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W3F1-2016-0063

October 13, 2016

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

SUBJECT: Responses to Request for Additional Information Set 1 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 1, dated September 15, 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 September 15, 2016 (Reference 2), the NRC staff made a Request for Additional Information (RAI) Set 1, needed to complete its review. Enclosure 1 provides the responses to the Set 1 RAIs.

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 October 13, 2016.

Sincerely,

FOR MIKE CHISUM
WF3 SVP

MRC/AJH

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

cc:

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Enclosure 1 to

W3F1-2016-0063

Set 1 RAI Responses
Waterford 3 License Renewal Application

RAI B.1.1-1

Background:

The "detection of aging effects" program element of Generic Aging Lessons Learned (GALL) Report aging management program (AMP) XI.M18, "Bolting Integrity," recommends periodic inspections (at least once per refueling cycle) of closure bolting for signs of leakage to ensure the detection of age-related degradation due to loss of material and loss of preload.

LRA Section B.1.1, "Bolting Integrity," states that the Bolting Integrity Program is an existing program, with enhancements, that will be consistent with GALL Report AMP XI.M18. License renewal application (LRA) Section B.1.1, Enhancement 1 to the "scope of program" program element states that the Bolting Integrity Program procedures will be enhanced to include submerged pressure-retaining bolting.

Issue:

Based on its review of the LRA and onsite review of program basis documents, the staff noted that the applicant's Bolting Integrity Program lacked information regarding the location, frequency, and method(s) of inspections for the submerged closure bolting. Noting that a submerged environment limits the ability to perform visual inspections and detect leakage of closure bolted connections and the applicant did not provide information on proposed inspection methods, it is not clear how the submerged closure bolting will be inspected such that loss of material and loss of preload can be detected prior to a loss of intended function.

Request:

For the submerged closure bolting within the scope of license renewal to be managed by the Bolting Integrity Program:

a) For each location that submerged closure bolting is used, describe the frequency and method(s) of inspection to be used to detect loss of material and loss of preload on the submerged closure bolts.
b) Provide a technical basis as to why the proposed frequency and method(s) of inspections will be sufficient to detect loss of material and loss of preload prior to a loss of intended function. Also describe how the proposed frequency and method(s) of inspection will be capable of detecting loss of material in crevice locations (e.g., threaded regions or the shank below the bolt heads) that are not readily visible.

Waterford 3 Response

a) Submerged closure bolting included in the Bolting Integrity Program is described as follows.

   LRA Table 3.2.2-3 incorrectly identified bolting submerged in treated borated water. This bolting is bolting for the fuel transfer tube flange cover. The subject bolting is in an environment of air-indoor when installed. The flange cover and associated bolting are removed during refueling activities when the flange is submerged. Table 3.2.2-3 is corrected in the LRA changes provided with this response.

   The four dry cooling tower (DCT) area sump pumps are connected to submerged discharge piping with flanged and bolted steel pressure-retaining connections in a waste water environment.

The DCT area sump pumps are not safety related; however, they are credited in the analyses for the probable maximum precipitation event to prevent flooding of local equipment.

Two DCT area sump pumps are located in each of two concrete sumps, which are approximately four feet in diameter and nine feet deep with a steel cover plate upon which the pump motors, couplings, stuffing box and discharge piping are mounted. For inspection of the normally inaccessible submerged bolted connection, a crane is required to remove the motor, pump, discharge piping, and submerged bolted connection. Since both sump pumps for each DCT area sump have a common discharge line, the removal of one pump renders both pumps unavailable and in modes 1 thru 4 requires WF3 to enter the ultimate heat sink Technical Specifications action statement for that DCT.

Aging management activities will include opportunistic inspection of the normally inaccessible submerged bolted connection on each DCT area sump pump. The DCT area sump pump submerged bolting is added to the exception regarding frequency of inspection and an enhancement to perform opportunistic inspections is provided in the LRA changes below. In addition, each DCT area sump pump is flow-tested at least once every seven years. An acceptable flow test indicates that the submerged bolted connection is not degraded due to loss of material or loss of preload such that the intended function cannot be met.

b) Degradation detected during the periodic flow test or opportunistic inspection would be entered into the corrective action program for further investigation.

Loss of material is a long-term aging effect when appropriate materials are selected for the operating environment. A review of operating experience and maintenance records dating back to 1987 identified no indication of loss of intended function of submerged bolting associated with the DCT sump pumps. Therefore, the monitoring methods and frequency of pump flow testing and opportunistic inspections have been shown effective in managing the applicable aging effects to prevent significant age-related degradation of the submerged DCT area sump pump submerged bolting

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

Table 3.2.2-3: Containment Penetrations

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
~~Bolting~~	~~Pressure Boundary~~	~~Stainless Steel~~	~~Treated borated water (ext)~~	~~Loss of material~~	~~Bolting Integrity~~	~~–~~	~~–~~	~~H~~
~~Bolting~~	~~Pressure Boundary~~	~~Stainless Steel~~	~~Treated borated water (ext)~~	~~Loss of preload~~	~~Bolting Integrity~~	~~V.E.EP-120~~	~~3.2.1-15~~	~~B~~

A.1.1 Bolting Integrity Program

The Bolting Integrity Program will be enhanced as follows.

