurbished, replaced, or their qualification is extended prior to reaching the aging limit established in the evaluation. Reanalysis of an aging evaluation address attributes of analytical methods, data collection and reduction method, underlying assumptions, acceptance criteria, and corrective actions.

The staff reviewed LRA Section A.1.16, consistent with the review procedures in SRP-LR Section 4.4.3.2, which state that Entergy is to provide information to be included in the USAR supplement that includes a summary description of the TLAA evaluation of the environmental qualification of electric equipment, and a USAR supplement with information equivalent to that in SRP-LR Table 4.4-2. Based on its review, the staff finds the USAR supplement meets the acceptance criteria in SRP-LR Section 4.4, and is therefore acceptable. Additionally, the staff determine that Entergy provided an adequate summary description of its action to address thermal, radiation, and cyclic aging on the intended functions of environmental qualification electric components, as required by 10 CFR 54.21(d).

4.4.4 Conclusion

On the basis of its review the staff concludes that Entergy has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclic aging on the intended functions of the EQ electrical components will be adequately managed by the EQ program for the period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.5 Concrete Containment Tendon Prestress Analyses

4.5.1 Summary of Technical Information in the Application

LRA Section 4.5 states that the Entergy's TLAA for concrete containment tendon prestress components. Entergy claims that this section is not applicable because the RBS containment design does not include tendons.

4.5.2 Staff Evaluation

The staff confirms that the RBS containment is a BWR Mark III steel containment design that does not include tendons.

4.5.3 Updated Safety Analysis Report Supplement

The staff concludes that no USAR supplement is required because the RBS containment buildings have no prestressed tendons.

4.5.4 Conclusion

On the basis of its review, as discussed above, the staff concludes this TLAA is not required.

4.6 Containment Liner Plate and Penetration Fatigue Analyses

4.6.1 Summary of Technical Information in the Application

LRA Section 4.6 describes Entergy's TLAAs for the following containment components:

- steel containment vessel (cylinder and dome)
- floor liner plate
- piping penetrations (sleeved and unsleeved)
- containment structural components:
    - personnel airlocks
    - polar crane
    - equipment hatch
    - drywell airlock
    - drywell combination door/hatch assembly
    - drywell head
- expansion joint (bellows) on sleeved penetration
- fuel transfer tube bellows

Entergy dispositioned the TLAAs for the containment components in accordance with 10 CFR 54.21(c)(1)(iii) stating that it will use the Fatigue Monitoring program (described in LRA Section B.1.18) to adequately manage the effects of cumulative fatigue damage due to fatigue on the intended functions for the period of extended operation.

4.6.2 Staff Evaluation

Steel Containment Cylinder and Dome

The staff reviewed Entergy's TLAA for the steel containment cylinder and dome fatigue analysis and the corresponding disposition of 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.6.3.1.1.3.

A review of USAR Section 6A.15.2 confirms, as stated in the LRA, that the fatigue analysis requirements for the steel containment cylinder and dome were evaluated in accordance with the requirements of Subarticle NE-3220 of the ASME Code, Section III, Division 1, Subsection NE. However, the LRA does not describe if a fatigue analysis was performed nor the transients considered in the fatigue analysis, the design values for the transients, or the calculated CUF. Additionally, it is not clear if the general disposition of 10 CFR 54.21(c)(1)(iii), as stated in LRA Section 4.6, was intended for this analysis, which resulted in the issuance of RAIs. RAI 4.6-1, dated December 27, 2018, and follow-on RAI 4.6-1a, dated April 12, 2018, are documented in ADAMS Accession Nos. ML17361A396 and ML18103A015, respectively. Entergy's responses, dated February 6, 2018 and May 10, 2018 are documented in ADAMS Accession Nos. ML18038B475 and ML18130A242, respectively.

During its evaluation of Entergy's response to RAI 4.6-1 and RAI 4.6-1a, the staff notes that the containment vessel (including dome) has fatigue analyses at locations adjacent to penetrations that conservatively assumed transients consisting of 510 thermal cycles, 100 operating basis earthquake cycles, 14,400 total safety relieve valve (SRV) cycles, and 13 containment leakage tests. For simplicity, the analyses conservatively assumes that all loadings from these assumed transients occur simultaneously for 14,400 cycles, which Entergy claims is sufficient to qualify the containment vessel based on projected cycles to 60 years of operation. The staff also notes that Entergy credits the Fatigue Monitoring program to ensure that containment vessel locations with fatigue analyses do not exceed the analyzed number of cycles during the period of extended operation, and dispositioned the TLAA for the steel containment vessel in accordance with 10 CFR 54.21(c)(1)(iii). SER Section 3.0.3.2.07 documents the staff's evaluation of the Fatigue Monitoring program. The staff finds Entergy's response and corresponding changes to the USAR supplement acceptable because (1) it provided description of the transients and associated conservatively estimated cycles considered in the fatigue analysis and stated the TLAA disposition, (2) the Fatigue Monitoring program will monitor the number of occurrences of the plant transients associated with the containment vessel and dome fatigue analysis to ensure that their effects remain within design acceptance criteria during the period of extended operation, which supports the disposition that the aging effects will be adequately managed, and (3) the updated USAR supplement contains an appropriate summary description. Thus, based on the staff's review of the responses to Request No. 1 of RAI 4.6-1 and follow-on RAI 4.6.1a, the staff's concerns in RAIs 4.6-1, Request No. 1, are resolved.

The staff finds Entergy has demonstrated that it will adequately manage the effects of cumulative fatigue damage (due to fatigue) on the intended functions of the steel containment cylinder and dome for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii),.

Additionally, the TLAA for the steel containment cylinder and dome fatigue analysis meets the acceptance criteria in SRP-LR Section 4.6.2.1.1.3 because Entergy's proposed aging management program ensures that it will adequately manage the effects of aging of the steel containment cylinder and dome for the period of extended operation.

<u>Floor liner plate</u>

The staff reviewed Entergy's TLAA for the floor liner plate fatigue analysis and the corresponding disposition of 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.6.3.1.1.3.

A review of Section 3.8.2.4.1 of the USAR confirms that the fatigue analysis requirements for the floor liner plate are evaluated in accordance with the requirements of ASME Code, Section III, Division 2. Section 6A.15.1.3.3 and Table 6A.15-1 of the USAR states that the fatigue analysis qualifies the floor liner plate for 4,200 safety relief valve (SRV) events out of 1,800 SRV events expected, 5 operating basis earthquakes (OBE) with 20 cycles each, 1 safe shutdown earthquake (SSE), and 1 design-basis accident (DBA) with 20 cycles. The USAR also states that the analysis resulted in a CUF of 0.85 < 1.0 for the basemat liner section in the weir annulus, and in a CUF of 0.034 < 1.0 for the basemat liner section between the drywell wall and the containment vessel. The staff notes that the projected transient cycles to 60 years in LRA Table 4.3-1 do not exceed the maximum cycles from this analysis, and the cumulative usage factor are expected to remain at less than one at the end of the period of extended operation. However, it is not clear if the general disposition of 10 CFR 54.21(c)(1)(iii), as stated in LRA Section 4.6, was intended for these analyses, which resulted in the NRC staff issuing RAI 4.6-1, Request 2. This RAI and Entergy's response are documented in ADAMS Accession No. ML18038B475.

During its evaluation of Entergy's response to RAI 4.6-1, Request No. 2, the staff noted that the applicant dispositioned the basemat liner fatigue analysis in accordance with 10 CFR 54.21(c)(1)(iii) and that the Fatigue Monitoring program will be used to manage the effects of aging associated with the fatigue analysis. The staff finds Entergy's response and changes to the USAR supplement acceptable because (1) the Fatigue Monitoring program will monitor the number of occurrences of the plant transients associated with the basemat liner fatigue analysis to ensure that the number of occurrences remain below the design acceptance criteria during the period of extended operation, which helps ensure that the aging effects will be adequately managed, and (2) the updated USAR supplement, as amended by the RAI response, contains an appropriate summary description. Thus, based on the review of the RAI response, the staff's concern in RAI 4.6-1, Request No. 2, is resolved.

The staff finds that Entergy has demonstrated that it will adequately manage the effects of cumulative fatigue damage due to fatigue on the intended functions of the floor liner plate for the period of extended operation. Additionally, the TLAA for the floor liner plate fatigue analysis meets the acceptance criteria in SRP-LR Section 4.6.2.1.1.3 because Entergy's proposed aging management program ensures that the effects of aging of the floor liner plate is adequately managed for the period of extended operation.

<u>Piping penetrations (sleeved and unsleeved)</u>

LRA Section 4.6 states that Entergy performed detailed fatigue calculations for the containment penetrations and evaluated them as part of the piping pressure boundary in LRA Section 4.3. The LRA also states that fatigue analysis was not required for the electrical penetrations due to the low stress results obtained from the stress evaluation. The staff evaluations of these penetrations are documented in Section 4.3.

<u>Containment structural components</u>

The staff reviewed Entergy's TLAAs for the following containment structural components: personnel airlocks, polar crane, equipment hatch, drywell airlock, drywell combination door/hatch assembly, and drywell head fatigue analyses and the corresponding disposition of 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.6.3.1.1.3.

LRA Section 4.6 states that these analyses consider earthquakes and safety relief valve lifts as part of their normal and upset conditions, and that they are tracked as shown in LRA Table 4.3-1. However, the LRA did not clearly identify the specific transients and associated design cycles of the transients considered for each analysis. As a result, the staff issued two requests for additional information. RAI 4.6-2, dated December 27, 2018, and follow-on RAI 4.6-2a, dated April 12, 2018 are documented in ADAMS Accession Nos. ML17361A396 and ML18103A015, respectively. Entergy's responses, dated February 6, 2018 and May 10, 2018, are documented in ADAMS Accession No. ML18038B475 and No. ML18130A242, respectively. Based on the staff's review of the RAI response, RAI 4.6-2 and RAI 4.6-2a are resolved."

