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William F. Maguire
Site Vice President
River Bend Station

RBG-47813

January 24, 2018

Attn: Document Control Desk
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: 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

References: 1) Entergy Letter: License Renewal Application (RBG-47735 dated May 25, 2017)

2) NRC email: River Bend Station, Unit 1, Request for Additional Information, Set 5 – RBS License Renewal Application – dated December 13, 2017 (ADAMS Accession No. ML17347B432)

3) Entergy Letter: Request for Due Date Extension for License Renewal Application NRC Request for Additional Information – Set 5 (RBG-47814 dated December 20, 2017)

Dear Sir or Madam:

In Reference 1, Entergy Operations, Inc (Entergy) submitted an application for renewal of the Operating License for River Bend Station (RBS) for an additional 20 years beyond the current expiration date. In an email dated December 13, 2017, (Reference 2) the NRC staff made a Request for Additional Information (RAI), needed to complete the License Renewal application review. On December 20, 2017, (Reference 3) Entergy requested that the due date for this submittal be extended from a 30 day response to a 45 day response. The extension was requested due to decreased resources during the latter part of December 2017. Enclosure 1 provides the responses to the Set 5 RAIs. Enclosure 2 provides voluntary changes to the License Renewal Application (Reference 1). If you require additional information, please contact Mr. Tim Schenk at (225)-381-4177 or tschenk@entergy.com.

In accordance with 10 CFR 50.91(b)(1), Entergy is notifying the State of Louisiana and the State of Texas by transmitting a copy of this letter to the designated State Official.

I declare under penalty of perjury that the foregoing is true and correct. Executed on January 24, 2018.

Sincerely,

WFMaguire

WFM/RMC/alc

Enclosure 1: Set 5 RAI Responses – River Bend Station
Enclosure 2: Voluntary License Renewal Application Changes – River Bend Station

cc: (with Enclosure)

U. S. Nuclear Regulatory Commission
Attn: Emmanuel Sayoc
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cc: (w/o Enclosure)

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RBF1-17-0168

**RBG-47813**

**Enclosure 1**

**Responses to Request for Additional Information**

**Set 5**

**REQUEST FOR ADDITIONAL INFORMATION**
**LICENSE RENEWAL APPLICATION**
**RIVER BEND STATION, UNIT 1 – SET 5**
**DOCKET NO.: 50-458**
**CAC NO.: MF9757**
**Office of Nuclear Reactor Regulation**
**Division of Materials and License Renewal**

**Question**
RAI B.1.4-1 (TRP 35 Buried Piping)

Background
The "preventive actions" program element of 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 Tank Recommendations," includes the following recommendations:

For buried stainless steel piping or tanks, coatings are provided based on the environmental conditions (e.g., stainless steel in chloride containing environments). Applicants provide justification when coatings are not provided.

Coatings are in accordance with Table 1 of NACE SP0169-2007 or Section 3.4 of NACE RP0285-2002 as well as the following coating types: asphalt/coal tar enamel, concrete, elastomeric polychloroprene, mastic (asphaltic), epoxy polyethylene, polypropylene, polyurethane, and zinc.

For buried steel, copper alloy, and aluminum alloy piping and tanks and underground steel and copper alloy piping and tanks, coatings are in accordance with Table 1 of NACE SP0169-2007 or Section 3.4 of NACE RP0285-2002.

GALL Report AMP XI.M41, as modified by LR-ISG-2015-01, Table XI.M41-2, "Inspection of Buried and Underground Piping and Tanks," recommends the following:

- In regard to the inspection quantities in Table XI.M41-2, the "detection of aging effects" program element states, "[a]dditional inspections, beyond those in Table XI.M41-2 may be appropriate if exceptions are taken to program element 2, "preventive actions," or in response to plant-specific operating experience."
- One inspection per 10-year interval for stainless steel piping (reference Table XI.M41-2).
- Use of Preventive Action Category F, the highest number of inspections category, for those portions of in-scope buried steel piping which cannot be classified as Category C, D, or E.

Issue
During the audit, the staff reviewed condition reports and plant-specific documents related to buried steel and stainless steel piping. The staff concluded the following:

- It is unclear whether all in-scope steel piping is coated.
- For at least portions of the stainless steel condensate makeup, storage, and transfer system piping, no coating was installed.
- Based on the availability of soil sample parameter results, it is not clear that the soil is

noncorrosive because redox potential values and soil drainage assessments were not available, and based on the presence of sulfides, a significant corrosivity penalty is applied. In addition, particularly in regard to stainless steel piping, chloride values were not available.

Request

1. For steel piping:
   a. State what type and whether coatings were specified to be applied to all in-scope steel buried piping. If the types of coatings are not consistent with the recommended coating types in AMP XI.M41, state the basis for their effectiveness at preventing aging effects for buried steel piping.

   b. If coatings were not specified to be applied to all in-scope steel buried piping (in essence, an exception to AMP XI.M41 preventive actions), state which Preventive Action Category will be used for those portions of in-scope buried steel piping that were not specified to be coated. If Preventive Action Category F will not be used for those portions of in-scope buried steel piping that were not specified to be coated, state the basis for why additional inspections, beyond those in Table XI.M41-2, are not required to provide reasonable assurance that the piping will meet its intended function during the period of extended operation.

   c. Provide sufficient data to demonstrate that for where in-scope steel piping is buried, the soil is not corrosive.

   d. If the soil is corrosive or cannot be demonstrated to be noncorrosive; state which Preventive Action Category will be used for portions of the in-scope buried steel piping where the cathodic protection system is not meeting performance goals (i.e., operational time period, effectiveness). If Preventive Action Category F will not be used for those portions of in-scope buried steel piping where the cathodic protection system is not meeting performance goals, state the basis for why additional inspections, beyond those in Table XI.M41-2, are not required to provide reasonable assurance that the piping will meet its intended function during the period of extended operation.