- Revise Bolting Integrity Program procedures to include submerged pressure retaining bolting.
- Revise Bolting Integrity Program procedures to monitor high strength bolting locations (i.e., bolting with actual yield strength greater than or equal to 150 ksi) for cracking.
- Revise Bolting Integrity Program procedures to include a volumetric examination per ASME Code Section XI, Table IWB-2500-1 for high-strength closure bolting with actual yield strength greater than or equal to 150 ksi regardless of code classification.
- Revise Bolting Integrity Program documents to specify opportunistic inspections of normally inaccessible dry cooling tower area sump pump discharge piping bolted connections.

B.1.1 Bolting Integrity

The Bolting Integrity Program at WF3, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M18, Bolting Integrity, with the following exception.

Exceptions to NUREG-1801

The Bolting Integrity Program has the following exception.

Elements Affected	Exception
4. Detection of Aging Effects	NUREG-1801 recommends periodic inspections of bolting for leakage, loss of preload and cracking. Periodic inspections are not performed for buried fire water system bolting and dry cooling tower area sump pump submerged bolting.[1]

Exception Note

1. The Bolting Integrity Program manages loss of preload for buried fire water system bolting using preventive measures implemented before burial, specifically, verifying correct material, checking for uniform gasket compression after assembly, and applying protective coating, and applying an appropriate preload. These measures have proven effective in managing loss of preload for buried fire water system bolting. Inspection of buried fire water system bolting is performed in accordance with the Buried and Underground Piping and Tanks Inspection Program.

   The Bolting Integrity Program manages loss of material and loss of preload for normally inaccessible submerged dry cooling tower (DCT) area sump pump discharge piping bolting. Aging management activities include opportunistic inspection of the normally inaccessible submerged bolted connection on each DCT area sump pump whenever the bolted connection is accessible. In addition, each DCT area sump pump is flow-tested at least once every seven years. An acceptable flow test is an indication that the submerged bolted connection has not

degraded due to loss of material or loss of preload. Degradation detected during the flow test or opportunistic inspection would be entered into the corrective action program for further investigation. Loss of material and loss of preload are long-term aging effects when appropriate materials are selected for the operating environment. A review of operating experience and maintenance records dating back to 1987 identified no indication of loss of intended function of submerged bolting associated with the DCT sump pumps. Therefore, the monitoring methods and frequency of pump flow testing and opportunistic inspections have been shown effective in managing the applicable aging effects to prevent significant age-related degradation of the submerged DCT area sump pump submerged bolting

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
1. Scope of the Program	Revise Bolting Integrity Program procedures to include submerged pressure-retaining bolting.
3. Parameters Monitored or Inspected	Revise Bolting Integrity Program procedures to monitor high strength bolting locations (i.e., bolting with actual yield strength greater than or equal to 150 ksi) for cracking.
4. Detection of Aging Effects	Revise Bolting Integrity Program procedures to include a volumetric examination per ASME Code Section XI, Table IWB-2500-1, for high strength closure bolting with actual yield strength greater than or equal to 150 ksi regardless of code classification.
4. Detection of Aging Effects	Revise Bolting Integrity Program documents to specify opportunistic inspections of normally submerged dry cooling tower area sump pump discharge piping bolting.

RAI B.1.1-2

Background:

GALL Report AMPs XI.M18 and XI.S3 state that molybdenum disulfide (MoS_2) should not be used as a lubricant due to its potential contribution to stress corrosion cracking (SCC), especially for high-strength bolts. GALL Report AMPs XI.S6 states that preventive actions emphasize proper selection of lubricants to prevent or minimize cracking of high-strength bolts. The GALL Report also states that the applicant is to evaluate applicable operating experience to support the conclusion that the effects of aging are adequately managed.

LRA Sections B.1.1, B.1.16, and B.1.38 state that the Bolting Integrity, Inservice Inspection-IWF, and Structures Monitoring Programs are existing AMPs, with enhancements and an exception, which will be consistent with GALL Report AMPs XI.M18, XI.S3, and XI.S6 respectively.

Issue:

LRA Sections B.1.1 states that the Bolting Integrity Program includes preventive actions to restrict the use of lubricants containing MoS_2. LRA Section B.1.16 states that "[p]lant procedures prohibit the use of lubricants containing molybdenum disulfide." LRA Section B.1.38 states that plant procedures use the recommendations in NUREG-1339, Electric Power Research Institute (EPRI) NP-5769, NP-5067, and TR-104213 to ensure proper specification of lubricant for bolting.

During its onsite audit, the staff confirmed that the bolting procedures had been revised to prohibit the use of MoS_2; however, it is not clear whether MoS_2 lubricants have been used at Waterford 3 before plant procedures were revised to prohibit their use.

Request:

State whether MoS_2 lubricants have been used on any high-strength structural bolts in sizes greater than 1 inch nominal diameter or any high-strength closure bolts within the scope of the Bolting Integrity, Inservice Inspection-IWF, and Structures Monitoring Programs. If MoS_2 lubricants have been used in the past, explain how the affected bolts will be managed for age-related degradation during the period of extended operation.

Waterford 3 Response

Based on review of site documentation and operating experience, it was determined that molybdenum-disulfide (MoS_2) has not been used on high-strength (actual measured yield strength greater than or equal to 150 kilo-pound per square inch [ksi]) structural bolts in sizes greater than 1 inch nominal diameter or high-strength closure bolts (actual measured yield strength greater than or equal to 150 ksi) within the scope of the programs identified in license renewal application Section B.1.1 "Bolting Integrity," B.1.16 "Inservice Inspection-IWF," and B.1.38 "Structures Monitoring."