The staff evaluated Entergy's response to RAI 4.6-2 and RAI 4.6-2a and notes the following:

- For each of the following components: the personnel airlock, drywell airlock, and drywell combination door/hatch assembly, there are fatigue waiver evaluations considering cycles (LRA Table 4.3-1) from stated transients (atmosphere to operating pressure and pressure fluctuations (startup), a loss-of-coolant accident, an operating bases earthquake, a safe shutdown earthquake, and safety relief valve actuations which concludes that no fatigue analysis is necessary for the component, and no CUFs were calculated. Entergy states that although these evaluations assume 120 plant startup cycles when evaluating the component, and LRA Table 4.3-1 indicates a higher limiting value of 168 plant startup cycles, the limiting value is still below the ASME Code criteria of 2,800 allowable cycles and does not impact the fatigue waiver conclusion. Entergy considered each fatigue waiver evaluation as a TLAA, and dispositioned the TLAAs in accordance with 10 CFR 54.21(c)(1)(iii). In its response, Entergy states that the Fatigue Monitoring program will ensure that actual cycles from operation remain within the assumed cycles from the fatigue waiver criteria of ASME Code, Section III, Subsection NE 3222.4(d).

- The polar crane has a fatigue analysis that assumes 5,000 safety relief valve (SRV) actuations, 100 operating bases earthquake (OBE) cycles and 50 safe shutdown earthquake (SSE) cycles, and has a CUF of less than 1. Entergy credits the Fatigue Monitoring program in accordance with 10 CFR 54.21(c)(1)(iii) to ensure that the actual cycles from operation remain within the values assumed for the fatigue analysis.

- The equipment hatch has a calculation that includes a fatigue waiver evaluation for the hatch cover and a fatigue calculation for the hatch bolting, which assumes 50,000 safety relief valve cycles. Entergy credits the Fatigue Monitoring program in accordance with 10 CFR 54.21(c)(1)(iii) to ensure that the actual cycles from operation remain within the values assumed for the fatigue analysis and fatigue waiver evaluations associated with the equipment hatch.

- The drywell head calculation concludes that alternating stresses from earthquake and safety relief valve loads were so low that the allowable number of cycles is infinite, and the CUF is zero. The analysis specifies 120 heatups, 5 operating bases earthquakes of 30 cycles each, 1 safe shutdown earthquake of 20 cycles, 50,000 safety relief valve cycles, and 350 loss-of-coolant-induced cycles. Entergy credits the Fatigue Monitoring program in accordance with 10 CFR 54.21(c)(1)(iii) to ensure that the actual cycles from operation remain within the values assumed for the fatigue analysis evaluations associated with the drywell head.

The staff finds Entergy's responses and corresponding changes to the USAR supplement acceptable because:

1. They provided descriptions of the transients considered in the fatigue analysis and/or fatigue waiver evaluation for each of the containment structural components, and identified the transients that will be monitored to support the disposition that the aging effects will be adequately managed by the Fatigue Monitoring program.

2. The Fatigue Monitoring program will monitor the number of occurrences of the plant transients associated with each of the containment structural components' fatigue waiver or analyses to ensure that they remain below the design limits to ensure that aging effects will be adequately managed during the period of extended operation.

3. The updated USAR supplement, as amended by the RAI response, contains an appropriate summary description.

Thus, based on the staff's review of the RAI responses, the staff's concerns in RAI 4.6-2 and 4.6-2a are resolved.

The staff finds Entergy has demonstrated that it will adequately manage the effects of cumulative fatigue damage (due to fatigue) on the intended functions of the following containment structural components: personnel airlocks, polar crane, equipment hatch, drywell airlock, drywell combination door/hatch assembly, and drywell head will, as required by 10 CFR 54.21(c)(1)(iii). Additionally, the TLAAs for the containment structural components meet the acceptance criteria in SRP-LR Section 4.6.2.1.1.3 because Entergy's proposed aging management program ensures that it will adequately manage the effects of aging on the intended function(s) of the containment structural components described above for the period of extended operation.

Expansion joint (bellows) in sleeved penetrations

The staff reviewed Entergy's TLAA for the expansion joint (bellows) fatigue analyses for sleeved penetrations and the corresponding disposition of 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.6.3.1.1.3.

LRA Section 4.6 states that the design specification required the bellows used in containment penetrations be qualified for 14,000 pipe thermal load cycles, 500 operating bases earthquake cycles, and 20,000 safety relief valve cycles. The staff notes that Entergy's projected transients to 60 years in LRA Table 4.3-1 do not exceed these values. However, staff was not clear on whether the general disposition of 10 CFR 54.21(c)(1)(iii), as stated in LRA Section 4.6, was also intended for this analysis. As a result, the staff issued a request for additional information. RAI 4.6-3 (ADAMS Accession ML17361A396) on December 27, 2017. Entergy's response to

RAI 4.6-3, dated February 6, 2018, is documented in ADAMS Accession No. ML18038B475. Based on the staff's review of the RAI response, RAI 4.6-3 is resolved

In its response to RAI 4.6-3, Request No.1, Entergy states that the Fatigue Monitoring program will manage the effects of aging associated with the expansion joint (bellows) fatigue analysis in accordance with 10 CFR 54.21(c)(1)(iii). The staff finds Entergy's response acceptable because the Fatigue Monitoring program will monitor the number of occurrences of the plant transients associated with the expansion joint (bellows) fatigue analysis to ensure that they remain below the design limits during the period of extended operation, thus ensuring that the aging effects will be adequately managed. Based on the staff's review of the RAI response, the staff's concern in RAI 4.6-3, Request No. 1 is resolved.

The staff finds that Entergy has demonstrated that it will adequately manage the effects of cumulative fatigue damage (due to fatigue) on the intended functions of the expansion joints (bellows) in sleeved penetrations for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). Additionally, the TLAA for the expansion joint (bellows) fatigue analyses for sleeved penetrations meets the acceptance criteria in SRP-LR Section 4.6.2.1.1.3 because Entergy's proposed aging management program ensures that that the effects of aging of the expansion joints (bellows) in sleeved penetrations will be adequately managed for the period of extended operation.

<u>Fuel transfer tube bellows</u>

The staff reviewed Entergy's TLAA for the fuel transfer tube bellows fatigue analysis for sleeved penetration and the corresponding disposition of 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.6.3.1.1.3.

LRA Section 4.6 states that the fuel transfer tube bellows are designed for 150 cycles of flexing and for seismic events. However, it was not clear what design cycle limits were specified for seismic events, how the cycles of flexing is considered in LRA Table 4.3-1, and if the general disposition of 10 CFR 54.21(c)(1)(iii), as stated in LRA Section 4.6, was also intended for this analysis. As a result, the staff issued a request for additional information- RAI 4.6-3 (ADAMS Accession No. ML 17361A 396) on December 27, 2017. Entergy's response, dated February 6, 2018, is documented in ADAMS Accession No. ML18038B475. Based on the staff's review of the RAI response, RAI 4.6-3 is resolved."

In its response to RAI 4.6-3, Requests No. 2 and 3, Entergy states the following:

- The fuel transfer tube bellows fatigue analyses specifies 150 cycles of flexing and 30 operating basis earthquake cycles.
- The cycles of flexing do not require monitoring since RBS projects approximately 70 reinstallations through the end of the period of extended operation.
- The Fatigue Monitoring program tracks the operating bases earthquake cycles to manage the effects of aging associated with the fuel transfer tube bellows in accordance with 10 CFR 54.21(c)(1)(iii).

The staff finds Entergy's response and corresponding changes to the USAR supplement acceptable because:

1. The projected number of cycles of flexing for the period of extended operation will not exceed the number of assumed transients used in the existing fatigue analysis through reinstallations.

2. The Fatigue Monitoring program will monitor the number of occurrences of the plant's operating basis earthquake to ensure that they remain below the design limits during the period of extended operation, thus ensuring that the aging effects will be adequately managed.

3. The updated USAR supplement, as amended by the RAI response, contains an appropriate summary description.

Thus, based on the staff's review of the RAI response, the staff's concerns in RAI 4.6-3, Requests Nos. 2 and 3, are resolved.

The staff finds Entergy has demonstrated that it will adequately manage the effects of cumulative fatigue damage (due to fatigue) on the intended functions of the fuel transfer tube bellows for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). Additionally, the TLAA for the fuel transfer tube bellows fatigue analysis for sleeved penetration meets the acceptance criteria in SRP-LR Section 4.6.2.1.1.3 because Entergy's proposed aging management program ensures that that the effects of aging of the fuel transfer tube bellows will be adequately managed for the period of extended operation

4.6.3 Updated Safety Analysis Report Supplement

LRA Section A.2.4 provides the USAR supplement summarizing the evaluation of TLAAs for the following components addressed in this section.

The staff reviewed LRA Section A.2.4 consistent with the review procedures in SRP-LR Section 4.6.3.2. The staff also notes that Entergy committed (in Commitment No. 11) to enhance the Fatigue Monitoring program as described in LRA Section A.1.18, to ensure that transients for components with a fatigue TLAA are being monitored and tracked during the period of extended operation.

Based on its review of the USAR supplement, as amended by letter dated May 10, 2018, the staff finds the supplement meets the acceptance criteria in SRP-LR Section 4.6.3.2, and is therefore acceptable. Additionally, the staff determines that Entergy has provided an adequate summary description of its actions to address cumulative fatigue damage for the structural components describe above, as required by 10 CFR 54.21(d).