2. For stainless steel piping:
   a. State what type and whether coatings were specified to be applied to all in-scope stainless steel buried piping. If the types of coatings are not consistent with the recommended coating types in AMP XI.M41, state the basis for their effectiveness at preventing aging effects for buried stainless steel piping.

   b. For portions of the in-scope buried stainless steel piping that are not coated (by design configuration or as detected during inspections), state how many inspections will be conducted per 10-year period and the basis for why the number of inspections will be adequate to manage associated aging effects.

Response

1.a. RBS design documents specify the application of coal tar epoxy coating to the buried steel piping in the systems that are within the scope of license renewal. A substitute coating of Tnemec HS 104 epoxy, which is a cycloaliphatic amine epoxy, is allowed by the specification for field-installed piping. Entergy believes that applications of the Tnemec coating are few, if any. While not included in the recommended coating types of AMP XI.M41, the Tnemec HS 104 does conform to the recommendations of American Water Works Association (AWWA) C210 "Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings" when installed in underground and underwater applications. It protects in immersion, salt spray and chemical exposures, and is applied in two coats at a minimum 6 mil dry film thickness each. It has superior abrasion resistance. As such it is an appropriate coating for preventing aging effects on steel piping.

b. Coatings were specified to be applied to all in-scope buried steel piping, and as such no further response is necessary for this question. A 2013 condition report documented one instance of buried steel piping that was discovered without protective coating. That piping ran from a drip pan under condensate transfer pumps to the condensate storage tank sump. The piping, which performs no license renewal intended function, had been installed in a 1986 plant modification that included inadequate directions for coating application. This condition is considered an isolated event and the modification process has been improved since 1986 to provide more specific installation instructions.

c. Site documentation is not adequate to demonstrate that the soil at the site is noncorrosive in accordance with the guidance in Table XI.M41-2.

d. Because the soil at the site has not been demonstrated noncorrosive, Preventive Action Category F of Appendix B of License Renewal Interim Staff Guidance LR-ISG-2015-01 will be used to determine the number of inspections for portions of the in-scope buried steel piping where the cathodic protection system is not meeting performance goals (i.e., operational time period, effectiveness) or where the piping is not protected by a cathodic protection system. This provision is added to Appendix A, Section A.1.4 and Appendix B, Section B.1.4.

2.a. Site documentation specifies that buried stainless steel piping is coated with coal tar epoxy, consistent with the recommended coating types in AMP XI.M41. This includes buried stainless steel piping that is subject to aging management review for license renewal.

b. The stainless steel piping in a soil environment is specified to be coated. Entergy has identified no buried stainless steel piping subject to aging management review that was not coated prior to installation.

The changes to LRA A.1.4 and B.1.4 follow with additions underlined and deletions lined through.

## A.1.4 Buried and Underground Piping and Tanks Inspection

The Buried and Underground Piping and Tanks Inspection Program manages the effects of aging on external surfaces of buried piping components and tanks subject to aging management review. Components included in the program are fabricated from metallic materials. The program will manage loss of material and cracking through preventive and mitigative features (e.g., coatings, backfill quality, and cathodic protection) and periodic inspection activities during opportunistic and directed excavations. The number of inspections is based on the availability and effectiveness of preventive and mitigative actions as specified in Appendix B of License Renewal Interim Staff Guidance LR-ISG-2015-01. 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 (i.e., operational time period, effectiveness) or where the piping is not protected by a cathodic protection system unless the soil is demonstrated to be noncorrosive. Annual cathodic protection surveys are conducted. For steel components, where the acceptance criteria for effectiveness of cathodic protection is other than -850 millivolts (mV) instant off, loss of material rates are measured.

## B.1.4 BURIED AND UNDERGROUND PIPING AND TANKS INSPECTION

### Program Description

The Buried and Underground Piping and Tanks Inspection Program is a new program that will manage the effects of aging on external surfaces of buried piping components and tanks subject to aging management review. Components included in the program are fabricated from metallic materials. The program will manage loss of material and cracking through preventive and mitigative features (e.g., coatings, backfill quality, and cathodic protection) and periodic inspection activities during opportunistic and directed excavations. The number of inspections is based on the availability and effectiveness of preventive and mitigative actions as specified in Appendix B of License Renewal Interim Staff Guidance LR-ISG-2015-01. 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 (i.e., operational time period, effectiveness) or where the piping is not protected by a cathodic protection system unless the soil is demonstrated to be noncorrosive. Annual cathodic protection surveys are conducted. For steel components, where the acceptance criteria for effectiveness of cathodic protection is other than -850 mV instant off, loss of material rates are measured.

### Question

RAI B.1.4-2 (TRP 35 Buried Pipe)

Background
During the audit, the staff reviewed cathodic protection surveys which documented test station voltage readings ranging from approximately +0.1 to -1.9 volts direct current (VDC) relative to a copper/ copper sulfate reference electrode (CSE). The "preventive actions" program element of GALL Report AMP XI.M41, as modified by LR-ISG-2015-01, states that to prevent damage to the coating or base metal, the limiting critical potential should not be more negative than -1200 millivolts (mV) relative to a CSE, instant-off.