RAI B.1.3-1

Background:

On February 4, 2016, the staff issued the final version of LR-ISG-2015-01, "Changes to Buried and Underground Piping and Tank Recommendations." The ISG replaces GALL Report AMP XI.M41, "Buried and Underground Piping and Tanks," and the associated UFSAR Summary Description issued in LR-ISG-2011-03, "Changes to the GALL Report, Revision 2 AMP XI.M41, 'Buried and Underground Piping and Tanks'."

LRA Section B.1.3, "Buried and Underground Piping and Tanks Inspection," and LRA Section A.1.3 (associated UFSAR Summary Description) were evaluated against GALL Report AMP XI.M41 and the UFSAR Summary Description in LR-ISG-2011-03.

Issue:

The Buried and Underground Piping and Tanks Inspection program and associated UFSAR Summary Description have not been evaluated against the changes to AMP XI.M41 and the UFSAR Summary Description issued in LR-ISG-2015-01.

Request:

As necessary, state and justify exception(s) to recommendations that will not be incorporated into the Buried and Underground Piping and Tanks Inspection program.

Waterford 3 Response

The Buried and Underground Piping and Tanks Inspection Program takes no exceptions to the program described in LR-ISG-2015-01. LRA Sections A.1.3, B.1.3, and 2.1.3 are revised as follows. Additions are shown with underline and deletions with strikethrough.

A.1.3 Buried and Underground Piping and Tanks Inspection Program

The Buried and Underground Piping and Tanks Inspection Program manages the effects of aging on external surfaces of buried piping components subject to aging management review. There are no buried tanks subject to aging management review. The program will manage loss of material, and cracking through preventive~~,~~ and mitigative actions (i.e.~~g.~~, coatings, backfill quality, and cathodic protection)~~, and periodic inspection activities~~. The number of inspections is based on the effectiveness of the preventive and mitigative actions. Annual cathodic protection surveys are conducted. For steel components using an acceptance criterion other than -850 mV instant off for demonstrating effectiveness of cathodic protection, loss of material rates are measured. ~~Program activities include verification of effective cathodic protection, non-destructive evaluation of pipe wall thickness, hydrostatic testing of piping, and visual inspection of the exterior of buried piping, fire hydrant and valve body components as permitted by opportunistic and directed excavations.~~

Inspections are conducted by qualified individuals. Where the coatings, backfill, or condition of exposed piping does not meet acceptance criteria such that the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material rate is extrapolated to the end of the period of extended operation, the sample size is

increased. If a lack of soil corrosivity is used as a basis for a reduction in the number of inspections, then soil testing is conducted at least once in each 10-year period starting 10 years prior to the period of extended operation.

B.1.3 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 subject to aging management review. There are no buried tanks subject to aging management review. Components included in the program are fabricated from metallic or concrete materials. The program will manage loss of material and cracking through preventive~~,~~ and mitigative actions (i.e.~~g.~~, coatings, backfill quality, and cathodic protection)~~, and periodic inspection activities~~. The number of inspections is based on the effectiveness of the preventive and mitigative actions. Annual cathodic protection surveys are conducted. For steel components using an acceptance criterion other than -850 mV instant off for demonstrating effectiveness of cathodic protection, loss of material rates are measured. ~~Program activities include verification of effective cathodic protection, non-destructive evaluation of pipe wall thickness, hydrostatic testing of piping, and visual inspection of the exterior of buried piping, fire hydrant and valve body components as permitted by opportunistic and directed excavations.~~

Inspections are conducted by qualified individuals. Where the coatings, backfill, or condition of exposed piping does not meet acceptance criteria such that the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material rate is extrapolated to the end of the period of extended operation, the sample size is increased. If a lack of soil corrosivity is used as a basis for a reduction in the number of inspections, then soil testing is conducted at least once in each 10-year period starting 10 years prior to the period of extended operation.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Buried and Underground Piping and Tanks Inspection Program will be consistent with the program described in NUREG-1801, Section XI.M41, "Buried and Underground Piping and Tanks," as modified by LR-ISG-2015-01~~11-03~~, "Changes to ~~the Generic Aging Lessons Learned (GALL) Report Revision 2 Aging Management Program XI.M41, '~~Buried and Underground Piping and Tanks Recommendations."

Operating Experience

Review of operating experience at Waterford 3 identified no aging mechanisms not already considered in Section XI.M41 of NUREG-1801 and LR-ISG-2015-01~~11-03~~.

2.1.3 Interim Staff Guidance Discussion

LR-ISG-2015-01 ~~(Draft)~~ Changes to Buried and Underground Piping and Tank Recommendations

This ISG provides expanded guidance for managing the effects of aging of buried and underground piping and tanks. This guidance is presented as revisions to NUREG-1800 (Ref. 2.1-2) and NUREG-1801 (Ref. 2.1-3), as revised by LR-ISG-2011-03. The revised guidance has been considered in the integrated plant assessment and is reflected in the aging management results in Section 3 and the aging management program description presented in Appendix B, Section B.1.3, Buried and Underground Piping and Tanks Inspection. ~~Due to the draft nature of the ISG and the timing of its issuance, it was not feasible to include recommended activities from this ISG into the Waterford 3 LRA.~~

RAI B.1.4-1

Background:

The program description of the Coating Integrity Program, and its associated FSAR Supplement, state that coatings that are within the scope of the program are those that are applied to the internal surfaces of in-scope components where loss of coating or lining integrity could impact the component's and downstream component's current licensing basis intended function(s).

