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Waterford 3

W3F1-2017-0003

January 19, 2017

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUBJECT: Responses to Request for Additional Information Set 10 Regarding the License Renewal Application for Waterford Steam Electric Station, Unit 3 (Waterford 3)
Docket No. 50-382
License No. NPF-38

- REFERENCES:**
1. Entergy letter W3F1-2016-0012 "License Renewal Application, Waterford Steam Electric Station, Unit 3" dated March 23, 2016.
 2. NRC letter to Entergy "Requests for Additional Information for the Review of the Waterford Steam Electric Station, Unit 3, License Renewal Application – Set 10" dated December 8, 2016.
 3. Entergy letter W3F1-2016-0063, "Responses to Request for Additional Information Set 1 Regarding the License Renewal Application for Waterford Steam Electric Station, Unit 3" dated October 13, 2016.

Dear Sir or Madam:

By letter dated March 23, 2016, Entergy Operations, Inc. (Entergy) submitted a license renewal application (Reference 1).

In letter dated December 8, 2016 (Reference 2), the NRC staff made a Request for Additional Information (RAI) Set 10, needed to complete its review. Enclosure 1 provides the responses to the Set 10 RAI.

During a conference call held on December 7, 2016 between the NRC staff and Entergy, the staff requested a supplemental response to RAI B.1.6-3 which was provided in Reference 3. The supplemental response, "RAI B.1.6-3 (Revised)" is also included in Enclosure 1.

There are no new regulatory commitments contained in this submittal. If you require additional information, please contact the Regulatory Assurance Manager, John Jarrell, at 504-739-6685.

I declare under penalty of perjury that the foregoing is true and correct. Executed on January 19, 2017.

Sincerely,



MRC/AJH

Enclosures: 1. Set 10 RAI Responses – Waterford 3 License Renewal Application

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Enclosure 1 to

W3F1-2017-0003

**Set 10 RAI Responses
Waterford 3 License Renewal Application**

RAI B.1.34-1a

Background:

By letter dated October 12, 2016, the staff issued RAI B.1.34 1 regarding the absence of a staff-approved withdrawal schedule for Capsule 277°. In its response dated November 10, 2016, the applicant stated that, for the capsule located at 277°, WCAP 18002 NP suggested a removal time of the reactor vessel refueling outage nearest to 48 EFPY. The applicant also stated that the estimated fluence for the capsule at 48 EFPY is 4.51×10^{19} n/cm² providing a fluence greater than the reactor vessel inner radius fluence calculated for 55 EFPY of 4.32×10^{19} n/cm².

In addition, the applicant stated that, in accordance with 10 CFR 50, Appendix H, Waterford Unit 3 will obtain NRC approval of the revised withdrawal schedule before its implementation. The applicant indicated that this action is consistent with GALL Report AMP XI.M31, "Reactor Vessel Surveillance," which indicates that a change to the capsule withdrawal schedule must be submitted to the NRC for approval prior to implementation.

The "detection of aging effects" program element of GALL Report AMP XI.M31 states that the withdrawal schedule shall be submitted as part of a license renewal application for NRC review and approval in accordance with 10 CFR Part 50, Appendix H.

Issue:

The applicant did not submit a withdrawal schedule for Capsule 277° as part of the license renewal application for NRC review and approval in accordance with 10 CFR Part 50, Appendix H. The staff noted that this is inconsistent with GALL Report AMP XI.M31.

Request:

Explain why the program is consistent with GALL Report AMP XI.M31, even though the applicant did not submit a withdrawal schedule for Capsule 277° as part of the license renewal application. Alternatively, submit the withdrawal schedule for Capsule 277° as part of the license renewal application for NRC review and approval in accordance with 10 CFR Part 50, Appendix H.

Waterford 3 Response

The WF3 commitment management system includes a commitment to submit a reactor vessel surveillance capsule withdrawal schedule for future removal of the capsule located at 277°. The commitment specifies submitting the reactor vessel surveillance capsule withdrawal schedule along with its technical justification for NRC approval prior to implementation. Finalization of the revised surveillance capsule withdrawal schedule is pending confirmation of NRC staff acceptance of the fluence calculation method used for schedule determination. Because the revised schedule is not ready for submittal as part of the license renewal application, Entergy provides the following

exception to the program described in NUREG-1801, Section XI.M31.

LRA Table B-3, WF3 Program Consistency with NUREG-1801, and Section B.1.34, Reactor Vessel Surveillance, are revised as shown below. Additions are underlined, deletions are lined through.