The "detection of aging effects" program element of GALL Report AMP XI.M41, as modified by LR-ISG-2015-01, states that piping inspection locations are selected based on characteristics such as coating type, coating condition, cathodic protection efficacy, backfill characteristics, soil resistivity, pipe contents, and pipe function.

Issue
The staff notes that cathodic protection efficacy (i.e., test station voltage readings more negative than -850 mV) is a characteristic that determines piping inspection location; however, it is unclear to the staff why exceeding the limiting critical potential (i.e., test station voltage readings more negative than -1200 mV) is not a characteristic that determines piping inspection location given that cathodic protection surveys have documented test station voltage readings as negative as -1900 mV relative to a CSE.

Request
Provide a basis for why exceeding the limiting critical potential of -1,200 mV relative to a CSE did not result in damage to coatings or the base metal, or state the changes to the "detection of aging effects" program element necessary to include exceeding the limiting critical potential as a criterion when determining piping inspection locations.

Response
To ensure that coating or base metal has not been damaged by exceeding the limiting critical potential of -1200 mV, a criterion for selecting buried and underground piping inspection locations in addition to those specified in XI.M41 will be included in the program as part of the detection of aging effects element. The additional criterion will be; In scope piping protected by cathodic protection that is located in areas exceeding the limiting critical potential of -1200 mV in more than one survey.

The changes to LRA Sections A.1.4 and B.1.4 follow with additions underlined and deletions lined through.

### A.1.4 Buried and Underground Piping and Tanks Inspection

The Buried and Underground Piping and Tanks Inspection Program manages the effects of aging on external surfaces of buried piping components and tanks subject to aging management review. Components included in the program are fabricated from metallic materials. The program will manage loss of material and cracking through preventive and mitigative features (e.g., coatings, backfill quality, and cathodic protection) and periodic inspection activities during opportunistic and directed excavations. The number of inspections is based on the availability and effectiveness of preventive and mitigative actions. Annual cathodic protection surveys are conducted. For steel components, where the acceptance criteria for effectiveness of cathodic protection is other than -850 millivolts (mV) instant off, loss of material rates are measured. The 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 in more than one survey.

### B.1.4 BURIED AND UNDERGROUND PIPING AND TANKS INSPECTION

**Program Description**

The Buried and Underground Piping and Tanks Inspection Program is a new program that will manage the effects of aging on external surfaces of buried piping components and tanks subject to aging management review. Components included in the program are fabricated from metallic materials. The program will manage loss of material and cracking through preventive and mitigative features (e.g., coatings, backfill quality, and cathodic protection) and periodic inspection activities during opportunistic and directed excavations. The number of inspections is based on the availability and effectiveness of preventive and mitigative actions. Annual cathodic protection surveys are conducted. For steel components, where the acceptance criteria for effectiveness of cathodic protection is other than -850 mV instant off, loss of material rates are measured. The 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 in more than one survey.

**Question**
RAI B.1.4-3 (TRP 35 Buried Piping)

Background
LRA Tables 3.3.2-3, "Service Water," 3.3.2-7, "Fire Protection – Water," 3.3.2-12, "Control Building HVAC," and 3.3.2-17, "Fuel Oil," state that loss of material will be managed for carbon steel bolting, fire hydrants, piping, tanks, and valve bodies exposed to soil.
GALL Report AMP XI.M41, as modified by LR-ISG-2015-01, states that steel components can experience stress corrosion cracking when exposed to a carbonate/bicarbonate environment depending on cathodic polarization level, temperature, and pH. This modification to GALL Report AMP XI.M.41 is based on the staff's review of NACE SP0169-2013, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems," Figure 2, "SCC [stress corrosion cracking] Range of Pipe Steel in Carbonate/Bicarbonate Environments."
During the audit, the staff reviewed results from soil corrosivity testing and cathodic protection surveys, which documented: (a) soil carbonate concentrations ranging from 60 to 150 milligrams per liter; (b) soil pH ranging from 6 to 7; and (c) test station voltage readings ranging from approximately +0.1 to -1.9 VDC relative to a CSE.

Issue
The LRA does not address cracking of steel exposed to soil, which can occur in a carbonate/bicarbonate environment depending on cathodic polarization level, temperature, and pH. Based on the staff's review of soil corrosivity testing and cathodic protection surveys during the audit, it is unclear why cracking is not an aging effect requiring management for steel piping exposed to soil.

Request
State the basis for why cracking is not an aging effect requiring management for steel piping exposed to soil. Alternatively, state the changes to LRA Section B.1.4 necessary to address cracking of buried steel piping.

Response
Cracking of carbon steel piping has been documented in the oil and gas pipeline industry but not in the nuclear industry. Cracking of carbon steel piping in the pipeline industry was documented as either high pH or neutral pH cracking. There are several potential reasons for the lack of similar operating experience in the nuclear industry. The most significant reason is the low operating pressures of buried piping at nuclear plants compared to operating pressures in gas pipelines. The significantly lower pressures result in lower hoop stresses on the pipe walls and a resultant lower likelihood of cracking. In addition, buried nuclear piping operates at relatively low temperatures, which also lowers the likelihood of high or neutral pH cracking and the potential impact of variances in the cathodic protection potential level.

