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W3F1-2016-0071

January 9, 2017

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

SUBJECT: Responses to Request for Additional Information Set 4 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 4" dated October 12, 2016.
3. Entergy letter W3F1-2016-0074 "Responses to Request for Additional Information Set 5 Regarding the License Renewal Application for Waterford Steam Electric Station, Unit 3" dated December 7, 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 October 12, 2016 (Reference 2), the NRC staff made a Request for Additional Information (RAI) Set 4, needed to complete its review. Enclosure 1 provides the responses to the Set 4 RAIs.

Also, Enclosure 2 includes a revised response to RAI 3.2.2.2-1 that supersedes the response provided in Reference 3, as discussed on conference call between Entergy and the NRC on 12/14/2016.

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 9, 2017.

Sincerely,

MRC/AJH

Enclosures: 1. Set 4 RAI Responses – Waterford 3 License Renewal Application
2. RAI 3.2.2.2-1 Revised Response

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Enclosure 1 to

W3F1-2016-0071

Set 4 RAI Responses
Waterford 3 License Renewal Application

RAI 1.16-1

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.1.16 states that the Inservice Inspection - IWF Program, with enhancements, is consistent with GALL Report Revision 2 aging management program (AMP) XI.S3, "ASME Section XI, Subsection IWF." The "detection of aging effects" program element in GALL Report AMP XI.S3 recommends that, for high-strength structural bolting (actual measured yield strength greater than or equal to 150 ksi) in sizes greater than 1 inch nominal diameter (hereafter referred to as high-strength bolting), volumetric examinations should be performed in addition to VT-3 visual examinations to detect cracking. These volumetric examinations may be waived with adequate plant-specific justification. Additionally, the GALL Report AMP XI.S3 for aging management of high-strength structural bolting recommends, in the:

- "scope of program," program element, the inclusion of high-strength structural bolting
- "preventive actions," program element, (1) the use of bolting material that has an actual measured yield strength less than 150 ksi and (2) prohibition of the use of molybdenum disulfide (MoS_2) as a thread lubricant due to its potential contribution to stress corrosion cracking (SCC)
- "parameters monitored or inspected," program element, monitoring of high-strength structural bolting susceptible to SCC, for cracking

Issue:

LRA Section B.1.16 states:

> [p]lant procedures prohibit the use of lubricants containing molybdenum disulfide. Since the use of this type of lubricant is prohibited in plant procedures and plant procedures provide the technical guidance for installation requirements […], stress corrosion cracking for high-strength structural bolting material, i.e., ASTM A325 and A490, is not plausible.

While the GALL Report specifically states that the use of MoS_2 lubricants as a lubricant is a potential contributor to SCC in high strength bolts, the GALL Report does not limit MoS_2 thread lubricant as the only contributor to the aging mechanism for SCC in the above-mentioned high strength bolts. Therefore, a justification to waive volumetric examinations of high-strength bolts based solely on the prohibition of MoS_2 lubricants does not fully account for high-strength bolting in environments conducive to SCC. Therefore, the staff has not determined that there is adequate basis to waive volumetric examination of high-strength structural bolting (actual measured yield strength of 150 ksi) in sizes greater than 1 inch nominal diameter.

In addition, during the audit, the staff noted that the "preventive actions" program element in the LRA program basis document does not discuss whether the program will specify the use of bolting material that

has an actual measured yield strength less than 150 ksi (1,034 MPa). For this reason, it is not clear whether the program will prevent future use of high strength bolting material (actual measured yield strength greater than or equal to 150 ksi or 1,034 MPa) in sizes greater than 1 inch nominal diameter. Also, the program does not account for how aging management would be accomplished if high strength bolting is used in the future (if it is used in areas that are conducive to SCC) as recommended by the GALL Report AMP XI.S3, for supplemental volumetric examination.

Request:

1. State whether high strength structural bolts (actual measured yield strength greater than or equal to 150 ksi) in sizes greater than 1 inch diameter are included within the scope of the LRA AMP B1.16, Inservice Inspection-IWF program. If so, state how the recommendations for managing degradation of high-strength bolts (including selection of bolting material less than 150 ksi) described in the "preventive actions," "parameters monitored or inspected," and "detection of aging effects" program elements will be implemented for the Inservice Inspection-IWF Program.
2. If criteria other than those described in the GALL Report are used, provide the basis to justify the adequacy of any proposed exception to manage aging effects on high strength bolting (actual measured yield strength greater than or equal to 150 ksi) in sizes greater than 1 inch nominal diameter for IWF supports, or
3. Provide additional justification to waive the volumetric examinations that the GALL Report recommends be performed in addition to VT-3 visual examinations to detect cracking of high-strength structural bolting.