4.6.4 Conclusion

On the basis of its review, the staff concludes that Entergy has demonstrated that it will use the Fatigue Monitoring program to adequately manage the effects of cumulative fatigue damage (due to fatigue) on the intended functions of the steel containment cylinder and dome, the floor liner plate, several containment structural components (i.e., personnel airlocks, polar crane, equipment hatch, drywell airlock, drywell combination door/hatch assembly, and drywell head), the expansion joint (bellows) on sleeved penetrations, and the fuel transfer tube bellows for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7 Other Plant-Specific TLAAs

LRA Section 4.7 summarizes Entergy's evaluation of the following plant-specific time-limited aging analyses (TLAAs):

- erosion of main steam line flow restrictors
- postulation of HELB locations
- fluence effects for reactor vessel internals
- crane load cycles analysis

4.7.1 Erosion of Main Steam Line Flow Restrictors

4.7.1.1 Summary of Technical Information in the Application

LRA Section 4.7.1 describes Entergy's TLAA for erosion of main steam line flow restrictors. Entergy dispositioned the TLAA for the main steam line flow restrictors in accordance with 10 CFR 54.21(c)(1)(ii) to demonstrate that it has projected the analysis to the end of the period of extended operation.

4.7.1.2 Staff Evaluation

The staff reviewed Entergy's TLAA for the erosion of the main steam line flow restrictors and the corresponding disposition that Entergy has projected the analysis to the end of the period of extended operation, consistent with SRP-LR Section 4.7.3.1.2.

LRA Section 4.7.1 refers to USAR Section 5.4.4.4, which states that the stainless steel main steam flow restrictors will erode very slowly, and that even with an erosion rate of 0.004 inches per year, the increase in flow (in the event of a main steam line break) after 40 years would be no more than 5%. During the audit, the staff noted that General Electric-Hitachi (GEH) performed a projected analysis for the erosion rate to support license renewal. The LRA states that the analysis has been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(ii). The staff observed that the LRA did not include: (1) the results of the revised analysis, or (2) a summary of changes to the analysis that resulted in the new erosion-corrosion rate. For this issue, the staff needed additional information, and therefore issued a request for additional information RAI 4.7.1-1 (ADAMS Accession No. ML18009A909) on January 9, 2018. Entergy's response, dated February 7, 2018, is documented in ADAMS Accession No. ML18087A164.

As part of its response to RAI 4.7.1-1, Entergy submitted proprietary report RBS-ME-16-0008, "GEH 003N4606, Revision 2, River Bend Station Unit 1 Main Steam Flow Restrictors, April 2016 (Proprietary)" (EC-RBS-0000075698). Entergy also updated the USAR supplement in LRA Section A.2.5.1 to reference this proprietary report. The staff notes that the analysis in RBS-ME-16-0008 identifies the revised wear rate of the flow restrictors and the expected radiological release rate (in the event of a main steam line break) associated with the increase in flow restrictor diameter due to flow-accelerated corrosion (FAC), erosion, and corrosion. In addition, the analysis includes a summary and evaluation of the factors that contributed to the revised wear rate. Based on its review of the proprietary report, the staff verified that with the revised erosion-corrosion rate of the main steam line flow restrictors, the consequent increase in radiological release in the event of a main steam line break will remain within the acceptance criteria value of 5% assumed in USAR Section 5.4.4.4 for the period of extended operation. This resolves RAI 4.7.1-1.

The staff finds Entergy has demonstrated that the analysis for the main steam line flow restrictors has been projected to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii). Additionally, the TLAA meets the acceptance criteria in SRP-LR Section 4.7.2 because the General Electric-Hitachi report reevaluated the conservative assumptions in the original analysis to show that the TLAA acceptance criteria continue to be satisfied for the period of extended operation.

4.7.1.3 Updated Safety Analysis Report Supplement

LRA Section A.2.5.1 provides the USAR supplement summarizing the erosion of main steam line flow restrictors TLAA. The staff reviewed LRA Section A.2.5.1 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review of the USAR supplement, as amended by letter dated February 7, 2018, the staff finds the supplement meets the acceptance criteria in SRP-LR Section 4.7.3.2, and is therefore acceptable. Additionally, the staff determines that Entergy has provided an adequate summary description of its actions to address erosion of the main steam line flow restrictors, as required by 10 CFR 54.21(d).

4.7.1.4 Conclusion

On the basis of its review, the staff concludes that Entergy has demonstrated that the analysis for erosion of the main steam flow restrictors has been projected to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii). The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.2 Postulation of HELB Locations

4.7.2.1 Summary of Technical Information in the Application

LRA Section 4.7.2 describes Entergy's TLAA for postulation of high-energy line break (HELB) locations. Entergy dispositioned the TLAA for the postulated HELB locations in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that it will use the Fatigue Monitoring program to adequately manage the effects of fatigue on the intended functions for the period of extended operation.

4.7.2.2 Staff Evaluation

The staff reviewed Entergy's TLAA for the Class 1 piping systems within containment and the corresponding disposition according to 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.7.3.1.3. The staff also reviewed Entergy's TLAA against the recommended criteria in SRP-LR Section 4.3.2.1.1.3, which states that an AMP corresponding to GALL Report AMP X.M1, "Fatigue Monitoring," may be used to demonstrate acceptance of a CUF-based analysis in accordance with the requirement in 10 CFR 54.21(c)(1)(iii). The staff evaluated Entergy's disposition against relevant information in applicable subsections and tables of USAR Chapter 3 and the criteria in 10 CFR Part 50, Appendix A, GDC 4, "Dynamic

Effects." GDC 4 requires that the design of nuclear power plants be sufficient to protect safety-related components, structures, or equipment against dynamic effects (including missiles, pipe whips, and discharge of fluids) that may result from equipment failures or events and conditions outside of the nuclear power plant.

The USAR Section 3.6 provides the basis for meeting GDC 4. This USAR section provides the design basis for identifying those plant piping components that need to be identified as high-energy pipe break locations for Entergy's design basis, such that the components would need to be restrained or supported in accordance with the component restraint basis defined in USAR Section 3.6.2.3A. USAR Section 3.6.2A states that high-energy systems include piping systems that exceed 200 °F and/or 275 psig during normal operating conditions. As stated in USAR Section 3.6.2.1.5.1A, postulated rupture locations in high-energy systems include intermediate piping locations where a CUF evaluation is used to determine the need for pipe-whip restraints in accordance with GDC 4. The LRA states that the fatigue analyses used to determine the CUF values for the intermediate locations are considered TLAAs. The staff notes that calculation of the CUFs is a TLAA because it is dependent on an assumed number of cycles expected for the life of the plant.

USAR Table 3.6A-21 identifies the plant systems that are HELB systems; however, the staff notes that LRA Section 4.7.2 did not identify the high-energy piping systems that are within the scope of the TLAA and the Fatigue Monitoring program's cycle counting activities. The staff also notes that, although Entergy credits the Fatigue Monitoring program to track and monitor transients that affect high-energy piping systems, Entergy did not identify which transients affect the analyzed piping or whether these transients are within the scope of and tracked by the Fatigue Monitoring program. For this issue, the staff needed additional information, and therefore issued a request for additional information RAI 4.7.2-1 (ADAMS Accession No. ML17361A396) on December 27, 2017. Entergy's response, dated February 6, 2018, is documented in ADAMS Accession No. ML18038B475.

In its response to RAI 4.7.2-1, Entergy did the following: (a) identified the systems that include components that are subject to the 0.1 CUF criterion, (b) indicated that LRA Table 4.3-1 contains all transients that need to be monitored for HELB analysis locations, and (c) confirmed that these transients are tracked by the Fatigue Monitoring program. The staff finds Entergy's response acceptable because it clarifies which systems are within scope of the TLAA and confirms that the transients used to calculate the CUFs for these piping systems are tracked by the Fatigue Monitoring program. This resolves RAI 4.7.2-1.

The staff notes that using the Fatigue Monitoring program for disposition and acceptance of the HELB TLAA is relevant for those intermediate high-energy Class 1 component locations with CUF values that are less than or equal to a value of 0.1. The reasons for this is component locations with CUF values in excess of 0.1 have already been designed with pipe whip restraints according to the criteria for restraining the components in the licensee's USAR-defined HELB methodology. For these unrestrained component locations, the staff finds that the Fatigue Monitoring program is acceptable to disposition the HELB TLAA in accordance with 10 CFR 54.21(c)(1)(iii) because: (a) Entergy will use the Fatigue Monitoring program to monitor the cumulative occurrences of transients that could impact the CUF values of the component locations, and (b) Entergy will implement appropriate corrective actions if the monitoring activities of the aging management program will cause the CUF value for a given unrestrained intermediate HELB component location to approach its CUF limit of 0.1.

The staff finds Entergy has demonstrated that it will adequately manage the effects of fatigue on the intended functions of the Class 1 piping systems within containment for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). Additionally, the TLAA meets the NRC staff's acceptance criteria in SRP-LR Section 4.7.2.1 because Entergy has adequately identified the piping systems subject to the TLAA, has identified the transients affecting these piping systems, and has enhanced the Fatigue Monitoring program to track the transients affecting components with a HELB TLAA such that corrective actions will be taken when the CUF value for an unrestrained, intermediate HELB location is approaching the CUF limit of 0.1.

In SER Section 3.0.3.2.7, the staff evaluates the ability of the Fatigue Monitoring program to manage the impacts of fatigue-related aging effects on ASME Code Class 1 components (including components that are within the scope of the HELB TLAA).

4.7.2.3 Updated Safety Analysis Report Supplement

LRA Section A.2.5.2 provides the USAR supplement summarizing the TLAA for postulation of high- energy line break (HELB) locations. The staff reviewed LRA Section A.2.5.2 consistent with the review procedures in SRP-LR Section 4.7.3.2.

The staff notes that Entergy committed (in Commitment No. 11) to "enhance the Fatigue Monitoring program as described in LRA Section A.1.18." Furthermore, the "enhancement to develop a set of fatigue usage calculations [will be implemented] prior to August 29, 2023 [and the] remaining enhancements [will be implemented] prior to February 28, 2025."