Issue:

GALL Report AMP XI.M42, "Internal Coatings/Linings for In-scope Piping, Piping Components, Heat Exchangers, and Tanks," recommends that coatings are within the scope of the AMP where loss of coating or lining integrity could prevent satisfactory accomplishment of any of the component's or downstream component's current licensing basis intended functions identified under 10 CFR 54.4(a)(1), (a)(2), or (a)(3). The scope of the Coating Integrity program is not consistent with the "scope of program" program element of AMP XI.M42 because the term "and" implies that both the component's intended function and a downstream component's intended function must be impacted by loss of coating integrity for the coating to be within the scope of the program. AMP XI.M42 recommends that the criteria for inclusion are either of the impacts.

Request:

State the basis for using the term "and" in the Coating Integrity Program description or revise the term to "or" in LRA Section B.1.4 and LRA Section A.1.4 to clarify which coatings are within the scope of the program.

Waterford 3 Response

The program description of the Coating Integrity Program as described in LRA Section B.1.4, and its associated FSAR Supplement as described in LRA Section A.1.4 are revised to state that coatings that are within the scope of the program are those that are applied to the internal surfaces of in-scope components where loss of coating or lining integrity could impact the component's or downstream component's current licensing basis intended function(s).

LRA Section A.1.4 is revised as follows. Additions are shown with underline and deletions with strikethrough.

A.1.4 Coating Integrity Program

The Coating Integrity Program consists of periodic visual inspections of coatings applied to the internal surfaces of in-scope components in an environment of raw water, treated water, lubricating oil, or fuel oil where loss of coating or lining integrity could impact the component's ~~and~~or downstream component's current licensing basis intended function(s). For coated surfaces that do not meet the acceptance criteria, physical testing is performed where physically possible in conjunction with coating repair or replacement. The training and qualification of individuals involved in coating inspections of noncementitious coatings are conducted in accordance with ASTM standards endorsed in Regulatory Guide (RG) 1.54 including limitations, if any, identified in RG 1.54 on a particular standard. For cementitious coatings, training and qualifications are based on an appropriate combination of education and experience related to inspecting concrete surfaces.

This program will be implemented prior to the period of extended operation.

RAI B.1.4-2

Background:

During its review of plant-specific operating experience, the staff reviewed a condition report that documents that the internal surfaces of the fire pump diesel jacket water cooling heater might be coated.

Issue:

The LRA Table 2s do not cite the fire pump diesel jacket water cooling heater. It is not clear to the staff whether this component is coated, and if it is, how loss of coating integrity will be managed.

Request:

State whether the internal surfaces of the fire pump diesel jacket water cooling heater are coated. If they are coated, state how loss of coating integrity will be managed for this component.

Waterford 3 Response

Information reviewed in vendor technical manuals indicates that the jacket cooling water heater is not coated. The substance noted in the referenced condition report was concluded to be discoloration caused by chemicals in the cooling water.

RAI B.1.4-3

Background:

LRA Section B.1.4 states an exception to the "detection of aging effects" program element of AMP XI.M42. The exception states that the Coating Integrity program will provide a one-time inspection of the internal coating for the 11-foot diameter carbon steel circulating water piping. AMP XI.M42 recommends periodic inspections of coatings.

Issue:

The exception does not state that periodic inspections of the internal coatings of the 11-foot diameter circulating water piping will be subsequently conducted if the one-time inspection results do not meet acceptance criteria.

Request:

State whether periodic inspections of the internal coatings of the 11-foot diameter circulating water piping will be subsequently conducted if the one-time inspection results do not meet acceptance criteria. If periodic inspections will not be conducted, state the basis for not conducting these inspections.

Waterford 3 Response

As stated in LRA Section B.1.4, the WF3 program will provide a one-time inspection of the internal coating for the 11-foot diameter carbon steel circulating water piping. If the one-time inspection results do not meet acceptance criteria, periodic inspections will be conducted. The subsequent periodic inspections will be conducted on either a representative sample of 73 1-foot axial length circumferential segments of piping or 50 percent of the total length of each coating/lining material and environment combination, whichever is less. The frequency of subsequent inspections will be determined as specified in LR-ISG-2013-01, App. C, Table 4a, Inspection Intervals for Internal Coatings/Linings for Tanks, Piping, Piping Components, and Heat Exchangers.

LRA Sections A.1.4 and B.1.4 are revised as shown below. Additions are shown with underline and deletions with strikethrough.

A.1.4 Coating Integrity

The Coating Integrity Program consists of periodic visual inspections of coatings applied to the internal surfaces of in-scope components in an environment of raw water, treated water, lubricating oil, or fuel oil where loss of coating or lining integrity could impact the component's and downstream component's current licensing basis intended function(s). For coated surfaces that do not meet the acceptance criteria, physical testing is performed where physically possible in conjunction with coating repair or replacement. The Coating Integrity Program will provide a one-time inspection of the internal coating for the 11-foot diameter carbon steel circulating water piping. If the one-time inspection results do not meet acceptance criteria, periodic inspections of the internal coatings will be conducted. The training and qualification of individuals involved in coating inspections of noncementitious coatings are conducted in accordance with ASTM standards endorsed in Regulatory Guide (RG) 1.54 including limitations, if any, identified in RG 1.54 on a particular standard. For cementitious coatings, training and qualifications are based on an appropriate combination of education and experience related to inspecting concrete surfaces.