Waterford 3 Response

1. Waterford 3 (WF3) has determined through review of site documentation (e.g. specifications, drawings, certified material requests) that there are no high-strength structural bolts with actual measured yield strength greater than or equal to 150 ksi in sizes greater than 1 inch diameter within the scope of the WF3 Inservice Inspection-IWF Program as described in LRA Section B.1.16. The WF3 program will be consistent with the program described in NUREG-1801, Section XI.S3. The recommendation in the "preventive actions" program element of NUREG-1801 AMP XI.S3 to consider the effects of stress corrosion cracking (SCC) when selecting high-strength bolts is included in the WF3 Inservice Inspection – IWF Program. 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. The WF3 Inservice Inspection-IWF Program will not use criteria other than those described in NUREG 1801 AMP XI.S3. See response to part 1
3. Volumetric examination of high-strength bolts is not necessary for the Inservice Inspection – IWF Program. The volumetric examination of high-strength bolting susceptible to stress corrosion cracking

discussed in program elements 3 and 4 of NUREG-1801 AMP XI.S3 is not necessary because there are no high-strength structural bolts with actual measured yield strength greater than or equal to 150 ksi in sizes greater than 1 inch diameter in the WF3 Inservice Inspection – IWF Program. See response provided in part 1 above.ki

RAI B.1.28-2

Background:

LRA Section B.1.28, "One-Time Inspection," notes that the program will be used to verify that change in material properties, loss of material and cracking are not occurring for reinforced concrete portions of the circulating water intake piping exposed to raw water.

During the audit, the staff reviewed a summary report prepared by Pure Technologies US, Inc. of a previous inspection conducted on similar concrete piping in a 132-inch cooling water discharge line. The summary report of the Pure Technologies US, Inc. inspection noted that a majority of the pipe joints exhibited separation and/or spalling and recommended all pipeline joints be cleaned and mortared to prevent corrosion of the joint steel and potential leaks. The report also recommended a re-inspection of the pipeline in approximately five years.

The “Program Description” and “Scope of Program” of GALL Report AMP XI.M32 “One-Time Inspection” states, in part: “This program cannot be used for structures or components with known age-related degradation mechanisms or when the environment in the period of extended operation is not expected to be equivalent to that in the prior 40 years. Periodic inspections should be proposed in these cases.”

Issue:

The GALL Report includes AMR line items for concrete piping exposed to raw water and recommends XI.M20, “Open-Cycle Cooling Water System,” for managing the effects of aging. GALL Report AMP XI.M20 recommends periodic inspections. In addition, the Pure Technologies report recommended a follow-up inspection of similar piping in approximately five years.

Based on the GALL Report recommendation in AMPs XI.M20 and XI.M32 that periodic inspections should be proposed for structures or components with known age-related degradation mechanisms, and the recommendations in the Pure Technologies report for addressing observed degradation mechanism(s), it is unclear to the staff why a one-time inspection is appropriate to manage the effects of aging for concrete piping in the circulating water system. The staff also needs additional information to determine whether the applicant’s operating experience supports the sufficiency of the LRA AMP.

Request:

Explain why it is appropriate to manage the effects of aging on concrete portions of the circulating water intake piping exposed to raw water via the one-time inspection program. The response should consider the guidance in the GALL Report AMPs for similar material and environment combinations and the operating experience described in the Pure Technologies report, specifically the recommendation to re-inspect the piping.

Waterford 3 Response

Based on results of previous inspection, Entergy has concluded that the One-Time Inspection Program is not the most appropriate program to manage the effects of aging on concrete portions of the circulating water intake piping exposed to raw water. The Periodic Surveillance and Preventive Maintenance Program will be credited to manage the effects of aging on this piping. Inspections under the Periodic Surveillance and Preventive Maintenance Program will occur at least once every ten years during the period of extended operation. A frequency of once every ten years is appropriate based on the following factors.