Based on its review of the USAR supplement, the staff finds it meets the acceptance criteria in SRP-LR Section 4.7.2.2, and is therefore acceptable. Additionally, the staff determines that Entergy has provided an adequate summary description of its actions to address its TLAA for the postulation of HELB locations, as required by 10 CFR 54.21(d).

4.7.2.4 Conclusion

On the basis of its review, the staff concludes that Entergy has demonstrated that it will use the Fatigue Monitoring program to adequately manage the effects of fatigue on the HELB locations for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.3 Fluence Effects for Reactor Vessel Internals

4.7.3.1 Summary of Technical Information in the Application

LRA Section 4.7.3, as amended by letter dated March 26, 2018 (ADAMS Accession No. ML18087A188), describes Entergy's TLAA for fluence effects for reactor vessel internals (RVIs). Entergy dispositioned the TLAA for the RVIs in accordance with 10 CFR 54.21(c)(1)(ii) to demonstrate that the analysis has been projected to the end of the period of extended operation.

4.7.3.2 Staff Evaluation

The staff reviewed Entergy's TLAA for the RVIs and the corresponding disposition of 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-LR Section 4.7.3.1.2.

It was not clear to the staff whether the methodology used for calculating the 60-year fluence levels is qualified for estimating neutron fluence at the various RVI component locations. Additionally, it was not clear to the staff what changes were made to the inputs, assumptions, etc. of the original analysis in order to demonstrate that the TLAA has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii). For these issues, the staff needed additional information, and therefore issued two requests for additional information. RAI 4.7.3-1, RAI 4.7.3-2, and Entergy's responses are documented in ADAMS Accession Nos. ML18087A188 (non-proprietary) and ML18087A192 (proprietary).

Responses to parts 1 – 3 of RAI 4.7.3-1 and the neutron fluence calculational methodology used to determine RVI component fluence are evaluated in Section 4.2.1 of this report. The staff determined that the neutron fluence calculation methodology is acceptable for projecting RVI component-specific fluence values to 54 EFPY. Parts 1 – 3 of RAI 4.7.3-1 were resolved in SER Section 4.2.1.

During its evaluation of Entergy's response to RAI 4.7.3-2, the staff noted that the design basis analysis was used with no changes to assumptions or conservatisms; Entergy indicated that the only changes to the analysis are updated fluences and loads. As part of RAI 4.7.3-2, the staff requested that Entergy provide the projected fluence values for the various RVI component locations. Entergy provided the projected fluence levels for the RVI component locations through 54 EFPY and discussed the method of projecting the analysis in part 4 of RAI 4.7.3-1. The staff noted that Entergy indicated that RVI components that are less than the prescribed fluence criteria must meet the applicable American Society of Mechanical Engineers (ASME) Code, Section III, Subsection NG requirements and RVI components that can't meet the fluence criteria must meet additional strain criteria identified in the plant's core support structure (CSS) design specification.

For those RVI components that have fluence values less than the prescribed fluence criteria, Entergy explained that there was at least an order of magnitude difference between the calculated fluence and the criteria. For the RVI components locations that exceed the prescribed fluence criteria, which include the shroud, core plate, top guide / grid, control rod guide tube (CRGT), orificed fuel support (OFS), and peripheral fuel support (PFS), Entergy determined that the additional CSS design specification strain criteria imposed were met in all cases, however, Entergy did not submit the results of these strain analysis. The staff needed additional information, and therefore issued a followup request for additional information RAI 4.7.3-1a (ADAMS Accession No. ML18121A029) on April 30, 2018. Entery's response, dated May 29, 2018, is documented in ADAMS Accession Nos. ML18149A638 (non-proprietary) and ML18149A639 (proprietary).

During its evaluation of Entergy's response to RAI 4.7.3-1a, the staff noted that the response provided sufficient demonstration that all component locations subject to the additional strain criteria of the design specification (i.e., components locations projected to exceed the fluence criteria) are projected to meet the strain criteria through the end of the period of extended operation. Additionally, the staff notes that of those component locations that exceed the fluence criteria, the shroud, top guide / grid, and CRGT will be inspected under the BWR Vessel Internals Program; the core plate is secured by wedge restrainers to prevent lateral movement; and the peripheral fuel support is projected to exceed the fluence criteria by less than an order of magnitude.

The staff finds Entergy's responses acceptable because; (a) in accordance with 10 CFR 50.21(c)(1)(ii), Entergy projected the analysis to 60 years of operation with updated fluences and loads, (b) based on the magnitude of available margin, the NRC staff has reasonable assurance that this margin is sufficient to cover fluence calculational method modeling approximations and validation gaps for RVI components locations below the fluence threshold such that comparison to the additional strain criteria is not required, and (c) the staff verified that RVI component locations that are projected to exceed the fluence criteria continue to meet the additional strain criteria required by the design specification such that their intended functions will be maintained during the period of extended operation. Part 4 of RAI 4.7.3-1, RAI 4.7.3-2, and RAI 4.7.3-1a are resolved.

As described in SER Section 4.2.1.2, the applicant's letter dated August 13, 2018 (ADAMS Accession No. ML18225A315) identified an error in the applicant's fluence methodology. The staff's evaluation in SER Section 4.2.1.2 concluded, in part, that the RVI neutron fluence values for 54 EFPY reported in the LRA and the applicant's March 2018 letter remain valid and bounding for 54 EFPY. Therefore, as described in SER Section 4.2.1.2, the staff finds that the applicant has taken appropriate actions to address this matter and no changes to the LRA or the applicant's March 2018 letter are necessary.

The staff finds Entergy has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis for the RVIs has been projected to the end of the period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 because (a) Entergy has demonstrated that the neutron fluence projection basis for the RVI components is based on use of an acceptable neutron fluence methodology, (b) Entergy has adequately explained how the evaluation of neutron fluence factors into the design basis strain calculations for RVI components at the facility, (c) the staff has verified that Entergy has appropriately projected the neutron fluence to the end of the period of extended operation (i.e., to 54 EFPY), and (d) Entergy has demonstrated that components projected to exceed the fluence criteria of the design specification will continue to meet the additional strain hardening requirements of the design specification through the end of the period of extended operation.

4.7.3.3 Updated Safety Analysis Report Supplement

LRA Section A.2.5.3 provides the USAR supplement summarizing the fluence effects for RVIs TLAA. The staff reviewed LRA Section A.2.5.3 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review of the USAR supplement, the staff finds it meets the acceptance criteria in SRP-LR Section 4.7.2.2, and is therefore acceptable. Additionally, the staff finds that Entergy provided an adequate summary description of its actions to address fluence effects for the RVIs, as required by 10 CFR 54.21(d).

4.7.3.4 Conclusion

On the basis of its review, the staff concludes that Entergy has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis for the RVIs has been projected to the end of the period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.4 Crane Load Cycles Analysis

4.7.4.1 Summary of Technical Information in the Application

LRA Section 4.7.4 describes Entergy's TLAAs for crane load cycles. Entergy dispositioned the TLAAs for the Crane Manufacturer's Association of America Specification No. 70 (CMAA-70) spent fuel cask trolley (SFCT), fuel building bridge (FBB), and reactor building polar (RBP) cranes in accordance with 10 CFR 54.21(c)(1)(i) to demonstrate that the analyses remain valid for the period of extended operation.

4.7.4.2 Staff Evaluation

The staff reviewed Entergy's TLAAs for the spent fuel cask trolley, the fuel building bridge, and the reactor building polar cranes and the corresponding disposition of 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-LR Section 4.7.3.1.1.

The staff reviewed the referenced CMAA-70 for Class A1 (standby service) and Class B (light service) cranes to verify that the reported lift cycle estimates in LRA Section 4.7.4 are within the limiting values and assumptions used in the existing analyses and that the existing analyses are shown to be bounding during the period of extended operation. Table 3.3.3.1.3-1 of CMAA-70 shows that the allowable number of loading (lift) cycles for Class A1 and Class B cranes range from 20,000 cycles to 100,000 cycles. These lift cycles correspond to the number of loading cycles imposed on crane supporting structural members over the life of the crane. The service Class defines the allowable stress range limits for structural members and fasteners in the cyclic loading operation. The design number of maximum lift cycles establishes the bounds of crane cyclic loading operation for the spent fuel cask trolley, the fuel building bridge, and the reactor building polar cranes for Entergy's dispositioning of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), that the analyses remains valid for the period of extended operation.

To support this evaluation the staff audited Entergy's procedure EN-FAP-LR-006, which provides an assessment for cumulative fatigue damage (metal fatigue) of structural components; and procedure EN-FAP-LR-008, which describes the process to identify and evaluate TLAAs. The staff also audited document RBS-CS-15-00003 which describes the structure and functionality of various in-scope cranes, including the spent fuel cask trolley and fuel building bridge cranes discussed in these TLAAs. In addition, the staff audited LRA supporting document RBS-EP-15-00004, which provides (as discussed in the Aging Management Programs Audit Report, dated January 29, 2018, ADAMS Accession No. ML17346A732) Entergy's methodology to estimate the number of lifts for each of the CMAA-70 cranes for the current license operating period of 40-years, as well as the number of lift cycles anticipated through the period of extended operation. The staff notes that for the estimated number of lift cycles for reactor building polar, spent fuel cask trolley, and fuel building bridge cranes lift cycles Entergy conservatively assumed for an 18-month refueling cycle (although RBS currently follows a 24-month refueling outage (RFO) cycle) a total of 40 RFOs over the period of extended operation. The staff evaluated Entergy's disposition of 10 CFR 54.21(c)(1)(i) for the LRA Section 4.7.4 listed cranes as stated below.