B.1.4 Coating Integrity

Exceptions to NUREG-1801

The Coating Integrity Program has the following exception.

Elements Affected	Exception
4. Detection of aging effects	NUREG-1801 recommends periodic inspections of internally coated piping. The WF3 program will provide a one-time inspection of the internal coating for the 11-foot diameter carbon steel circulating water piping.[1] If the one time inspection results do not meet acceptance criteria, periodic inspections will be conducted. The subsequent periodic inspections will be conducted on either a representative sample of 73 1-foot axial length circumferential segments of piping or 50 percent of the total length of each coating/lining material and environment combination, whichever is less. The frequency of subsequent inspections will be determined as specified in LR-ISG-2013-01, App. C, Table 4a, Inspection Intervals for Internal Coatings/Linings for Tanks, Piping, Piping Components, and Heat Exchangers.

RAI B.1.6-1

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 will be maintained consistent with the current licensing basis for the period of extended operation. As described in the Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (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 the GALL Report. The "preventive action" program element of the GALL Report AMP XI.S1 states, in part: "The program is also augmented to require that the selection of bolting material installation torque or tension and the use of lubricants and sealants are in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339 to prevent or mitigate degradation and failure of structural bolting."

Section 3.2.B.2b of the AMPER document for LRA AMP B.1.6 states, in part: "The program is a condition monitoring program and does not include guidance for the selection of bolting material, installation torque or tension, and use of lubricants and sealants. The program is supplemented by existing plant procedures to ensure that the selection of bolting material installation torque or tension, and the use of lubricants and sealants is appropriate for the intended purpose. These procedures use the guidance contained in NUREG-1339 and in EPRI NP-5769, NP-5067, and TR-104213 to ensure proper specification of bolting material, lubricant, and installation torque." The staff was unable to verify the link between these existing procedures and the actual implementing procedures (e.g., SEP-CISI-104, SEP-RR-WF3-001) for the LRA B.1.6 AMP.

Issue:

It is not clear to the staff if the above statements in the preventive actions program element are consistent because (1) it appears to be an enhancement to an existing code-based condition monitoring [only] program, and (2) the staff was unable to identify a link between the AMP implementing procedure(s) and the existing supplemental procedure(s) being credited. The staff needs additional information to verify consistency of the LRA AMP "preventive action" program element with that of the GALL Report AMP. Based on review of the respective AMPER documents, the staff also notes that this is a common issue for the "preventive action" program element across LRA AMPs B.1.6 "Containment Inservice Inspection – IWE," and B.1.16 "Inservice Inspection– IWF."

Request:

1. For LRA AMPs B.1.6 and B.1.16, clarify how the "preventive action" program element in each LRA AMP is consistent with the GALL Report AMP XI.S1, and XI.S3, respectively, with regard to supplemental preventive actions for selection of bolting material installation torque or tension and the use of lubricants and sealants in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339 to prevent or mitigate degradation and failure of structural bolting; or, justify the exception taken to the GALL Report AMP.

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

Waterford 3 Response

1. WF3 aging management programs (AMPs) identified in license renewal application (LRA) sections B.1.6, B.1.16 and B.1.38 use implementing procedures that ensure that the selection of bolting material, the selection of installation torque or tension, and the use of lubricants and sealants are appropriate for the intended purpose. These procedures use the guidance contained in NUREG-1339 and in EPRI NP-5769, NP-5067, and TR-104213 to ensure proper specification of bolting material, lubricant, and installation torque. The preventive actions for lubricants and stress corrosion cracking potential are already included in WF3 plant procedures that provide guidance for the selection of bolting material, the selection of installation torque or tension, and use of lubricants and sealants. No additional enhancement is necessary. There are no exceptions taken and the programs identified will be consistent with the NUREG-1801 program. For clarification, appropriate sections of the WF3 program evaluation report have been revised to indicate that the programs do include guidance for the selection of bolting material, installation torque or tension, and use of lubricants and sealants. This is consistent with the NUREG-1801 program discussion related to high-strength bolting.

2. No update to the LRA or FSAR supplement is necessary.

RAI B.1.6-2

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 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 "preventive action" program element of GALL Report AMP XI.S1 states, in part: "If the structural bolting consists of ASTM A325, ASTM F1852, and/or ASTM A490 bolts, the preventive actions for storage, lubricants, and stress corrosion cracking potential discussed in Section 2 of RCSC (Research Council for Structural Connections) publication "Specification for Structural Joints Using ASTM A325 or A490 Bolts," need to be considered."

The enhancement to the "preventive actions" program element of LRA AMP B.1.6 and Section 3.2.B.2b of the AMPER document, intended to achieve consistency with the GALL Report AMP states: "Revise plant procedures to include the preventive actions for storage of ASTM A325, ASTM F1852 and A490 bolting from Section 2 of Research Council for Structural Connections publication, "Specification for Structural Joints Using ASTM A325 or A490 Bolts." The staff noted that the applicant excluded the use of preventive actions for lubricants, and stress corrosion cracking potential by stating that a review of Section 2 of the RCSC publication concluded that the publication only addressed storage and does not address the preventive actions for lubricants and stress corrosion cracking potential for these bolts.