- The normal operating pressure in the circulating water intake piping is low.
- The circulating water intake piping serves a license renewal intended function only in the event of a tornado that requires makeup from the circulating water system to the auxiliary component cooling water wet cooling tower basins
- The interior of the piping is normally inaccessible. Access requires entry through a water box of the main condenser.
- The condition of the reinforced concrete piping was generally good.

The first inspection of the reinforced concrete piping will be performed during the first five years of the period of extended operation.

LRA revisions are as follows. Additions are underlined and deletions are lined through.

LRA Sections and Tables Affected

Table 3.3.1: Auxiliary Systems
Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System Summary of Aging Management Evaluation
A.1.28 One-Time Inspection Program
A.1.30 Periodic Surveillance and Preventive Maintenance Program
B.1.28 One-Time Inspection
B.1.30 Periodic Surveillance and Preventive Maintenance

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-30	Concrete; cementitious material piping, piping components, and piping elements exposed to raw water	Changes to material properties due to aggressive chemical attack	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	The nonsafety-related concrete circulating water intake piping (included in scope for a rare tornado event) is designed and constructed to AWWA C-300, -301, -302 requirements resulting in dense, well-cured high strength concrete with low permeability. The pipe is exposed to raw water (river water) that is not aggressive. Consequently, changes in material properties is not a significant aging effect for the piping. Nevertheless, the ~~One-Time Inspection~~ Periodic Surveillance and Preventive Maintenance Program will confirm that unacceptable degradation is not occurring.

3.3.1-31	Concrete; cementitious material piping, piping components, and piping elements exposed to raw water	Cracking due to settling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	The nonsafety-related concrete circulating water intake piping is included in scope for a rare tornado event. Bedding under this piping conforms to Class A or Class C as specified by the American Concrete Pipe Association which provides a densely compacted backfill limiting the potential for settlement leading to cracking of the concrete piping. Consequently, cracking of the piping due to settling is not a significant aging effect for the piping. This is consistent with NUREG-1800, Table 3.3.1, which does not identify cracking due to settling for reinforced concrete piping. Nevertheless, the ~~One-Time Inspection~~ Periodic Surveillance and Preventive Maintenance Program will confirm that unacceptable degradation is not occurring.

3.3.1-32	Reinforced concrete, asbestos cement piping, piping components, and piping elements exposed to raw water	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive chemical attack	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	The nonsafety-related concrete circulating water intake piping (included in scope for a rare tornado event) is designed and constructed to AWWA C-300, -301, -302 requirements resulting in dense, well-cured high strength concrete with low permeability. The pipe is exposed to raw water (river water) that is not aggressive. Consequently, cracking and changes in material properties are not significant aging effects for the piping. Nevertheless, the ~~One-Time Inspection~~ Periodic Surveillance and Preventive Maintenance Program will confirm that unacceptable degradation is not occurring.

3.3.1-33	Concrete; cementitious material piping, piping components, and piping elements exposed to raw water	Loss of material due to abrasion, cavitation, aggressive chemical attack, and leaching	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	The nonsafety-related concrete circulating water intake piping (included in scope for a rare tornado event) is designed and constructed to AWWA C-300, -301, -302 requirements resulting in dense, well-cured high strength concrete with low permeability. The pipe is exposed to raw water (river water) that is not aggressive. Consequently, loss of material is not a significant aging effect for the piping. Nevertheless, the ~~One-Time Inspection~~ Periodic Surveillance and Preventive Maintenance Program will confirm that unacceptable degradation is not occurring.

Table 3.3.2-3
Component Cooling and Auxiliary Component Cooling Water System
Summary of Aging Management Evaluation

Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Concrete	Raw water (int)	Change in material properties	Periodic Surveillance and Preventive Maintenance ~~One-Time Inspection~~	VII.C1.AP-250 VII.C1.AP-155	3.3.1-30 3.3.1-32	E
Piping	Pressure boundary	Concrete	Raw water (int)	Cracking	Periodic Surveillance and Preventive Maintenance ~~One-Time Inspection~~	VII.C1.AP-248 VII.C1.AP-155	3.3.1-31 3.3.1-32	E
Piping	Pressure boundary	Concrete	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance ~~One-Time Inspection~~	VII.C1.AP-249	3.3.1-33	E

A.1.28 One-Time Inspection Program

~~CW intake piping internals (reinforced concrete portions)~~	~~One-time inspection activity will confirm that change in material properties, loss of material, and cracking are not occurring or are occurring so slowly that they will not affect the component intended function during the period of extended operation.~~

A.1.30 Periodic Surveillance and Preventive Maintenance Program

The Periodic Surveillance and Preventive Maintenance (PSPM) Program manages aging effects not managed by other aging management programs, including change in material properties, cracking, loss of material, and reduction of heat transfer.