The piping exposed to soil in scope of the Buried and Underground Piping and Tanks Inspection Program at River Bend Station (RBS) is in low-temperature and low-pressure systems. The presence of a carbonate/bicarbonate environment by itself doesn't create the potential for cracking of carbon steel. Cracking also requires high stress and a breach in the protective coating on a susceptible material. The operating stresses at RBS are low and the carbon steel material is coated with coal tar epoxy. Because of the low stress, the potential for cracking is very low even with a breach of the protective coating and high variance in cathodic protection polarization levels. As a result of these conditions, cracking is not an aging effect requiring management. However, RBS will perform a visual examination of buried carbon steel piping surfaces for evidence of cracking when carbon steel piping surfaces are exposed for inspections. Provisions for these inspections are included in LRA Sections A.1.4 and B.1.4.

The changes to LRA A.1.4 and B.1.4 follow with additions underlined and deletions lined through.

**A.1.4 Buried and Underground Piping and Tanks Inspection**

The Buried and Underground Piping and Tanks Inspection Program manages the effects of aging on external surfaces of buried piping components and tanks subject to aging management review. Components included in the program are fabricated from metallic materials. The program will manage loss of material and cracking through preventive and mitigative features (e.g., coatings, backfill quality, and cathodic protection) and periodic inspection activities during opportunistic and directed excavations. The number of inspections is based on the availability and effectiveness of preventive and mitigative actions. <u>A visual examination of buried carbon steel piping surfaces for evidence of cracking is performed whenever carbon steel piping surfaces are exposed.</u> Annual cathodic protection surveys are conducted. For steel components, where the acceptance criteria for effectiveness of cathodic protection is other than -850 millivolts (mV) instant off, loss of material rates are measured.

**B.1.4 BURIED AND UNDERGROUND PIPING AND TANKS INSPECTION**

**<u>Program Description</u>**

The Buried and Underground Piping and Tanks Inspection Program is a new program that will manage the effects of aging on external surfaces of buried piping components and tanks subject to aging management review. Components included in the program are fabricated from metallic materials. The program will manage loss of material and cracking through preventive and mitigative features (e.g., coatings, backfill quality, and cathodic protection) and periodic inspection activities during opportunistic and directed excavations. The number of inspections is based on the availability and effectiveness of preventive and mitigative actions. Annual cathodic protection surveys are conducted. <u>A visual examination of buried carbon steel piping surfaces for evidence of cracking is performed whenever carbon steel piping surfaces are exposed.</u> For steel components, where the acceptance criteria for effectiveness of cathodic protection is other than -850 mV instant off, loss of material rates are measured.

**<u>Question</u>**
DRAI B.1.14-1 (TRP 44 Containment Leak Rate)

<u>Background</u>
NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report," in its Introduction states:

[I]f an applicant takes credit for a program in the GALL Report, it is incumbent on the applicant to ensure that the conditions and operating experience at the plant are bounded by the conditions and operating experience for which the GALL Report program was evaluated. If these bounding conditions are not met, it is incumbent on the applicant to address the additional effects of aging and augment the GALL Report aging management program(s) as appropriate.

LRA Section B.1.14, "Containment Leak Rate," program states that the applicant has implemented Option B of 10 CFR Part 50 Appendix J for leak rate testing (LRT) and is consistent, with no exceptions or enhancements, with the GALL Report AMP XI.S4. The regulation in 10 CFR Part 50, Appendix J requires LRTs to assure containment leakage does not exceed allowable leakage rates. The GALL Report AMP XI.S4, "10 CFR Part 50, Appendix J," "scope of program," program element sets the bounding condition, "the scope of the containment LRT program includes all containment boundary pressure-retaining components."

As required by 10 CFR 54.21(a)(3), relevant aging effects (e.g., as described in GALL Report, Revision 2) associated with the containment boundary pressure-retaining components must be adequately managed so that their intended function will be maintained consistent with the CLB for the period of extended operation.

Issue

LRA AMP B.1.14 Basis Document contains Procedure SEP-APJ-004, "Primary Containment Leakage Rate Testing (Appendix J) Program," as the implementing procedure for the 10 CFR 50, Appendix J, LRT. The procedure specifies a number of containment structure pressure-retaining components (e.g., penetrations, valves) to be excluded from local leak rate tests (LLRTs). It is not clear how the applicant's containment leak rate AMP will meet the bounding condition described in the "scope of program" program element to satisfy program consistency with the GALL Report AMP XI.S4, and adequately manage aging effects of the excluded components so that their intended function will be maintained consistent with the CLB for the period of extended operation.

Request

1. For those containment pressure-retaining components that have been excluded from the "scope of program," program element of LRA AMP B.1.14 "Containment Leak Rate," identify how aging effects will be adequately managed during the period of extended operation.

2. Indicate which AMPs, TLAAs, and/or AMR line items will be used to manage the aging effects for each of the components not included, or justify why an AMP, TLAA, and/or AMR line item is not necessary to manage the relevant aging effects during the period of extended operation.

Response

The components listed in the table below are exempted from 10 CFR Part 50, Appendix J local leak rate testing. During the period of extended operation, the aging management programs identified by notes in the table below will manage the effects of aging on those components that are exempt from 10 CFR Part 50, Appendix J local leak rate testing.