<u>Spent Fuel Cask Trolley (SFCT) Crane</u>: The staff reviewed USAR Section 9.1.4.1.2.1, Section 9.1.4.2.2.1, Table 3.9A-5, and Figure 9.1-10 for the capacity and configuration of the crane. The spent fuel cask trolley crane is designed and built to Seismic Category I requirements and to the CMAA-70 Service Class A1 crane specifications. The spent fuel cask trolley crane has dual hooks (i.e., a main hook and an auxiliary hook); however, only one hook

at a time is operational. According to USAR Section 9.1.4.2.2.1 the function of the 125 ton main hook is to lift and transport a limited number of spent fuel transfer casks at every refueling cycle. The function of the 15 ton auxiliary hook is to handle much smaller loads. RBS-EP-15-00004 describes the lifting cycles for the two hooks as follows: (1) the main hook lifts about 4 casks every refueling cycle, estimated to be about a total of 200 lift cycles calculated over 40 RFOs, and further augmented by 25% to account for construction lift cycles, which leaves (2) the auxiliary hook performing the majority of lifting light loads. RBS-EP-15-00004 states that the estimated 5,000 lift cycles of light loads are based on a conservative estimate of 100 lifts performed at each RFO cycle through the period of extended operation (40 RFO cycles), and further augmented by 25% to account for construction lift cycles. The structural components of the crane are designed to CMAA-70 Service Class A1 crane loading cycles, which according to Table 3.3.3.1.3-1 of CMAA-70 specifications indicate that fatigue may be a design concern if they exceed 20,000 lift cycles. Therefore, the analysis for the spent fuel cask trolley crane remains valid through the period of extended operation, because the estimated number of total lift cycles for the main and auxiliary hooks are less than the limiting value of 20,000 lift cycles for fatigue to be of consideration according to Table 3.3.3.1.3-1 of CMAA-70.

<u>Fuel Building Bridge (FBB) Crane</u>: The staff verified that the 15 ton fuel building bridge crane is used for rack installations/lifting light loads as noted in RBS USAR Section 9.1.2.2.2 and Section 9.1.4.1.2.2. The crane is designed and built to Seismic Category II requirements and to CMAA-70 Service Class B specifications. RBS-EP-15-00004 states that the estimated 40,000 lift cycles are based conservatively on 800 lifts of very light loads performed at each RFO cycle through the period of extended operation (40 RFO cycles) and further augmented by 25% to account for construction lift cycles as discussed in the staff's Aging Management Programs Audit Report, dated January 29, 2018 (ADAMS Accession No. ML17346A732). Therefore, the analysis for the fuel building bridge crane remains valid through the period of extended operation, because the estimated 40,000 lift cycles for its hook, associated trolley, and supporting structural components is less than the limiting 100,000 loading cycles shown in Table 3.3.3.1.3-1 of CMAA-70 for Service Class B crane classification.

<u>Reactor Building Polar (RBP) Crane</u>: The staff verified in RBS USAR Section 9.1.4.1.2.3 and Section 9.1.4.2.2.3 that the reactor building polar crane has two hooks: a 100 ton main hook and a 5 ton auxiliary hook. The reactor building polar crane is designed and built to Seismic Category I requirements and to CMAA-70 Service Class A1 specifications. The main hook services the drywell and reactor vessel heads, the steam dryer, and steam separator. The auxiliary hook handles smaller loads during the RFO cycle. RBS-EP-15-00004 indicates that the estimated 1,000 lift cycles for the main hook of this crane are based on an upper bound estimate of 20 lifts performed at each RFO cycle through the period of extended operation (40 RFO cycles) and further augmented by 25% to account for construction lift cycles as outlined in the staff's Aging Management Programs Audit Report, dated January 29, 2018 (ADAMS Accession No. ML17346A732). Similarly, the estimate for the auxiliary hook includes 780 lifts performed at each RFO cycle through the period of extended operation (40 RFO cycles) and further augmented by 25% to account for construction lift cycles as outlined in the Aging Management Programs Audit Report, dated January 29, 2018 (ADAMS Accession No. ML17346A732). Therefore, the analysis for the RPB crane for its main and auxiliary hooks, trolleys, and supporting structure remains valid through the period of extended operation, because the total estimated number of lift cycles for the main hook is 1,000 and for the auxiliary hook is 39,000 lift cycles. Combined, these result in less than the limit of 100,000 loading cycles specified in Table 3.3.3.1.3-1 of CMAA-70 for Service Class A1 crane classification.

The staff finds Entergy has demonstrated pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the spent fuel cask trolley, the fuel building bridge, and the reactor building polar cranes remain valid for the period of extended operation. Additionally, the TLAAs meet the acceptance criteria in SRP-LR Section 4.7.2.1 because Entergy demonstrated that the lift cycles for the spent fuel cask trolley, the fuel building bridge, and the reactor building polar cranes are less than the limiting loading cycles shown in Table 3.3.3.1.3-1 of the CMAA-70 for Service Class A1 and Class B cranes.

4.7.4.3 Updated Safety Analysis Report Supplement

LRA Section A.2.5.4 provides the USAR supplement summarizing the crane load cycle limits for the spent fuel cask trolley, the fuel building bridge, and the reactor building polar cranes. The staff reviewed LRA Section A.2.5.4 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review, the staff finds of the USAR supplement meets the acceptance criteria in SRP-LR Section 4.7.2.2, and is therefore acceptable. Additionally, the staff determines that Entergy has provided an adequate summary description of its actions to address the analysis of crane load cycle limits for the spent fuel cask trolley, the fuel building bridge, and the reactor building polar cranes, as required by 10 CFR 54.21(d).

4.7.4.4 Conclusion

On the basis of its review, the staff concludes that Entergy has demonstrated that the crane load cycle analyses for the spent fuel cask trolley, fuel building bridge, and reactor building polar cranes, remain valid for the period of extended operation, as required by 10 CFR 54.21(c)(1)(i). The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.8 Conclusion for TLAAs

The staff reviewed LRA Section 4, “Time-Limited Aging Analyses.” On the basis of its review, the staff concludes that Entergy has provided a sufficient list of TLAAs, as defined in 10 CFR 54.3, and that Entergy has demonstrated that: (1) the TLAAs will remain valid for the period of extended operation, as required by 10 CFR 54.21(c)(1)(i), (2) the TLAAs have been projected to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii), or (3) the effects of aging on intended function(s) will be adequately managed for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also reviewed the USAR supplement for the TLAAs and finds that the supplement contains descriptions of the TLAAs sufficient to satisfy the requirements of 10 CFR 54.21(d). In addition, the staff concludes, as required by 10 CFR 54.21(c)(2), that no plant-specific, TLAA-based exemptions are in effect.

With regard to these matters, the staff concludes that there is reasonable assurance that Entergy will continue to conduct the activities authorized by the renewed licenses in accordance with the CLB, and that any changes made to the CLB, in order to comply with 10 CFR 54.29(a), are in accordance with the Atomic Energy Act of 1954, as amended, and NRC regulations.

5 REVIEW BY THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

In accordance with Title 10 of the *Code of Federal Regulations* Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," the Advisory Committee on Reactor Safeguards (ACRS) will review the license renewal application for River Bend Station, Unit 1 (RBS). The ACRS Subcommittee on Plant License Renewal will also review the U.S. Nuclear Regulatory Commission staff's draft safety evaluation report for the RBS license renewal application. Entergy Operations, Inc. and Entergy Louisiana, LLC (collectively, Entergy or the applicant) and the NRC staff will meet with the ACRS subcommittee and the full committee to discuss issues associated with the RBS license renewal application.

After the ACRS completes its review of the license renewal application and the draft safety evaluation report, the ACRS full committee will issue a report discussing the results of its review. An update to this safety evaluation report will include the ACRS report as well as the staff's response to any ACRS issues and concerns.

6 CONCLUSION

The staff of the U.S. Nuclear Regulatory Commission (NRC) reviewed Entergy Operations, Inc. and Entergy Louisiana, LLC's (collectively, Entergy's or the applicant's) license renewal application for River Bend Station, Unit 1. The NRC staff performed its review in accordance with NRC regulations and NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants." Title 10 of the *Code of Federal Regulations* Section 54.29, "Standards for Issuance of a Renewed License" (10 CFR 54.29), sets the standards for NRC issuance of a renewed license. In accordance with 10 CFR 54.29(a), the Commission may issue a renewed license if it finds that actions have been identified and have been or will be taken, such that there is reasonable assurance that Entergy will continue to conduct activities authorized by the renewed license in accordance with the current licensing basis.

On the basis of its review of the River Bend Station, Unit 1 license renewal application, the staff determined that Entergy has met the requirements of 10 CFR 54.29(a), subject to the resolution of any open items that may be identified.

The staff notes that any requirements of 10 CFR Part 51, Subpart A, "National Environmental Policy Act—Regulations Implementing Section 102(2)," will be documented in Final Supplement 58 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 58, Regarding River Bend Station, Unit 1," which was not yet published at the time that the staff completed this safety evaluation report. The NRC will publish Final Supplement 58 to NUREG-1437 following the NRC staff's consideration of comments received on Draft Supplement 58 to NUREG-1437, published on May 25, 2018 (ADAMS Accession No. ML18143B736).

APPENDIX A RIVER BEND STATION, UNIT 1
LICENSE RENEWAL COMMITMENTS

During the U.S. Nuclear Regulatory Commission staff's review of the River Bend Station, Unit 1 license renewal application, Entergy Operations, Inc. and Entergy Louisiana, LLC (collectively, Entergy or the applicant) made commitments related to aging management programs to manage aging effects for structures and components. The following table lists these commitments along with the implementation schedules and sources for each commitment.