Inspections occur at least once every 5 years during the period of extended operation, except for inspection of the circulating water intake piping. Inspection of the internal surface of the nonsafety-related concrete circulating water intake piping occurs at least once every 10 years with the first inspection prior to December 18, 2029.

Credit for program activities has been taken in the aging management review of the following systems and structures.

- Inspect submersible sump pumps and backup pumps for dry cooling towers.
- Inspect emergency diesel generator system heat exchanger tubes.
- Inspect internal surface of stainless steel expansion joint in diesel exhaust.
- Inspect tubes and fins of the CCW dry cooling tower radiator.
- Inspect the internal surface of the portable UHS replenishment pump casing.
- Inspect the circulating water intake piping internal surface (reinforced concrete portions)
- Inspect the inside surface of RCP oil collection components (drip pans, enclosures, flame arrestors (tail pipe), piping, sight glass, tanks, and valve bodies).
- Inspect internal and external surfaces of control room HVAC portable smoke removal fan and smoke-ejector duct.

B.1.28 One-Time Inspection

Program Description

~~Circulating water intake piping (reinforced concrete portions)~~	~~One-time inspection activity will confirm that change in material properties, loss of material and cracking are not occurring or are occurring so slowly that they will not affect the component intended function during the period of extended operation.~~

B.1.30 Periodic Surveillance and Preventive Maintenance

Program Description

There is no corresponding NUREG-1801 program.

The Periodic Surveillance and Preventive Maintenance (PSPM) Program includes periodic inspections and tests to manage aging effects not managed by other aging management programs, including change in material properties, cracking, loss of material, and reduction of heat transfer.

Inspections occur at least once every 5 years during the period of extended operation, except for inspection of the circulating water intake piping. Inspection of the internal surface of the nonsafety-related concrete circulating water intake piping occurs at least once every 10 years with the first inspection prior to December 18, 2029.

Credit for program activities has been taken in the aging management review of systems, structures and components as described below.

System	Inspection
Plant drains	Perform a visual inspection of the surface condition of a representative sample of the submersible sump pumps and the back-up pumps for the dry cooling towers.
Emergency generator system	Perform a visual inspection of the surface condition of a representative sample of EDG cooler heat exchanger tubes to manage loss of material due to wear. Monitor the surface condition of the expansion joint to verify the absence of cracking due to stress corrosion/IGA.
Circulating water intake piping (reinforced concrete portions)	Perform visual inspection of the internal surface of the concrete piping to confirm that unacceptable degradation due to the effects of aging is not occurring.
Component cooling and auxiliary component cooling water system	Use visual or other NDE techniques to inspect a representative sample of the tubes and fins of the CCW dry cooling tower radiator to manage loss of material and fouling that could result in a reduction of heat transfer capability. Perform a visual inspection of the internal surface of the portable UHS replenishment pump casing to manage loss of material.

System	Inspection
RCP oil collection (RCPOC)	Visually inspect the inside surface of RCP oil collection components (representative samples) in an environment of waste lube oil to manage loss of material.

Evaluation

3. Parameters Monitored/Inspected

The Periodic Surveillance and Preventive Maintenance Program monitors and inspects parameters linked to the degradation of the particular structure or component. For example, surface conditions of metallic components are monitored for loss of material, fouling that could result in a reduction of heat transfer capability, cracking, and worn or flaking surfaces, while polymeric components are inspected for cracking, crazing, scuffing, dimensional changes, discoloration and hardening as evidenced by loss of suppleness.

For selected metallic piping components, wall thickness is measured to determine the extent of corrosion caused by recurring internal corrosion mechanisms. For reinforced concrete piping, visual inspections monitor the condition of the internal surface.