Notes:

1. The External Surfaces Monitoring Program [B.1.17] manages the effects of aging on external surfaces.
2. The External Surfaces Monitoring Program [B.1.17] manages the effects of aging on internal surfaces.
3. The Internal Surfaces in Miscellaneous Piping and Ducting Components Program [B.1.25] manages the effects of aging on internal surfaces.
4. The Water Chemistry Control – BWR Program [B.1.42] manages the effects of aging on internal surfaces.
5. The Fatigue Monitoring Program [B.1.18] manages cracking due to fatigue for components with a fatigue TLAA (internal surfaces).
6. The Fatigue Monitoring Program [B.1.18] manages cracking due to fatigue for components

with a fatigue TLAA (external surfaces).

7. External surface of stainless steel components exposed to indoor air have no aging effects requiring management.
8. Internal surface of stainless steel components exposed to indoor air have no aging effects requiring management.

| **Component No.** | **Notes** |
|---|---|
| CMS-SOV31A | 3, 5, 6, 7 |
| CMS-SOV31B | 3, 5, 6, 7 |
| CMS-SOV31C | 3, 7 |
| CMS-SOV31D | 3, 7 |
| CMS-SOV35A | 3, 7 |
| CMS-SOV35B | 3, 7 |
| CMS-SOV35C | 3, 5, 6, 7 |
| CMS-SOV35D | 3, 5, 6, 7 |
| CMS-V15 | 7, 8 |
| CMS-V16 | 7, 8 |
| CMS-V2 | 7, 8 |
| CMS-V3 | 7, 8 |
| DFR-MOV146 | 1, 3 |
| DFR-V181 | 1, 3 |
| DFR-V182 | 1, 3 |
| E12-MOVF004A | 1, 4 |
| E12-MOVF004B | 1, 4 |
| E12-MOVF011A | 1, 4 |
| E12-MOVF011B | 1, 4 |
| E12-MOVF021 | 1, 4 |
| E12-MOVF024A | 1, 4, 5 |
| E12-MOVF024B | 1, 4, 5 |
| E12-MOVF064A | 1, 4, 5 |
| E12-MOVF064B | 1, 4, 5 |
| E12-MOVF064C | 1, 4 |
| E12-MOVF073A | 1, 4, 5 |
| E12-MOVF073B | 1, 4, 5 |
| E12-MOVF105 | 1, 4 |
| E12-RVF005 | 1, 4, 5 |

| Component No. | Notes |
|---|---|
| E12-RVF017A | 1, 4, 5 |
| E12-RVF017B | 1, 4, 5 |
| E12-RVF025A | 1, 4, 5 |
| E12-RVF025B | 1, 4, 5 |
| E12-RVF025C | 1, 4 |
| E12-RVF030 | 1, 4 |
| E12-RVF036 | 1, 4 |
| E12-RVF101 | 1, 4 |
| E21-MOVF001 | 1, 4 |
| E21-MOVF011 | 1, 4 |
| E21-MOVF012 | 1, 4 |
| E21-RVF018 | 1,4 |
| E21-RVF031 | 1,4 |
| E22-MOVF012 | 1, 4 |
| E22-MOVF015 | 1, 4 |
| E22-MOVF023 | 1, 4 |
| E22-RVF014 | 4, 7 |
| E22-RVF035 | 4, 7 |
| E22-RVF039 | 4, 7 |
| E33-MOVF008 | 1, 4, 5 |
| E51-AOVF065 | 1, 2 |
| E51-MOVF019 | 1, 4 |
| E51-MOVF031 | 1, 4 |
| E51-MOVF068 | 1, 4, 5 |
| HVR-V10 | 7, 8 |
| HVR-V12 | 7, 8 |
| HVR-V14 | 7, 8 |
| HVR-V16 | 7, 8 |
| HVR-V18 | 7, 8 |
| HVR-V8 | 7, 8 |
| LSV-V64 | 1, 3 |
| LSV-V65 | 1, 3 |
| RHS-AOV62 | 4, 7 |

| Component No. | Notes |
|---|---|
| RHS-AOV63 | 4, 7 |
| RHS-AOV64 | 4, 7 |
| RHS-RV65 | 4, 7 |
| RHS-RV66 | 4, 7 |
| RHS-RV67A | 4, 5, 7 |
| RHS-RV67B | 4, 5, 7 |
| SSR-SOV139 | 1, 4, 5 |

**Question**

D-RAI 3.5.1.76-1 (TRP 46 Structures Monitoring)

Background

SRP-LR Table 3.5-1, item 76, recommends that sliding surfaces for radial beam seats in BWR drywell be managed for loss of mechanical function due to corrosion, distortion, dirt, overload, and wear during the period of extended operation by the Structures Monitoring Program.

LRA Table 3.5-1, item 3.5.1-76, states that RBS containment does not have the steel radial beam seats in BWR drywell subject to the listed aging effects. However, Section 3.8.3.4.7 of River Bend Station Unit 1 (RBS) Updated Safety Analysis Report (USAR) states that drywell floor beams at the drywell end and containment floor beams at the containment end have sliding supports. The USAR describes the drywell floor framing as vertically supported by the drywell and the primary shield wall, and the containment floor framings as vertically supported at the drywell and the steel containment.

Issue

Based on the information provided in the LRA, it is not clear if the sliding support surfaces described in USAR Section 3.8.3.4.7 are within the scope of RBS license renewal and subject to aging management review pursuant to 10 CFR 54.21(a)(1), and whether they will be managed for loss of mechanical function due to corrosion, distortion, dirt, overload, and wear during the period of extended operation pursuant to 10 CFR 54.21(a)(3).

Request

1. State, with supporting justification, whether or not the floor beam sliding supports described in USAR Section 3.8.3.4.7 are within the scope of RBS license renewal and subject to aging management review pursuant to 10 CFR 54.21(a)(1).