Issue:

It is not clear to the staff if the above statements are consistent because (1) the LRA AMP enhancement description does not include the RCSC Section 2 recommended preventive actions for *lubricants and stress corrosion cracking potential*, and (2) the related justification provided in the AMPER document appears to interpret the referenced RCSC standard and the GALL Report in a manner that is inconsistent with the considerations in the GALL Report AMP. Additionally, SRP-LR states that if an applicant takes credit for a program in the GALL Report, it is incumbent on the applicant to ensure that the plant program contains all the elements of the referenced GALL Report program.

The staff needs additional information to determine the adequacy of the stated enhancement to establish consistency with the "preventive action" program element of the GALL Report AMP. Based on review of the respective AMPER documents, the staff also notes that this is a common issue for the "preventive action" program element across LRA AMPs B.1.6 "Containment Inservice Inspection – IWE," B.1.16 "Inservice Inspection – IWF," and B.1.38 "Structures Monitoring."

Request:

1. For LRA AMPs B.1.6, B.1.16 and B.1.38, clarify how the described enhancement in the "preventive action" program element in LRA AMP is adequate to establish consistency with the GALL Report AMP XI.S1, XI.S3, and XI.S6, respectively, with regard to preventive actions for lubricants and stress corrosion cracking potential of ASTM A325, ASTM F1852, and/or ASTM A490 bolts; or, justify the exception to the GALL Report AMP.

Waterford 3 Response

1. WF3 aging management programs (AMPs) identified in license renewal application (LRA) sections B.1.6, B.1.16 and B.1.38 use implementing procedures that ensure that the selection of bolting material, the selection of installation torque or tension, and the use of lubricants and sealants are appropriate for the intended purpose. These procedures use the guidance contained in NUREG-1339 and in EPRI NP-5769, NP-5067, and TR-104213 to ensure proper specification of bolting material, lubricant, and installation torque. The preventive actions for lubricants and stress corrosion cracking potential are already included in WF3 plant procedures that provide guidance for the selection of bolting material, the selection of installation torque or tension, and use of lubricants and sealants. Storage recommendations discussed in Section 2 of the RCSC publication for these high-strength bolts are not addressed in plant procedures. Therefore, the LRA includes an enhancement to revise plant procedures to include the RCSC recommendations for storage. No additional enhancement is necessary. There are no exceptions taken and the programs identified will be consistent with the associated NUREG-1801 programs. For clarification, appropriate sections of the WF3 program evaluation report have been revised to more clearly identify the NUREG-1801 recommendations that are already included in the program implementing procedures.

RAI B.1.6-3

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

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. These bellows have an analyses that are considered CLB fatigue analyses. There are no stainless steel penetration sleeves subject to significant cyclic loading, associated with the steel containment vessel (SCV). Dissimilar metal welds associated with the stainless steel bellows are not subject to significant cyclic loading. No "other [stainless] steel components" were identified that are associated with containment penetrations and are subject to significant 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.

RAI B.1.6-4

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 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 ten elements of AMP XI.S1, "ASME Section XI, Subsection IWE," described in NUREG-1801.

During the audit, the staff reviewed condition report CR-WF3-2000-01375, dated 10/28/2000, that addressed plant-specific operating experience in which corrosion has been noted in the knuckle region of the steel containment vessel below the annulus moisture barrier area. The condition was initially investigated in area #15 (directly below maintenance access hatch) that revealed excessive corrosion in the region below the moisture barrier in the annulus. CR-WF3-2000-1375 was written to address and document corrective actions associated with the corrosion and flaking noted on the containment vessel to a depth of at least 18 inches below the surface of the outer moisture barrier in the annulus region. This condition appeared to exist around the entire knuckle region of the containment vessel within the annulus.

CR-WF3-2000-01375 noted that this corrosion was apparently from initial construction (from exposure to the weather), was determined to be non-active, and ultrasonic wall thickness measurements showed that the containment vessel wall thickness exceeded the design thickness of 2.1875 inches in all examined locations and that the containment vessel structural integrity and leak-tightness were not jeopardized. Chemical analysis of scale samples indicated the presence of chlorides and sulfides. The presence of these chemicals also indicates the potential for an active corrosion mechanism to be initiated should any moisture be introduced. The CR documented that the issue was addressed by taking several corrective actions including apparent cause evaluation, repair and supplementary examinations of the moisture barrier every refueling outage from RF10 (2001) through RF16 (2009), VT-1 examination and ultrasonic thickness (UT) measurements of containment vessel exposed by removal of moisture barrier, chemical analysis of elastomeric moisture barrier materials and scales (flaking) from areas of corrosion of the containment vessel, and examination of the adjacent concrete, to ensure that the corrosion mechanism was and expected to remain inactive unless reactivated by the presence of moisture.

Issue:

The above plant-specific operating experience of corrosion noted in 2000 in the annulus knuckle region of the steel containment vessel is not addressed in LRA Section B.1.6. There exists the potential that the existing corrosion, with presence of traces of chlorides and sulfides, of the steel containment vessel in the knuckle area below the annulus moisture barrier that was determined to be non-active may be reactivated by moisture and potentially impact containment vessel intended function prior to or during the period of extended operation. During the audit, the staff also came across condition reports CR-WF3-2012-05353 and CR-WF3-2012-07654 documenting non-conformances related to cracking, surface discontinuities and potential leak paths in the annulus moisture barrier identified during Refueling outage 18. The staff also noted that, during this outage, a construction opening for steam generator replacement was made in the Shield Building by hydrodemolition which could have resulted in intrusion of water into the annulus moisture barrier areas. The staff needs additional information,

necessary to determine whether the applicant's plant-specific operating experience supports the sufficiency of the LRA AMP.