4. Detection of Aging Effects

Periodic surveillance and preventive maintenance activities provide for periodic component inspections and testing to detect aging effects. Inspection and test intervals are established such that they provide timely detection of degradation prior to loss of intended functions. Inspection and test intervals, sample sizes, and data collection methods are dependent on component material and environment, biased toward locations most susceptible to aging, and derived with consideration of industry and plant-specific operating experience and manufacturers' recommendations.

Established techniques such as visual inspections are used. Each inspection or test occurs at least once every 5 years, except for inspection of the circulating water intake piping. Inspection of the internal surface of the nonsafety-related concrete circulating water intake piping occurs at least once every 10 years with the first inspection prior to December 18, 2029. Inspections are performed by personnel qualified to perform the selected technique.

For each activity listed above that refers to a representative sample, a representative sample is 20 percent of the population (defined as components having the same material, environment, and aging effect combination) with a maximum of 25 components.

RAI 1.38-1

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.

The "parameters monitored or inspected," and "detection of aging effects" program elements of 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 to 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 bolts.

LRA Section B.1.38, "Structures Monitoring," states that the Structures Monitoring Program is an existing program, with enhancements, that will be consistent with GALL Report AMP XI.S6. The staff notes that LRA Section B.1.38 does 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 68, states, in part, that "since molybdenum disulfide thread lubricants are not used at WF3, for structural bolting applications, SCC of high strength structural bolting is not an aging effect requiring management at WF3."

During the AMP audit, the staff reviewed the applicant's "Aging Management Program Evaluation Report Civil/Structural" (AMPER), implementing procedures, plant structural specifications and drawings, and noted the following:

- The applicant excluded the use of supplemental examinations in high strength structural bolts and states, in part, that "since a thread lubricant containing molybdenum disulfide is not used at WF3, SCC of structural bolting in not plausible, inspections are not required to be supplemented with volumetric or surface examinations." (AMPER Section 3.4.2.b)
- Plant structural specification LOU 1564.723, "Structural Steel Seismic I & II," states, in part, that "field connections shall be friction type joints, assembled with 7/8" diameter high-strength bolts, unless otherwise noted on drawings…"
- Plant drawings notes, in general, stated that "field connections, unless noted, shall be ASTM A325 high strength bolted friction type connections…"
- Structural drawings reviewed by the staff indicates the use of several types of bolts (including A325 and A193 B7 types bolts), and bolts with diameter greater than 1 inch.

Issue:

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 Structures Monitoring Program does not provide sufficient justification for not managing the aging effects of SCC in high strength structural bolting, because the GALL Report does not credit the molybdenum disulfide thread lubricant as the only contributor to the aging mechanism of SCC in high strength bolts.
2. It is not clear to the staff (1) whether high strength structural bolts 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 and drawings do not preclude the use of high strength structural bolts with diameter greater than 1 inch when specified or noted as such in the drawing details.

Request:

1. State whether or not there are high-strength structural bolts (actual measured yield strength greater than or equal to 150 ksi) in sizes greater than 1 inch diameter used in structural applications. Note: consider actual bolts being specified in the plant's structural drawing details in addition to generic drawing notes.
2. If high-strength structural bolts (actual measured yield strength greater than or equal to 150 ksi) in sizes greater than 1 inch diameter are used in structural applications, state whether and how the recommendations for managing degradation of high-strength bolts 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.
3. Update the LRA and FSAR supplement, as appropriate, to be consistent with the response to the above requests.

Waterford 3 Response

1. WF3 has identified the following high-strength structural bolting with actual measured yield strength greater than or equal to 150 ksi in sizes greater than 1 inch diameter that are within the scope of the Structures Monitoring Program. The reactor coolant pumps (RCP), safety injection tanks (SIT) and reactor coolant system (RCS) supports have bolting consisting of ASTM A-540 threaded bolts/studs. These bolts/studs with minimum yield strength of 150 ksi are monitored in the Structures Monitoring Program by visual inspection.

   WF3 has determined through review of site documentation (e.g. specifications, drawing, certified material requests, etc.) that there are no other high-strength structural bolts with actual measured yield strength greater than or equal to 150 ksi in sizes greater than 1 inch diameter within the scope of the Structures Monitoring Program.