2. If within the scope of license renewal and subject to aging management review, state whether and how the loss of mechanical function due to corrosion, distortion, dirt, overload, and wear will be managed, pursuant to 10 CFR 54.21(a)(3), for the beam sliding supports described in USAR Section 3.8.3.4.7 . Further, identify the associated AMR line item(s).

3. Update the LRA and FSAR supplement, as appropriate, to be consistent with the response to the above requests.

Response

1. Entergy has determined that the River Bend Station (RBS) floor beam sliding supports described in USAR Section 3.8.3.4.7 are integral to steel components (specifically beams and plates) that are within the scope of license renewal. Changes to LRA Table 2.4-1, Table 3.5.1 and Table 3.5.2-1 follow with additions underlined and deletions lined through.

**Table 2.4-1**
**Reactor Building**
**Components Subject to Aging Management Review**

| **Component** | **Intended Function** |
|---|---|
| ***Steel and Other Metals*** | |
| Cranes: rails and structural girders | Support for Criterion (a)(1) equipment<br>Support for Criterion (a)(2) equipment |
| Cranes: structural girders | Support for Criterion (a)(1) equipment<br>Support for Criterion (a)(2) equipment |
| Penetration: sleeves | Enclosure protection<br>Flood barrier<br>Missile barrier<br>Pressure boundary<br>Support for Criterion (a)(1) equipment<br>Support for Criterion (a)(2) equipment<br>Support for Criterion (a)(3) equipment |
| Penetration: sleeves and bellows | Enclosure protection<br>Pressure boundary<br>Support for Criterion (a)(1) equipment |
| Plant exhaust stack | Support for Criterion (a)(2) equipment |
| Steel components: beams, columns and plates <u>(including sliding surfaces)</u> | Enclosure protection<br>Heat sink<br>Missile barrier<br>Support for Criterion (a)(1) equipment<br>Support for Criterion (a)(2) equipment |

**Table 3.5.1: Structures and Component Supports**

| Item Number | Component | Aging Effect/ Mechanism | Aging Management Programs | Further Evaluation Recommended | Discussion |
|---|---|---|---|---|---|
| 3.5.1-76 | Sliding surfaces: radial beam seats in BWR drywell | Loss of mechanical function due to corrosion, distortion, dirt, overload, wear | Structures Monitoring Program | No | The RBS containment and drywell floor supports have sliding surfaces. The Structures Monitoring Program manages loss of material, which could cause loss of mechanical function. See also Item Number 3.5.1-77. ~~RBS is a BWR Mark III with a free-standing SCV. RBS containment does not have the steel elements: radial beam seats in BWR drywell subject to the listed aging effects.~~ |

**Table 3.5.2-1: Reactor Building**

| Structure and/or Component or Commodity | Intended Function | Material | Environment | Aging Effect Requiring Management | Aging Management Program | NUREG-1801 Item | Table 1 Item | Notes |
|---|---|---|---|---|---|---|---|---|
| Steel components: beams, columns, plates (including sliding surfaces) | EN, HS, MB, SNS, SSR | Carbon steel | Air – indoor uncontrolled | Loss of material | Structures Monitoring | III.A1.TP-302 | 3.5.1-77 | C |

**Question**

D-RAI B.1.41-1 (TRP 46 Structures Monitoring)

Background

The "parameters monitored or inspected," and "detection of aging effects" program elements of GALL Report AMP XI.S3, "ASME Section XI, Subsection IWF," and GALL Report AMP XI.S6, "Structures Monitoring," recommends that high strength (actual measured yield strength greater than or equal to 150 ksi) structural bolts in sizes greater than 1 inch in diameter be monitored for stress corrosion cracking (SCC). The GALL Report also recommends that visual inspections be supplemented with volumetric or surface examinations to detect cracking for this type of bolt.

LRA Section B.1.41, "Structures Monitoring," and LRA Section B.1.23, "Inservice Inspection – IWF" state that the ISI-IWF and Structures Monitoring Program are existing programs, with enhancements, that will be consistent with GALL Report AMPs XI.S3 and XI.S6 respectively. The staff notes that LRA Sections B.1.23 and B.1.41 do not provide an enhancement to the "parameters monitored or inspected," and/or "detection of aging effects" program elements to address the aging effects of SCC in high strength structural bolts. LRA Table 3.5.1, item 69, states, in part, that RBS "does not have high strength bolts that are subject to sustained high tensile stress in a corrosive environment," and that "[the] listed aging effects do not require management."

During the AMP audit, the staff reviewed the applicant's document RBS-EP-15-00008, "Aging Management Program Evaluation Results - Civil/Structural" (AMPER), and associated implementing procedures and structural specifications and drawings, and noted the following:

- RBS specifications for structural steel and miscellaneous steel (e.g. Specifications Nos. 210.330, 210.311) allow the use of high strength bolts with diameters greater than 1 inch.
- The applicant excluded the use of supplemental examinations in high strength structural bolts and stated, in part, "since thread lubricants recommended in plant procedures do not contain molybdenum disulfide, SCC is not plausible, inspections are not supplemented with volumetric or surface examinations." (Reference AMPER Section 3.4.B.4.b)

<u>Issue</u>
It is not clear to the staff if "parameters monitored or inspected," and "detection of aging effects" program elements of the Structures Monitoring Program is consistent with the GALL Report recommendation because:

1. The applicant's ISI-IWF and Structures Monitoring Program and associated AMPERs do not provide sufficient justification for not managing the aging effects of SCC in high strength structural bolting since the GALL Report does not credit the molybdenum disulfide thread lubricants as the only contributor to SCC in high strength bolts.