Request:

1. Summarize the plant-specific operating experience of corrosion around the entire circumference of the steel containment vessel in the knuckle region below the annulus moisture barrier documented in CR-WF3-2000-01375, its cause and actions taken to address it.

2. With regard to the above plant-specific operating experience described in CR-WF3-2000-01375, explain with sufficient technical detail, any enhancement that may be made to the LRA AMP to verify, prior to entering the period of extended operation, that the observed corrosion in the knuckle region continues to remain non-active and address adverse findings, if any, such that the containment vessel remains capable of performing its intended functions through the period of extended operation. Alternatively, explain why such a verification enhancement is deemed not necessary prior to entering the period of extended operation for the LRA AMP to meet the criteria of 10 CFR 54.21(a)(3).

Waterford 3 Response

1. Plant-specific operating experience (OE) involving corrosion around the circumference of the steel containment vessel (SCV) in the knuckle region below the annulus moisture barrier is summarized as follows.

   As described in WF3 License Renewal Application (LRA) Section B.1.6, the Containment Inservice Inspection (CII-IWE) Program includes inspection of the SCV and moisture barrier. The October 2000 CII-IWE inspection identified corrosion of the SCV in the knuckle region. Consistent with the WF3 corrective action program, a condition report (CR) was written and corrective actions were initiated. Visual examinations of the SCV, performed during the same period, as part of the corrective actions outlined in the condition report, revealed corrosion of a greater extent than anticipated. Corrosion was noted on the SCV to a depth of at least 18 inches below the top surface of the moisture barrier where the barrier was removed. This condition existed around the entire knuckle region of the SCV within the annulus. The evaluation concluded that the condition did not affect the containment structural integrity or its leaktightness. The nondestructive examination (NDE) report shows that all examined locations exceed the design wall thickness of 2.1875 inches. A nonconformance report (NCR) during original construction indicates that the original plates installed in the knuckle region were corroded with slight pitting. All the examined sections of the plates had a material thickness greater than 2.1875 inches. While corrosion and scale were noted to a degree consistent with original construction data, the ultrasonic (UT) thickness measurements showed that the SCV wall thickness remains above the design thickness of 2.1875 inches. Specifically, the conditions noted during the October 2000 CII-IWE inspections were consistent with the conditions noted during initial construction confirming that the corrosion has not progressed and remains non-active. Additionally, the corrosion involved flaking and the area behind the flakes exhibited signs of general corrosion. For active corrosion mechanisms, bright metal would be expected behind flaking. No moisture was noted within the annulus including the area where the moisture barrier was removed. The results of these inspections confirm no active corrosion.

   In October 2003, an inspection of the SCV was conducted in accordance with ASME Code Section XI - IWE. A general visual inspection was performed including 100% of the

accessible SCV surface areas and the area around the fuel transfer tube. VT-3 examinations of the interior surface of the SCV found areas with flaking, peeling, blistering, and discoloration of the coating. These areas were repaired and re-inspected during the following refueling outage with satisfactory results. VT-3 examinations of the interior moisture barrier (located between the SCV and the concrete floor on the ledge on elevation -4) revealed 13 locations where the moisture barrier was deteriorated. These damaged sections of the moisture barrier were removed and replaced with new sealant.

In May 2005, a general visual inspection of the inside surface of the SCV was performed in accordance with ASME Code Section XI - IWE. The examination of the SCV met the screening criteria as accepted by the Responsible Engineer (RE). The general visual inspection results indicated that the SCV meets its structural integrity requirements. The accessible areas of the outer SCV surface were examined from the annulus area. No discrepancies were found.

In October 2012, inspections were performed of the SCV surface and the moisture barrier inside the annulus from 0° to 138° azimuth. Results of the inspections were satisfactory. During steam generator replacement activities, hydro-blasting was performed resulting in standing water over the moisture barrier between the 30° and 70° azimuth location. Three 18"x18" moisture barrier sections were removed and the liner was examined at the 30°, 42°, and 70° locations. No active degradation was noted. After replacement of these sections of the moisture barrier, an examination of the repaired moisture barrier areas was performed with satisfactory examination results.

As discussed above, the apparent cause of the corrosion of the SCV below the moisture barrier in the annulus was determined to be installation of corroded plates during original construction. The corrective actions to address this issue included the following.

The moisture barrier was repaired and reexamined. The site inspection procedure was revised to specify increased examination frequency for the moisture barrier. The concrete in the vicinity of the annulus moisture barrier was inspected with satisfactory results and was documented in the final inspection report. It was determined that due to the porous nature of the materials, additional steps were necessary to ensure that the corrosion remains inactive. Those potential steps were: 1) Regular monitoring of the containment SCV surfaces covered by the barrier material. 2) Removal of the corrosion products and coating the affected surfaces with an approved coating system prior to reinstallation of the barrier material. 3) Removal of the corrosion products and replacement of the barrier material with a non-deleterious material impervious to water. A procedure change was initiated to ensure monitoring of the external (annulus side) moisture barrier and the associated SCV surfaces until such time as either option 2 or 3 were performed. This change required supplementary examinations to ensure that the corrosion remains inactive by examining both disturbed areas of SCV (previously inspected and recoated) and undisturbed sections of the moisture barrier each refueling outage. These supplementary examinations were performed as specified by the RE. Since, accelerated corrosion was not likely as long as the areas remained dry and all measured SCV thicknesses were above the specified design thickness, Code required IWE augmented examinations were not applied.