2. The "parameters monitored or inspected," and "detection of aging effects" program elements of NUREG-1801 AMP XI.S6 provide recommendations for managing cracking of high-strength bolts due to stress corrosion cracking (SCC). In the WF3 Structures Monitoring Program, these recommendations are not necessary because the environmental conditions for SCC are not present for the high-strength bolting identified in Part 1 of this response.

NUREG-1801 AMP XI.S6 “detection of aging effects” program element states that visual inspection of high-strength bolting is supplemented with volumetric or surface examination to detect cracking. Justification for waiving volumetric and surface examination of WF3 high-strength bolting follows.

The A-540 bolts/studs associated with each SIT are in an area outside the secondary shield walls that is dry and relatively cool. The A-540 bolts/studs associated with the RCP and RCS are part of the “stop supports” for these components. These components are not exposed to an aggressive environment (i.e. high stress, wet environment with high oxygen levels or lubricant containing molybdenum disulfide) conducive to SCC. The thread lubricant used for this bolting material is N-5000, Anti-Seize lubricant which is a nickel/graphite based thread lubricant not containing molybdenum disulfide. Because these connections are in a noncorrosive, low-temperature and low-stress environment, stress corrosion cracking in these bolts is not expected. In addition, NUREG-1801 does not identify A-540 bolting material as prone to SCC. The Structures Monitoring Program inspections of the SIT, RCP and RCS support bolting performed at least once every five years provide reasonable assurance that environmental conditions will be maintained that are not conducive to SCC. Therefore, cracking due to SCC is not considered an aging effect requiring management for these bolts

3. Consistent with the response to RAI B.1.16-1 and with the response above, LRA Table 3.5.1 items 3.5.1-68 and 3.5.1-69 discussion has been revised to provide additional clarification.

LRA revisions are as follows. Additions are shown with underline and deletions with strikethrough.

Item Number	Component	Aging Effect/ Mechanism	Aging Management Program	Further Evaluation Recommended	Discussion
3.5.1-68	High-strength structural bolting	Cracking due to stress corrosion cracking	ISI (IWF)	No	WF3 does not have high-strength structural bolts with actual measured yield strength greater than or equal to 150 ksi in sizes greater than 1 inch diameter within the scope of the WF3 Inservice Inspection-IWF Program. Therefore, the listed aging effect is not an aging effect requiring management for WF3 ISI (IWF) high-strength bolting. ~~NUREG-1801 item referencing this item defines the bolting susceptible to SCC as: high strength (actual measured yield strength greater than or equal to 150 kilo-pound per square inch [ksi] or greater than or equal to 1,034 MPa) for structural bolts greater than 1 inch (25 mm) in diameter. Per EPRI 1015078, a periodically wetted environment and the use of thread lubricant containing molybdenum disulfide must be present to initiate SCC in high yield-strength bolting. Since Molybdenum disulfide thread lubricants are not used at WF3, for structural bolting applications, SCC of high strength structural bolting is not an aging effect requiring management at WF3.~~
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.	No	WF3 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. ~~WF3 procedures do not identify the use of high strength bolts ASTM A325 and A-490 for structural applications.~~ Therefore, the listed aging effect is not applicable for WF3 high strength bolting.

RAI 3.3.2.3.15.29-1

Background:

LRA Table 3.3.2-15-29, "Radiation Monitoring System, Nonsafety-Related Components Affecting Safety-Related Systems," states that aluminum filter housing exposed to waste water will be managed for loss of material using the Internal Surfaces In Miscellaneous Piping and Ducting Components program.

Issue:

Stress corrosion cracking (SCC) is a form of environmentally assisted cracking which is known to occur in high and moderate strength aluminum alloys. Halide concentrations should generally be considered high enough to facilitate cracking due to SCC of aluminum alloys in waste water unless demonstrated otherwise; however, depending on the specific aluminum alloy used for the filter housings, the aging effect of cracking due to SCC may be applicable. Without knowledge of the specific aluminum alloy, it is unclear to the staff if cracking due to SCC is an applicable aging effect for this material/environment combination.

Request:

Provide the basis for why cracking due to SCC is not an applicable aging effect for aluminum filter housing exposed to waste water in the "Radiation Monitoring System, Nonsafety Related Components Affecting Safety Related" system.