2. It is not clear to the staff (1) whether high strength structural bolts (exempt for ASTM A325, F1852, and A490 under the Structures Monitoring Program, but applicable to the ISI-IWF program) greater than 1 inch in diameter are used or not in structural applications, or (2) how supplemental examinations are performed for these bolts because the plant's structural specifications do not preclude the use of high strength structural bolts with diameter greater than 1 inch.

<u>Request</u>
1. State whether or not there are high-strength structural bolts (ASTM A325, F1852, and A490 are exempt for SMP applications, but are not exempt for ISI-IWF applications) in sizes greater than 1 inch diameter used in structural applications or component supports at RBS.

2. If high-strength structural bolts (ASTM A325, F1852, and A490 are exempt for SMP applications, but are not exempt for ISI-IWF applications) in sizes greater than 1 inch diameter are used in structural applications or component supports:

    a. State whether and how the GALL Report recommendations for managing degradation of high-strength bolts due to SCC described in the "parameters monitored or inspected," and "detection of aging effects" of the GALL Report AMP XI.S6 will be implemented for the Structures Monitoring Program. Otherwise, provide adequate technical justification for the exception taken to the GALL Report AMP recommendation.

b. If the SCC aging effect is determined to be not applicable, as discussed in LRA Table 3.5.1, item 3.5.1-68, and Table 3.5.1, item 3.5.1-69, describe how the environment is monitored to ensure that the aging effect of cracking due to SCC remains not applicable for high-strength structural bolting.

3. Update the LRA and FSAR supplement, as appropriate, to be consistent with the response to the above requests.

Response

1. River Bend Station (RBS) has determined through review of site documentation (e.g. specifications, drawings, certified material test reports) that there are no structural bolts with actual measured yield strength greater than or equal to 150 ksi in sizes greater than 1 inch diameter that are subject to aging management review for license renewal. The RBS Inservice Inspection-IWF (ISI-IWF) Program and Structures Monitoring Program will be consistent with the programs described in NUREG-1801, Sections XI.S3 and Section XI.S6. The recommendation in the "preventive actions" program elements of NUREG-1801 Section XI.S3 and Section XI.S6 to consider the potential for stress corrosion cracking (SCC) when selecting high-strength bolts is included in the RBS ISI-IWF Program and SMP. A program implementing procedure states:

   "When procuring high strength (yield strength > 150 ksi) fasteners (bolts or studs), greater than 1" nominal diameter, confirmation of actual yield strength is required. If actual yield strength is greater than 150 ksi, and the proposed installation will be in a corrosive environment (i.e., moisture, dissolved oxygen, sulfates, fluorides or chlorides), specify inspection/replacement requirements for the fasteners to address the potential for stress corrosion cracking (SCC)."

2. a. For structural applications and component supports subject to aging management review, RBS does not use structural bolts with actual measured yield strength greater than or equal to 150 ksi in sizes greater than 1 inch diameter. See response to Item 1 above. Therefore, cracking of high-strength bolts due to SCC described in the "parameters monitored or inspected," and "detection of aging effects" of NUREG-1801 Section XI.S3 and Section XI.S6 is not an aging effect requiring management.

   b. The reason that cracking due to SCC is not an aging effect requiring management at RBS is that there is no high-strength bolting that is prone to SCC. The reason is not related to the operating environment. Therefore, monitoring of the environment is not necessary to demonstrate that cracking due to SCC remains not applicable.

3. For clarification, license renewal application (LRA) Table 3.5.1 Item 69 is revised to state that RBS does not use structural bolts with actual measured yield strength greater than or equal to 150 ksi in sizes greater than 1 inch diameter that are subject to aging management review for license renewal.

The changes to LRA Table 3.5.1 follow with additions underlined and deletions lined through.

**Table 3.5.1: Structures and Component Supports**

| Item Number | Component | Aging Effect/ Mechanism | Aging Management Programs | Further Evaluation Recommended | Discussion |
|---|---|---|---|---|---|
| 3.5.1-69 | High-strength structural bolting | Cracking due to stress corrosion cracking | Structures Monitoring Program Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts. | High-strength structural bolting | ~~Listed aging effects do not require management at RBS. RBS does not have high strength bolts that are subject to sustained high tensile stress in a corrosive environment. As defined in this line item, ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. Therefore, the listed aging effect is not applicable for RBS high strength bolting.~~<br>RBS does not use structural bolts with actual measured yield strength greater than or equal to 150 ksi in sizes greater than 1 inch diameter for structural applications or component supports that are subject to aging management review for license renewal. Therefore, the listed aging effect is not an aging effect requiring management for RBS high-strength structural bolting. |

**RBG-47813**

**Enclosure 2**

**Voluntary License Renewal Application Change**

TRP 44-3 Voluntary LRA Change to Address Audit Question
Following a breakout discussion on 11/2/2017, the reviewer re-iterated that consistency between the license renewal application (LRA) and River Bend Technical Specifications concerning the conditions and limitations of NEI 94-01 Rev 2A. This info was not in the LRA Appendix A.1.14 and should be included. As a result a revision to LRA Appendix A.1.14, is needed to be consistent with the Technical Specification statement.

The changes to LRA Appendix A.1.14 and B.1.14 follow with additions underlined and deletions lined through.