**Table B-3
WF3 Program Consistency with NUREG-1801**

Program Name	Plant-Specific	NUREG-1801 Comparison	
		Program has Enhancements	Program has Exceptions to NUREG-1801
Reactor Vessel Surveillance [B.1.34]			<u>X</u>

B.1.34 REACTOR VESSEL SURVEILLANCE

NUREG-1801 Consistency

The Reactor Vessel Surveillance Program is consistent with the program described in NUREG-1801, Section XI.M31, Reactor Vessel Surveillance, with the following exception.

Exceptions to NUREG-1801

~~None~~The Reactor Vessel Surveillance Program has the following exception.

<u>Elements Affected</u>	<u>Exception</u>
4. <u>Detection of Aging Effects</u>	<u>NUREG-1801 recommends that a reactor vessel surveillance capsule withdrawal schedule be submitted as part of a license renewal application. WF3 will submit the revised capsule withdrawal schedule separate from the license renewal application, but prior to implementation.</u> ¹

1. The WF3 commitment management system includes a commitment to submit a reactor vessel surveillance capsule withdrawal schedule for future removal of the capsule located at 277°. The commitment specifies submitting the schedule along with its technical justification for NRC approval. In accordance with 10 CFR 50, Appendix H, Entergy will obtain NRC approval of the revised reactor vessel surveillance capsule withdrawal schedule prior to implementation.

RAI B.1.6-3 (Revised)

Background:

Section 54.21(a)(3) of 10 CFR requires the applicant to demonstrate that the effects of aging for structures and 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 described in SRP-LR, an applicant may demonstrate compliance with 10 CFR 54.21(a)(3) by referencing the GALL Report and when evaluation of the matter in the GALL Report applies to the plant.

LRA Section B.1.6 states that the Containment Inservice Inspection - IWE AMP, with enhancement, will be consistent with the AMP XI.S1, "ASME Section XI, Subsection IWE," described in NUREG-1801. The "detection of aging effects" program element of GALL Report AMP XI.S1, "ASME Section XI, Subsection IWE," recommends that the program be augmented to require surface examination, in addition to visual examination, to detect cracking in stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading but have no current licensing basis (CLB) fatigue analysis. This program element also states that, where feasible, appropriate Appendix J tests (AMP X1.S4) may be performed in lieu of surface examination.

During the license renewal AMP audit, the staff noted that the "detection of aging effects" program element in the LRA Aging Management Program Evaluation Report (AMPER) document (WF3-EP-14-00008, Revision 1, Section 3.2.B.4.b) states: "Stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading but have no CLB fatigue analysis are monitored for cracking. Additionally, XI.S4 Containment Leak Rate Program (10 CFR Part 50, Appendix J) tests may be performed in lieu of surface examination." Further, the staff noted that the LRA AMP did not include any enhancement to the "detection of aging effects" program element to supplement (augment) the existing program and implementing procedures to require surface examination (or other enhanced examination method) capable of detecting cracking.

The technical basis for including the provision in the GALL Report (Revision 2) AMP XI.S1 to augment the program to require surface examination [or other enhanced examination] of stainless steel, dissimilar metal welds, and steel components subject to cyclic loading but have no CLB fatigue analysis is provided on pages II-446 and II-447 in Table II-22 of NUREG-1950 "Disposition of Public Comments and Technical Bases for Changes to License Renewal Guidance Documents NUREG-1801 and NUREG-1800." The basis provided therein states, in part:

VT-3 examination may not detect fine cracks that could occur as a result of cyclic loading and are only pressure-tested as part of the containment Type A Integrated Leak Rate Test (ILRT). The frequency of Type A test is every 10 years and could be extended for up to 15 years if a licensee implements Option B, performance-based test, in accordance with 10 CFR Part 50 Appendix J. The ILRT frequency thus may not provide for early detection of cracking such that corrective actions are taken to prevent loss of primary containment leak-tightness. The program is therefore augmented to require surface examination for detection of cracking during the period of extended operation.

Issue:

Noting that visual examination may not detect fine cracks that could occur as a result of cyclic loading and that the LRA AMP did not identify any enhancement to augment the existing program and implementing procedures with examination method(s) capable of detecting cracking, it is not clear to the staff that the statements noted above for the “detection of aging effects” program element are consistent with the GALL Report because the LRA AMP basis document does not state that supplemental surface examination will be performed, in addition to visual examination, to detect cracking in stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading but have no CLB fatigue analysis. Further, if the option to perform appropriate Appendix J tests in lieu of surface examination will be used for any of the mentioned components, the LRA AMPER document does not mention the type of Appendix J test that would be performed for the specific components in order for staff to evaluate the appropriateness of the test for timely detection cracking in these components.