Waterford 3 Response

Upon further review of available documentation and consultation with the equipment supplier, Entergy has found that the filter housings are constructed of stainless steel. The aging effect requiring management for stainless steel filter housings with a waste water (int) environment is loss of material. The Internal Surfaces in Miscellaneous Piping and Ducting Components Program is the program credited for managing this aging effect. The material type of aluminum is removed from LRA Section 3.3.2.1.15 because there are no other component types constructed of aluminum in the auxiliary systems in scope for 10 CFR 54.4(a)(2). The line items for filter housings constructed of aluminum are deleted from LRA Table 3.3.2-15-29. Line items for stainless steel filter housings are appropriately shown in LRA Table 3.3.2-15-29.

The LRA is revised as follows. Deletions are shown with strikethrough.

LRA Sections and Tables Affected

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

The following lists encompass materials, environments, aging effects requiring management, and aging management programs for the series 3.3.2-15-xx tables.

Materials

Nonsafety-related components affecting safety-related systems are constructed of the following materials.

~~Aluminum~~
Carbon steel
Copper alloy
Copper alloy > 15% zinc or > 8% aluminum
Glass
Gray cast iron
Plastic
Stainless steel

Table 3.3.2-15-29
Radiation Monitoring System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-29: Radiation Monitoring System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
~~Filter housing~~	~~Pressure boundary~~	~~Aluminum~~	~~Air – indoor (ext)~~	~~None~~	~~None~~	~~VII.J.AP-135~~	~~3.3.1-113~~	~~A~~
~~Filter housing~~	~~Pressure boundary~~	~~Aluminum~~	~~Waste water (int)~~	~~Loss of material~~	~~Internal Surfaces in Miscellaneous Piping and Ducting Components~~	~~--~~	~~--~~	~~G~~
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Filter housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E

Enclosure 2 to

W3F1-2016-0071

RAI 3.2.2.2-1 Revised Response
Waterford 3 License Renewal Application

RAI 3.2.2.2-1 Revised Response

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 will be maintained consistent with the current licensing basis for the period of extended operation. As described in NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," an applicant may demonstrate compliance with 10 CFR 54.21(a)(3) by referencing the NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," and when evaluation of the matter in the GALL Report applies to the plant.

The LRA states that the Water Chemistry Control-Primary and Secondary program will be consistent with GALL Report AMP XI.M2, "Water Chemistry." GALL Report AMP XI.M2 recommends a verification of the effectiveness of the chemistry control program, such as GALL Report AMP XI.M32, "One-Time Inspection," to ensure that significant degradation is not occurring and the component's intended function is maintained during the period of extended operation.

Issue:

LRA Table 3.2.2-2 states that the nickel alloy thermowell exposed to treated borated water will be managed by the Water Chemistry Control-Primary and Secondary program for loss of material. The line item in question does not have a plant-specific note indicating that it will be included in the One-Time Inspection program inspection sample, as recommended by
GALL Report AMP XI.M2.

Request:

Confirm that a one-time inspection program such as GALL Report, AMP XI.M32, "One-Time Inspection," will be used to verify the effectiveness of the Water Chemistry Control-Primary and Secondary program for managing loss of material by including the nickel alloy thermowell in the One-Time Inspection program or provide the bases for not including the item in question in the One-Time Inspection program.

Waterford 3 Response

The One-Time Inspection Program will verify the effectiveness of the Water Chemistry Control – Primary and Secondary Program for managing loss of material including loss of material for the nickel alloy thermowell identified in LRA Table 3.2.2-2. The description of the Water Chemistry Control – Primary and Secondary Program in Appendix B, Section B.1.41, states that the One-Time Inspection Program as described in Section B.1.28 includes inspections to verify that the Water Chemistry Control – Primary and Secondary Program has been effective at managing the effects of aging. The description of the One-Time Inspection Program includes the aging effect of loss of material for the Water Chemistry Control – Primary and Secondary Program.

The plant-specific note for using the One-Time Inspection Program to verify the effectiveness of the Water Chemistry Control – Primary and Secondary Program (Note 201) is not used in the WF3 license renewal application for line items that do not have a matching NUREG-1801 line item (no table entries in columns "NUREG-1801 Item" and "Table 1 Item"). Plant-specific notes are used to help explain how a program compares to the NUREG-1801 program for that line item and therefore have no purpose for line items that are not compared to NUREG-1801.