**A.1.14 Containment Leak Rate**

The Containment Leak Rate Program consists of tests performed in accordance with the regulations and guidance provided in 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," Option B; RG 1.163, "Performance-Based Containment Leak-Testing Program"; NEI 94-01, "Industry Guideline for Implementing Performance-Based Options of 10 CFR Part 50, Appendix J"; and , the conditions and limitations specified in NEI 94-01, Revision 2-A, Section 4.1, dated October 2008." ~~ANSI/ANS 56.8, "Containment System Leakage Testing Requirements."~~ The program provides for detection of pressure boundary degradation due to aging effects such as loss of leak tightness, loss of material, cracking, or loss of sealing in various systems penetrating containment. The program also provides for detection of age-related degradation in material properties of gaskets, O-rings, and packing materials for the containment pressure boundary access points.

Three types of tests are performed under Option B. Types A, B and C leakage rate testing will be implemented in accordance with the criteria set forth in RG 1.163, NEI 94-01, Revision 3-A, and, the conditions and limitations specified in NEI 94-01, Revision 2-A, Section 4.1, dated October 2008 ~~the testing criteria of ANSI/ANS-56.8-2002~~. Type A tests are performed to determine the overall primary containment integrated leakage rate at the loss of coolant accident peak containment pressure. Performance of the integrated leakage rate test (ILRT) demonstrates the leak-tightness and structural integrity of the containment. Type B and Type C containment local leakage rate tests (LLRTs) are intended to detect local leaks and to measure leakage across each pressure-containing or leakage-limiting boundary of containment penetrations. Corrective actions are taken if leakage rates exceed acceptance criteria. Test frequencies for Type A, B and C leakage rate testing comply with the requirements of 10 CFR Part 50, Appendix J, Option B based upon the criteria in NEI 94-01, Revision 3-A and the conditions and limitations specified in NEI 94-01, Revision 2-A, Section 4.1, dated October 2008.

### B.1.14 Containment Leak Rate

**Program Description**

The Containment Leak Rate Program consists of tests performed in accordance with the regulations and guidance provided in 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," Option B; RG 1.163, "Performance-Based Containment Leak-Testing Program"; NEI 94-01, "Industry Guideline for Implementing Performance-Based Options of 10 CFR Part 50, Appendix J"; and the conditions and limitations specified in NEI 94-01, Revision 2-A, Section 4.1, dated October 2008." ~~ANSI/ANS 56.8, "Containment System Leakage Testing Requirements."~~

Three types of tests are performed under Option B. Types A, B and C leakage rate testing will be implemented in accordance with the criteria set forth in RG 1.163, NEI 94-01, Revision 3-A, and the conditions and limitations specified in NEI 94-01, Revision 2-A, Section 4.1, dated October 2008." ~~the testing criteria of ANSI/ANS-56.8-2002.~~ Type A tests are performed to determine the overall primary containment integrated leakage rate at the loss of coolant accident peak containment pressure. Performance of the integrated leakage rate test (ILRT) demonstrates the leak-tightness and structural integrity of the containment. A general visual examination of the accessible interior and exterior areas of the steel containment vessel is performed prior to any ILRT. The Type A leakage rate test is performed during a period of reactor shutdown. Type B and Type C containment local leakage rate tests (LLRT) are intended to detect local leaks and to measure leakage across each pressure-containing or leakage-limiting boundary of containment penetrations. Test frequencies for Type A, B and C leakage rate testing comply with the requirements of 10 CFR Part 50, Appendix J, Option B based upon the criteria in NEI 94-01, Revision 3-A and the conditions and limitations specified in NEI 94-01, Revision 2-A, Section 4.1, dated October 2008.".

The parameters monitored are leakage rates of the steel containment vessel and associated welds, penetrations, fittings, and other access openings. The leakage rate acceptance criteria are established in accordance with 10 CFR Part 50, Appendix J, Option B.

The Containment Leak Rate Program provides measures to detect degradation prior to loss of intended function. The program provides for detection of pressure boundary degradation due to aging effects such as loss of leak tightness, loss of material, cracking, or loss of sealing in various systems penetrating containment. The program also provides for detection of age-related degradation in material properties of gaskets, O-rings, and packing materials for the containment pressure boundary access points. The use of pressure tests verifies the pressure-retaining integrity of the containment. The containment leakage rate tests demonstrate the leak-tightness of containment isolation barriers. While satisfactory performance of containment leakage rate tests demonstrates the leak-tightness and structural integrity of the containment, it does not by itself provide information that would indicate that aging degradation has initiated or that the capacity of the containment may have been reduced. This is achieved with implementation of a containment inservice inspection program as described in ASME Section XI, Subsection IWE.

The Containment Leak Rate Program documents and trends test results in accordance with the provisions of 10 CFR Part 50, Appendix J, Option B, based upon the criteria in NEI 94-01, Revision 3-A and the conditions and limitations specified in NEI 94-01, Revision 2-A, Section 4.1, dated October 2008.". The Containment Leak Rate Program demonstrates that the test results meet the acceptance criteria.

Evaluations are performed for test or inspection results that do not satisfy established criteria and a condition report is initiated to document the issue in accordance with plant administrative procedures.

The 10 CFR Part 50, Appendix B corrective action program ensures that conditions adverse to quality are promptly corrected. Corrective actions are performed in accordance with applicable procedures that meet the requirements of 10 CFR Part 50, Appendix J, Option B.