Table A-1 River Bend Station License Renewal Commitments

No.	Program or Activity	Commitment	Implementation Schedule	Source (Letter Number)
1	Aboveground Metallic Tanks	Implement the Aboveground Metallic Tanks Program as described in LRA Section A.1.1.	Prior to February 28, 2025.	RBG-47735 RBG-47818
2	Bolting Integrity	Enhance the Bolting Integrity Program as described in LRA Section A.1.2.	Prior to February 28, 2025.	RBG-47735 RBG-47828
3	Neutron Absorbing Material Monitoring	Implement the Neutron Absorbing Material Monitoring Program as described in LRA Section A.1.3.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735 RBG-47830 RBG-47848
4	Buried and Underground Piping and Tanks Inspection	Implement the Buried and Underground Piping and Tanks Inspection Program as described in LRA Section A.1.4.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735 RBG-47813 RBG-47850 RBG-47860
5	BWR Vessel Internals	Enhance the BWR Vessel Internals Program as described in LRA Section A.1.10.	Prior to February 28, 2025.	RBG-47735 RBG-47818
6	Coating Integrity	Implement the Coating Integrity Program as described in LRA Section A.1.11.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735 RBG-47805
7	Compressed Air Monitoring	Enhance the Compressed Air Monitoring Program as described in LRA Section A.1.12.	Prior to February 28, 2025.	RBG-47735

No.	Program or Activity	Commitment	Implementation Schedule	Source (Letter Number)
8	Containment Inservice Inspection – IWE	Enhance the CII-IWE Program as described in LRA Section A.1.13.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735
9	Diesel Fuel Monitoring	Enhance the Diesel Fuel Monitoring Program as described in LRA Section A.1.15.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735 RBG-47812 RBG-47849 RBG-47860
10	External Surfaces Monitoring	Enhance the External Surfaces Monitoring Program as described in LRA Section A.1.17.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735
11	Fatigue Monitoring	Enhance the Fatigue Monitoring Program as described in LRA Section A.1.18.	Enhancement to develop a set of fatigue usage calculations: prior to August 29, 2023. Remaining enhancements: prior to February 28, 2025.	RBG-47735

No.	Program or Activity	Commitment	Implementation Schedule	Source (Letter Number)
11a	Fatigue Monitoring	Revise the Fatigue Monitoring Program description (Section 7B) of RBS-EP-15-00006, "Aging Management Program Evaluation Report Class 1 Mechanical," to state acceptable corrective actions include repair of the component, replacement of the component, and a more rigorous analysis of the component to demonstrate that the design code limit will not be exceeded during the period of extended operation.	Prior to February 28, 2025.	RBG-47846
12	Fire Water System	Enhance the Fire Water System Program as described in LRA Section A.1.20.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735 RBG-47805 RBG-47818
12a	Fire Water System	Remove existing coating, perform bottom thickness measurements and recoat the fire water storage tanks.	Within seven years prior to February 28, 2025.	RBG-47818
13	Flow-Accelerated Corrosion	Enhance the Flow-Accelerated Corrosion Program as described in LRA Section A.1.21.	Prior to February 28, 2025.	RBG-47735 RBG-47860
14	Inservice Inspection – IWF	Enhance the ISI-IWF Program as described in LRA Section A.1.23.	Prior to February 28, 2025.	RBG-47735
15	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Enhance the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program as described in LRA Section A.1.24.	Prior to February 28, 2025.	RBG-47735
16	Internal Surfaces in Miscellaneous Piping and Ducting Components	Implement the Internal Surfaces in Miscellaneous Piping and Ducting Components Program as described in LRA Section A.1.25.	Prior to February 28, 2025.	RBG-47735 RBG-47835 RBG-47860

No.	Program or Activity	Commitment	Implementation Schedule	Source (Letter Number)
17	Masonry Wall	Enhance the Masonry Wall Program as described in LRA Section A.1.26.	Prior to February 28, 2025.	RBG-47735
18	Non-EQ Electrical Cable Connections	Implement the Non-EQ Electrical Cable Connections Program as described in LRA Section A.1.27.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735
19	Non-EQ Inaccessible Power Cables (≥ 400 V)	Implement the Non-EQ Inaccessible Power Cables (≥ 400 V) Program as described in LRA Section A.1.28.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735 RBG-47828
20	Non-EQ Insulated Cables and Connections	Implement the Non-EQ Insulated Cables and Connections Program as described in LRA Section A.1.29. Revise RBS report, Aging Management Program Evaluation Results - Electrical, to include directions to perform an engineering evaluation in the corrective actions program element.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735 RBG-47828
21	Non-EQ Sensitive Instrumentation Circuits Test Review	Implement the Non-EQ Sensitive Instrumentation Circuits Test Review Program as described in LRA Section A.1.30.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735

No.	Program or Activity	Commitment	Implementation Schedule	Source (Letter Number)
22	One-Time Inspection	Implement the One-Time Inspection Program as described in LRA Section A.1.32.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735 RBG-47834 RBG-47860
23	One-Time Inspection – Small-Bore Piping	Implement the One-Time Inspection – Small-Bore Piping Program as described in LRA Section A.1.33.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735
24	Periodic Surveillance and Preventive Maintenance	Enhance the PSPM Program as described in LRA Section A.1.34.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735 RBG-47805 RBG-47835 RBG-47846 RBG-47860 RBG-47861 RBG-47867
25	Reactor Head Closure Studs	Enhance the Reactor Head Closure Studs Program as described in LRA Section A.1.36.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735
26	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Enhance the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program as described in LRA Section A.1.38.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735

No.	Program or Activity	Commitment	Implementation Schedule	Source (Letter Number)
27	Selective Leaching	Implement the Selective Leaching Program as described in LRA Section A.1.39.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735 RBG-47812
28	Structures Monitoring	Enhance the Structures Monitoring Program as described in LRA Section A.1.41.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47735 RBG-47842 RBG-47860
29	Water Chemistry Control – Closed Treated Water Systems	Enhance the Water Chemistry Control – Closed Treated Water Systems Program as described in LRA Section A.1.43.	Prior to February 28, 2025.	RBG-47735
30	Control Rod Drive Return Line Nozzle Program	Enhance the Control Rod Drive Return Line Nozzle Program as described in LRA Section A.1.5.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47812
31	Service Water Integrity	Enhance the Service Water Integrity Program as described in LRA Section A.1.40.	Prior to February 28, 2025.	RBG-47834
32	Neutron Absorbing Material Monitoring	Install aluminum boron-carbide neutron absorbing material before the period of extended operation so that the Boraflex material in the spent fuel pool will not be credited to perform a neutron absorption function. Entergy shall submit a letter to the NRC, within 60 days following installation of the new neutron absorbing material, confirming that the Boraflex material is no longer credited for neutron absorption.	Prior to February 28, 2025, or the end of the last refueling outage prior to August 29, 2025, whichever is later.	RBG-47830 RBG-47848

APPENDIX B CHRONOLOGY

This appendix consists of Table B-1, a chronological list of the routine licensing correspondence between the U.S. Nuclear Regulatory Commission (NRC) staff and Entergy Operations, Inc. and Entergy Louisiana, LLC (collectively, Entergy or the applicant). You can find the listed correspondence in the Agencywide Documents Access and Management System (ADAMS). This appendix also lists other correspondence on the NRC staff's review of the River Bend Station, Unit 1 license renewal application (under Docket No. 50-458.

Table B-1 Chronology

Date	ADAMS Accession No.	Subject
May 25, 2017	ML17174A355	River Bend Station (RBS) License Renewal Application (LRA) NRC Presentation
May 25, 2017	ML17153A282	W.F. Maguire of Entergy Operations, Inc. (Entergy) to NRC Submitting License Renewal Application River Bend Station—Unit 1 Docket No. 50-458, License No. NPF-47
July 10, 2017	ML17186A159	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, River Bend Station, Unit 1 License Renewal Application—Supplemental Information Needed for Acceptance of Requested Licensing Action (CAC No. MF9747)
July 27, 2017	ML17180A077	Letter from Sheldon Stuchell of NRC to W.F. Maguire of Entergy, Correction Letter for Receipt and Availability of the License Renewal Application for the River Bend Station, Unit 1 (CAC No. MF9747)
August 1, 2017	ML17213A064	W.F. Maguire of Entergy Operations, Inc. to NRC Submitting Supplement to License Renewal Application River Bend Station—Unit 1 Docket No. 50-458, License No. NPF-47
August 7, 2017	ML17187A035	Letter from Sheldon Stuchell of NRC to W.F. Maguire of Entergy, Determination of Acceptability and Sufficiency for Docketing and Proposed Review Schedule Regarding the Application from Entergy Operations, Inc., for Renewal of the Operating License for River Bend Station, Unit 1 (CAC No. MF9747 and MF9778)

Date	ADAMS Accession No.	Subject
August 9, 2017	ML17173A133	Federal Register Notice (FRN) License Renewal Application; Opportunity to Request a Hearing and to Petition for Leave to Intervene Regarding the Application from Entergy Operations, Inc., for Renewal of the Operating License for River Bend Station, Unit 1 (CAC No. MF9747 and MF9778)
August 9, 2017	ML17187A037	Letter from Emmanuel Sayoc of NRC to Entergy, Summary of Meeting Held on April 25, 2017, between the U.S. Nuclear Regulatory Commission Staff and Entergy Operations, Inc. Representatives to Discuss the River Bend Station, Unit 1 License Renewal Application (CAC No. MF9747)
August 9, 2017	ML17180A136	Letter from Emmanuel Sayoc of NRC to Entergy, Summary of Meeting Held on May 25, 2017, between the U.S. Nuclear Regulatory Commission Staff and Entergy Operations, Inc. Representatives to Discuss the River Bend Station, Unit 1 License Renewal Application (CAC No. MF9747)
Sept. 25, 2017	ML17262A200	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Plan for the Operating Experience Review Audit Regarding the River Bend Station, Unit 1, License Renewal Application (CAC No. MF9747)
October 10, 2017	ML17269A051	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Plan for the Aging Management Program Regulatory Audit Regarding the River Bend Station, Unit 1, License Renewal Application (CAC No. MF9747)
October 11, 2017	ML17279A874	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, River Bend Station, Unit 1, Plan for the Scoping and Screening Methodology Regulatory Audit Regarding the License Renewal Application (CAC No. MF9757)
October 23, 2017	ML17303A102	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Final Request for Additional Information [Set 1] for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757)