Request:

1. State whether the supplemental surface examination recommended in GALL Report AMP X1.S1 will or will not be performed, in addition to visual examination, to detect cracking in the following containment pressure-retaining boundary components: stainless steel penetration sleeves, bellows, dissimilar metal welds, and other steel components that are subject to cyclic loading but have no CLB fatigue analysis. If supplemental surface examination will be performed, identify the components and indicate what standard will be used to perform surface examination of these components, and explain how it is captured in the implementing procedures of the LRA AMP without an enhancement.
2. If an Appendix J test is used to detect cracking, in lieu of supplemental surface examination, identify the applicable components, and indicate the type of Appendix J test that will be used for these applicable components and provide information to justify its appropriateness for timely detection of cracking prior to loss of intended function, consistent with the basis for the GALL Report provision indicated in the Background section.
3. If supplemental examination will not be performed or supplemental examination methods other than that described in GALL Report AMP XI.S1 will be used for any of the components listed in Request 1, describe the exception to the GALL Report AMP XI.S1 and justify the exception with regard to adequate capability of the LRA AMP to detect cracking due to fatigue damage from cyclic loading consistent with the criteria of 10 CFR 54.21(a)(3).

Waterford 3 Response (Revised)

1. As discussed in the background section above, the “detection of aging effects” program element of the GALL Report (NUREG-1801) AMP XI.S1, “ASME Section XI, Subsection IWE,” recommends that the program be augmented to include surface examination, in addition to visual examination, to detect cracking in stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading but have no current licensing basis (CLB) fatigue analysis. This program element also states that, where feasible, appropriate Appendix J tests (AMP X1.S4) may be performed in lieu of surface examination. As indicated in Waterford 3 (WF3) LRA Table 3.5.2-1, “TLAA – metal fatigue” applies to stainless steel penetration bellows. The bellows have analyses that are considered CLB fatigue analyses. Bellows are provided to accommodate movement of the penetration piping and sleeves due to thermal expansion. The bellows expansion joints provide the flexibility to minimize loading on penetration sleeves. Calculations for steel containment vessel penetrations were reviewed and it was confirmed that fatigue for these penetrations was not included as a design parameter. Thus, there are no stainless steel penetration sleeves associated with the containment vessel that are subject to cyclic loading. Dissimilar metal welds associated with the stainless steel bellows were not analyzed for cyclic loading. No “other [stainless] steel components” were identified that are associated with containment penetrations and subject to cyclic loading. As discussed in LRA Section 4.6, the containment vessel was designed to exhibit a general elastic behavior under accident and earthquake conditions of loading. No permanent deformations due to primary stresses have been permitted in the design under any condition of loading.

Therefore, supplemental surface examination recommended in Generic Aging Lessons Learned (GALL) Report AMP X1.S1 does not apply for the stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading. The discussion provided in the “detection of aging effects” program element in the LRA Aging Management Program Evaluation Report (AMPER) (WF3-EP-14-00008, Revision 1, Section 3.2.B.4.b) regarding the absence of CLB fatigue analysis is incorrect and has been revised consistent with this response. As stated in LRA Section B.1.6, the Containment Inservice Inspection – IWE Program (CII-IWE), with enhancements, will be consistent with the program described in NUREG-1801, Section XI.S1, ASME Section XI, Subsection IWE. Among WF3 components subject to aging management review, no stainless steel components without a CLB fatigue analysis have been identified that are subject to cyclic loading.

2. As stated in Response 1 above, a CLB fatigue analysis does exist for the WF3 stainless steel components at issue that are subject to cyclic loading, i.e., penetration bellows, and, therefore, supplemental surface examination or a substitute method is not applicable. As described in LRA Section B.1.6, WF3 CII-IWE program with the stated enhancement will be consistent with the program described in NUREG-1801 Section XI.S1.

3. As stated in Response 1 above, a CLB analysis does exist for WF3 stainless steel components at issue that are subject to cyclic loading, i.e., penetration bellows. Therefore, supplemental examinations as described in the "detection of aging effects" program element of NUREG-1801 AMP XI.S1, "ASME Section XI, Subsection IWE," or substitute methods do not apply. WF3 CII-IWE program has no exceptions to the GALL program XI.S1. As described in LRA Section B.1.6, the WF3 CII-IWE program with the stated enhancement will be consistent with the program described in NUREG-1801 Section XI.S1.