Date	ADAMS Accession No.	Subject
October 31, 2017	ML17298B174	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Audit Plan for the Onsite Aging Management Program Regulatory Audit for the River Bend Station, Unit 1, License Renewal Application (CAC No. MF9757)
November 16, 2017	ML17324B364	W.F. Maguire of Entergy to NRC, Response to License Renewal Application (LRA) NRC Request for Additional Information (RAI) Set 1, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
November 16, 2017	ML17320B099	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Final Request for Additional Information (Set 2) for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757)
November 29, 2017	ML17335A098	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Final Request for Additional Information (Set 3) for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757)
December 12, 2017	ML17347B473	W.F. Maguire of Entergy to NRC, Response to License Renewal Application (LRA) NRC Request for Additional Information (RAI) Set 2, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
December 13, 2017	ML17347B424	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Final Request for Additional Information for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757)—Set 4
December 13, 2017	ML17347B432	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Final Request for Additional Information for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757)—Set 5
December 27, 2017	ML17361A396	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Final Request for Additional Information for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757)—Set 6

Date	ADAMS Accession No.	Subject
January 4, 2018	ML17348B167	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, River Bend Station, Unit 1 License Renewal Application Review December 2017 Status Letter (CAC Nos. MF 9747 and MF9757)
January 8, 2018	ML17348B142	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Scoping and Screening Audit Report Regarding River Bend Station, Unit 1—License Renewal Application Review (CAC No. MF9757)
January 8, 2018	ML17347A383	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Operating Experience Audit Report Regarding River Bend Station, Unit 1 License Renewal Application Review (CAC No. MF9757)
January 8, 2018	ML18002A369	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, River Bend Station, Unit 1 License Renewal Application Review Response to Request for Due Date Extension for Request for Additional Information (CAC Nos. MF9747 and MF9757) —Set 7
January 9, 2018	ML18009A909	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Final Request for Additional Information for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757)—Set 7
January 10, 2018	ML18010A848	W.F. Maguire of Entergy to NRC, Response to License Renewal Application (LRA) NRC Request for Additional Information Set 3, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
January 22, 2018	ML18022A941	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Final Request for Additional Information for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757)—Set 8
January 24, 2018	ML18025B544	W.F. Maguire of Entergy to NRC, Response to License Renewal Application (LRA) NRC Request for Additional Information (RAI) Set 4, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47

Date	ADAMS Accession No.	Subject
January 24, 2018	ML18025B750	W.F. Maguire of Entergy to NRC, Response to License Renewal Application (LRA) NRC Request for Additional Information (RAI) Set 5, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
January 29, 2018	ML17346A732	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Aging Management Programs Audit Report Regarding River Bend Station, Unit 1, License Renewal Application (CAC No. MF9757)
January 31, 2018	ML18087A170	Proprietary Determination Correspondence to RBS in response to the Feb. 7, 2018 letter from W.F. Maguire of Entergy to NRC, Response to License Renewal Application (LRA) NRC Request for Additional Information (RAI) Set 7, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47, Enclosure 4 Containing Proprietary Information Withhold from Public Disclosure under Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390, “Public Inspections, Exemptions, Requests for Withholding”
February 6, 2018	ML18038B475	W.F. Maguire of Entergy to NRC, Response to License Renewal Application (LRA) NRC Request for Additional Information (RAI) Set 6, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
February 7, 2018	ML18087A164	W.F. Maguire of Entergy to NRC, Response to License Renewal Application (LRA) NRC Request for Additional Information (RAI) Set 7, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47, Enclosures 1–3 Containing Non-Proprietary Information
February 7, 2018	ML18038B470	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Final Request for Additional Information for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757)—Set 9
February 8, 2018	ML18043A008	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Final Request for Additional Information for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757)—Set 10

Date	ADAMS Accession No.	Subject
February 12, 2018	ML18043A351	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Final Request for Additional Information for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757)—Set 11
February 15, 2018	ML18046A044	License Renewal Application Update—Neutron-Absorbing Material Monitoring Program, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
February 20, 2018	ML18051A531	W.F. Maguire of Entergy to NRC, Response to License Renewal Application (LRA) NRC Request for Additional Information (RAI) Set 8, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
February 22, 2018	ML18058A085	W.F. Maguire of Entergy to NRC, Request for Due Date Extension for License Renewal Application NRC Request for Additional Information From 30 Days to 45 Days, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
March 6, 2018	ML18065A213	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Final Request for Additional Information for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757)—Set 12
March 7, 2018	ML18057A453	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Summary of Public Telephone Conference Call Held on February 20, 2018 between the U.S. Nuclear Regulatory Commission and Entergy Regarding Requests for Additional Information Pertaining to the River Bend Station, Unit 1, License Renewal Application Review (CAC No. MF9757)
March 8, 2018	ML18059A822	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Summary of Public Telephone Conference Call Held on February 27, 2018 between the U.S. Nuclear Regulatory Commission and Entergy Regarding Requests for Additional Information Pertaining to the River Bend Station, Unit 1, License Renewal Application Review (CAC No. MF9757)

Date	ADAMS Accession No.	Subject
March 8, 2018	ML18067A437	W.F. Maguire of Entergy to NRC, Response to License Renewal Application (LRA) NRC Request for Additional Information (RAI) Set 9, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF 47
March 14, 2018	ML18073A068	W.F. Maguire of Entergy to NRC, Response to License Renewal Application NRC Request for Additional Information (RAI) Set 11, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
March 22, 2018	ML18081A018	License Renewal Application Update—Neutron-Absorbing Material Monitoring Program—Supplement, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
March 22, 2018	ML18081A021	Response to License Renewal Application NRC Request for Additional Information Set 5 Supplement River Bend Station, Unit 1 Docket No. 50-458, License No. NPF-47
March 26, 2018	ML18087A188	W.F. Maguire of Entergy to NRC, Response to License Renewal Application NRC Request for Additional Information (RAI) Set 10, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47, Enclosure 1 Containing Non-Proprietary Information
March 26, 2018	ML18087A192	Proprietary Determination Correspondence to RBS in response to the March 26, 2018 letter from W.F. Maguire of Entergy to NRC, Response to License Renewal Application (LRA) NRC Request for Additional Information (RAI) Set 10, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47, Enclosure 2 Containing Proprietary Information Withhold from Public Disclosure under 10 CFR 2.390
March 27, 2018	ML18087A087	W.F. Maguire of Entergy to NRC, Response to License Renewal Application NRC Request for Additional Information Set 4 Supplement, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47

Date	ADAMS Accession No.	Subject
March 28, 2018	ML18078A755	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Summary of Public Telephone Conference Call Held on March 6, 2018 between the U.S. Nuclear Regulatory Commission and Entergy Regarding Requests for Additional Information Pertaining to the River Bend Station, Unit 1, License Renewal Application Review (CAC No. MF9757)
March 29, 2018	ML18071A018	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Summary of Public Telephone Conference Call Held on February 27, 2018 between the U.S. Nuclear Regulatory Commission and Entergy Regarding Requests for Additional Information Pertaining to the River Bend Station, Unit 1, License Renewal Application Review (CAC No. MF9757)
April 2, 2018	ML18092B187	W.F. Maguire of Entergy to NRC, License Amendment Request to Correct a Non-Conservative Technical Specification Figures 3.4.11-1, “Minimum Temperature Required vs. RCS Pressure,” by Replacing with 54 Effective Full-Power Years (EFPY) Curves, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47 (ADAMS Accession No. ML18092B187) Attachments 1 through 6 Nonproprietary information (including an affidavit)
April 2, 2018	ML18092B190	W.F. Maguire of Entergy to NRC, License Amendment Request to Correct a Non-Conservative Technical Specification Figures 3.4.11-1, “Minimum Temperature Required vs. RCS Pressure,” by Replacing with 54 Effective Full-Power Years (EFPY) Curves, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47, Attachment 7 Containing Proprietary Information Withhold from Public Disclosure under 10 CFR 2.390
April 3, 2018	ML18093A099	W.F. Maguire of Entergy to NRC, Response to License Renewal Application NRC Request for Additional Information (RAI) Set 12, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47

Date	ADAMS Accession No.	Subject
April 4, 2018	ML18094A137	W.F. Maguire of Entergy to NRC, Response to License Renewal Application NRC Request for Additional Information Set 5 Supplement, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
April 9, 2018	ML18099A236	Topics for the April 10, 2018 Public Call with the Entergy River Bend Station, Unit 1
April 12, 2018	ML18103A015	Letter from Emmanuel Sayoc of NRC to W.F. Maguire of Entergy, Summary of Public Telephone Conference Call Held on March 27, 2018, between the U.S. Nuclear Regulatory Commission and Entergy and Final Request for Additional Information for the Safety Review of the River Bend Station, Unit 1 License Renewal Application (CAC No. MF9757)—Set 13
April 17, 2018	ML18106A615	Topics for the April 18, 2018 Public Telephone Conference with Entergy on the River Bend Station, Unit 1 License Renewal Application
April 17, 2018	ML18107A764	Additional Topics for the April 18, 2018 Public Telephone Conference with Entergy on the River Bend Station, Unit 1 License Renewal Application
April 24, 2018	ML18115A061	Draft Response on RAI B.1.21-1 Flow Accelerated Corrosion from RBS
April 24, 2018	ML18115A163	Draft Response on RAI B.1.21-2 Flow Accelerated Corrosion from RBS
April 24, 2018	ML18107A504	Summary of Public Telephone Conference Call on March 29, 2018 Between NRC and Entergy Regarding the Need for Additional Information to Support the River Bend Station, Unit 1 License Renewal Application (CAC No. MF9757)
April 24, 2018	ML17362A554	River Bend Station, Unit 1 – Issuance of Scoping Summary Report Associated with License Renewal Application Environmental Review (EPID L-2017-LNE-0027)
April 25, 2018	ML18115A072	Draft Response on RAI B.1.25-1 (Internal Surfaces in Miscellaneous Piping and Ducting Components) from RBS
April 25, 2018	ML18115A228	Draft Response on RAI B.1.43-2 (Closed Treated Water Systems)

Date	ADAMS Accession No.	Subject
April 26, 2018	ML18116A622	Response to License Renewal Application NRC Request for Additional Information Supplement to B.1.35-1 River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
April 30, 2018	ML18121A029	Letter from Emmanuel Sayoc of NRC to W. F. Maguire of EOI, Final Request for Additional Information for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757) – Set 14
May 1, 2018	ML18122A125	Draft Response to NRC Request for Additional Information (RAI) B.1.15-1 (Diesel Fuel Monitoring)
May 1, 2018	ML18122A124	Draft Response to NRC Request for Additional Information (RAI) B.1.40-2 (Service Water Integrity) from Staff's Review on the River Bend Station License Renewal Application
May 1, 2018	ML18121A294	Draft Response to NRC Request for Additional Information (RAI) 4.6-1a (Fatigue Monitoring) from Staff's Review on the River Bend Station License Renewal Application
May 1, 2018	ML18121A302	Draft Response to NRC Request for Additional Information (RAI) 4.6-2a (Fatigue Monitoring) from Staff's Review on the River Bend Station License Renewal Application
May 2, 2018	ML18122A231	Draft Response to NRC Request for Additional Information (RAI) B.1.40-5 (Service Water Integrity) from Staff's Review on the River Bend Station License Renewal Application
May 2, 2018	ML18122A126	Draft Response to NRC Request for Additional Information (RAI) B.1.17-1 External Surfaces Monitoring from Staff's Review on the River Bend Station, Unit 1 License Renewal Application
May 3, 2018	ML18121A029	Letter from Emmanuel Sayoc of NRC to W. F. Maguire of EOI, Final Request for Additional Information for the Safety Review of the River Bend Station License Renewal Application (CAC No. MF9757) – Set 15
May 3, 2018	ML18123A495	Draft Response to NRC Request for Additional Information (RAI) B.1.4-2 2nd Revision Buried Pipe Generated from Staff's Review on the River Bend Station, Unit 1 License Renewal Application

Date	ADAMS Accession No.	Subject
May 7, 2018	ML18124A190	Summary of Public Telephone Conference Call Held on April 18, 2018 Between the U.S. Nuclear Regulatory Commission and Entergy Regarding the Need for Additional Information to Support the River Bend Station, Unit 1 License Renewal Application
May 7, 2018	ML18127A034	Summary of a Telephone Conference Call Held on April 25, 2018 Between the U.S. Nuclear Regulatory Commission and Entergy Regarding the Need for Additional Information to Support the River Bend Station, Unit 1 License Renewal Application
May 7, 2018	ML18127B169	River Bend Station – NRC License Renewal Inspection Report 5000458/2018011 (71002 Regional Inspection)
May 8, 2018	ML18129A356	Summary of a Telephone Conference Call Held on April 26, 2018 Between the U.S. Nuclear Regulatory Commission and Entergy Regarding the Need for Additional Information to Support the River Bend Station, Unit 1 License Renewal Application
May 10, 2018	ML18130A242	W. F. Maguire of Entergy to NRC, Response to License Renewal Application NRC Request for Additional Information Set 13, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
May 10, 2018	ML18130A935	W. F. Maguire of Entergy to NRC, Response to License Renewal Application NRC Request for Supplemental Information, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
May 10, 2018	ML18120A135	Summary of Public Telephone Conference Call Held on April 10, 2018 Between the U.S. Nuclear Regulatory Commission and Entergy Regarding the Need for Additional Information to Support the River Bend Station, Unit 1 License Renewal Application
May 15, 2018	ML18135A107	RBS Draft Response to NRC Request for Additional Information (RAI) 4.3.1-2a Class 1 Fatigue w-header-footer-watermark received on 05/13/18
May 16, 2018	ML18138A144	W. F. Maguire of Entergy to NRC, Response to License Renewal Application NRC Request for Additional Information RAI 3.2.2.2-1a Supplement, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47

Date	ADAMS Accession No.	Subject
May 16, 2018	ML18136A821	Draft Response to NRC Request for Additional Information (RAI) 3.6.2.2.2.2-1a High Voltage Insulators – RBS LRA Review
May 16, 2018	ML18136A705	RBS Draft Response to LRA Review RAI 4.7.3-1a Fluence Effects for RV Internals
May 21, 2018	ML18141A488	RBS Draft Response to LRA Review RAI 3.6.2.2.2-1a High Voltage Insulators
May 24, 2018	ML18143A686	RBS Draft Response (Operating Experience) to Draft RAI 3-0-5
May 25, 2018	ML18143B736	Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 58, Regarding River Bend Station, Unit 1, Draft Report for Comment, NUREG-1437
May 29, 2018	ML18149A638	W. F. Maguire of Entergy to NRC, Response to License Renewal Application NRC Request for Additional Information Sets 14,15 and Operating Experience Review Clarification, River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
May 29, 2018	ML18149A639	W. F. Maguire of Entergy to NRC, RBG-47861 Enclosure 3 Proprietary Information Withhold from Public Disclosure under 10 CFR 2.390
May 31, 2018	ML18151A082	Letter from Emmanuel Sayoc of NRC to W. F. Maguire of Entergy, Summary of a Telephone Conference Call Held on May 21, 2018 Between the U.S. Nuclear Regulatory Commission and Entergy Regarding the Need for Additional Information to Support the River Bend Station License Renewal Application (CAC No. MF9757)
June 04, 2018	ML18143B396	Summary of a Telephone Conference Call Held on May 3, 2018 Between the U.S. Nuclear Regulatory Commission and Entergy Regarding the Need for Additional Information to Support the River Bend Station, Unit 1 License Renewal Application (CAC No. MF9757)
June 6, 2018	ML18158A137	License Renewal Application, Revised Updated Safety Analysis Report Supplement, Appendix A, Section A.4, License Renewal Commitment List, River Bend Station, Unit 1 Docket No. 50-458 License No. NPF-47

Date	ADAMS Accession No.	Subject
June 13, 2018	ML18164A348	License Renewal Application, Revised Updated Safety Analysis Report Supplement, Appendix A, Section A.4, License Renewal Commitment List, Revised Commitment 5, River Bend Station, Unit 1 Docket No. 50-458 License No. NPF-47
June 14, 2018	ML18155A550	Summary of a Telephone Conference Call Held on May 17, 2018 Between the U.S. Nuclear Regulatory Commission and Entergy Regarding the Need for Additional Information to Support the River Bend Station, Unit 1 License Renewal Application (CAC No. MF9757)
July 9, 2018	ML18179A483	Schedule Revision For The Review Of The River Bend Station, Unit 1, License Renewal Application (CAC No. MF9757)
August 2, 2018	ML18214A162	W. F. Maguire of Entergy to NRC, Amendment 1 to License Renewal Application (License Renewal Application Annual Update), River Bend Station, Unit 1, Docket No. 50-458, License No. NPF-47
August 13, 2018	ML18225A315	W. F. Maguire of Entergy to NRC, Supplemental Information Related to License Renewal Application NRC Request for Additional Information Set 10 (4.2.1-1, 4.7.3-1 and 4.7.3-2), River Bend Station, Unit 1 Docket No. 50-458, License No. NPF-47
August 15, 2018	ML18225A215	Summary of a Telephone Conference Call Held on August 6, 2018, Between the U.S. Nuclear Regulatory Commission and Entergy to Clarify the Fluence Information in Support of the River Bend Station, Unit 1 License Renewal Application Review (CAC No. MF9757)
August 16, 2018	ML18138A355	Letter from Emmanuel Sayoc of NRC to W. F. Maguire of Entergy, Transmittal Letter of the Safety Evaluation Report Related To The License Renewal Of River Bend Station, Unit 1 (TAC No. MF9757)
August 16, 2018	ML18212A151	Safety Evaluation Report Related To The License Renewal Of River Bend Station, Unit 1 (TAC No. MF9757)

APPENDIX C PRINCIPAL CONTRIBUTORS

This appendix lists the principal contributors to this safety evaluation report and their areas of responsibility.

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APPENDIX D REFERENCES

This appendix lists the references used throughout this safety evaluation report for review of the license renewal application for **River Bend Station, Unit 1**.

Table D-1 References

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10. SUPPLEMENTARY NOTES

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11. ABSTRACT (200 words or less)

This safety evaluation report documents the U.S. Nuclear Regulatory Commission staff's technical review of the River Bend Station, Unit 1 license renewal application. By letter dated May 25, 2017, Entergy Operations, Inc. and Entergy Louisiana, LLC (collectively, Entergy or the applicant) submitted its license renewal application (LRA) in accordance with Title 10 of the *Code of Federal Regulations* Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." Entergy requests renewal of the River Bend Station, Unit 1 Operating License No. NFP-47 for a period of 20 years beyond the current expiration date of midnight, August 29, 2025.

River Bend Station is located approximately 38.6 km (24 miles) northwest of Baton Rouge, LA. The NRC issued the River Bend Station, Unit 1 (RBS) construction permit on March 25, 1977, and the operating license on November 20, 1985. RBS is a boiling-water reactor. General Electric Company supplied the nuclear steam supply system and Stone & Webster Engineering Corporation originally designed and constructed the balance of the plant. The RBS licensed power output is 3091 megawatts thermal with a

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)

River Bend Station, Unit 1, License Renewal, boiling-water reactor. NFP-47, General Electric Company, Stone & Webster Engineering Corporation, Docket No, 50-458, Entergy Operations, Inc., Entergy Louisiana, LLC, U.S. Nuclear Regulatory Commission.

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