No changes to the "operating experience" (OE) program element of LRA AMP B.1.6 is necessary. The OE section of the AMP B.1.6 was developed during the LRA preparation which included a review of the past 10 years (post 2003) of site-specific OE consistent with NEI 95-10, Section 4.4.

2. As discussed in WF3 LRA Section B.1.6, the Containment Inservice Inspection (CII-IWE) Program includes inspection of steel containment vessel (SCV) and moisture barrier. As discussed in response Part 1 above, the observed corrosion in the knuckle region identified during CII-IWE inspections in October of 2000 remains inactive. Moisture barrier examinations are performed in accordance with Table IWE-2500-1 Examination Category E-A, Item Number E1.30. Degradation of the moisture barrier was previously identified in the fall of 2000 (during the first period of the second interval). Condition reports were written to assess and evaluate the degradation. In addition to the requirements of ASME Code Section XI, Table IWE-2500-1, owner-elected examinations were performed every outage from October 2000 through October 2009. Due to the degradation remaining essentially unchanged, these areas were determined to no longer need the supplemental examinations in accordance with IWE-2420(c). In 2012, inspections were performed on selected areas of the SCV. The moisture barrier was removed and the SCV visually inspected at the ~42 degree, ~35 degree, and ~65 degree locations prior to replacement of the moisture barrier. The areas were examined for evidence of cracking, discoloration, wear, pitting, excessive corrosion, arc strikes, gouges, surface discontinuities, dents, bulges, or other surface irregularities. The general condition of the SCV in these areas was assessed, and no evidence of degradation that may affect structural integrity or leak tightness was identified.

   During these inspections, no evidence of active degradation or relevant conditions on the SCV liner were identified that would warrant additional inspections. Subsequent inspections have not identified degradation related to moisture barriers.

   As discussed here and in response 1 above, the observed corrosion of SCV in knuckle region is addressed as part of WF3 corrective action program. As described in LRA Section B.1.6, the SCV including moisture barrier is inspected as part of WF3 CII-IWE aging management program (AMP) in accordance with ASME Code Section XI, Subsection IWE to ensure they continue to perform their intended functions through the period of extended operation.

   No additional enhancements to LRA AMP Section B.1.6 are necessary.

RAI A.1.6-1

Background:

Section 54.21(d) of 10 CFR requires that the FSAR supplement for the LRA must contain a summary description of the programs and activities for managing the effects of aging and the evaluation of time-limited aging analyses for the period of extended operation determined by paragraphs (a) and (c) of this section, respectively. As described in SRP-LR, the FSAR supplement defines the LRA AMP the applicant is crediting to satisfy 10 CFR 54.21(a)(3), and for AMPs consistent with the GALL Report, the applicant may demonstrate compliance by providing information in the FSAR supplement equivalent to that in Table 3.0-1 of the SRP-LR.

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.

Issue:

The information in the FSAR supplement description in LRA Section A.1.6 "Containment Inservice Inspection – IWE" and the LRA AMPER document (WF3-EP-14-00008, Revision 1) does not appear to provide an adequate summary description of the LRA AMP B.1.6 because (1) it does not sufficiently define what the LRA AMP covers in terms of components, materials, environments, aging effects, and key condition monitoring actions; rather, a significant part of the supplement primarily repeats the structural configuration description of the steel containment vessel that is already in FSAR Section 3.8.2, and (2) the description does not provide information consistent with that for program XI.S1 in SRP-LR Table 3.0-1. The staff needs additional information necessary to verify the sufficiency of the FSAR supplement program description.

Request:

Clarify how the FSAR supplement in LRA Section A.1.6 adequately defines the LRA AMP B.1.6 in terms of components, materials, environments, aging effects, and key condition monitoring actions; or, provide a revised FSAR supplement description for LRA Section A.1.6 to also include information, equivalent to that in SRP-LR Table 3.0-1 for GALL Report AMP XI.S1, that sufficiently defines the LRA AMP in terms of components, materials, environments, aging effects, and key condition monitoring actions.

Waterford 3 Response

License renewal application (LRA) Section A.1.6 is revised to include information, equivalent to that in SRP-LR Table 3.0-1 for GALL Report AMP XI.S1.

LRA Sections A.1.6 is revised as follows. Additions are shown with underline and deletions with strikethrough.

A.1.6 Containment Inservice Inspection – IWE Program

The Containment Inservice Inspection (CII) – IWE Program implements the requirements of 10 CFR 50.55a. The regulations in 10 CFR 50.55a impose the inservice inspection (ISI) requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, Subsection IWE, for steel containments (Class MC) and steel liners for concrete containments (Class CC). The WF3 containment is a low-leakage, free-standing steel containment vessel (SCV)

consisting of a vertical upright cylinder with a hemispherical dome and an ellipsoidal bottom. The SCV's ellipsoidal bottom is encased in concrete and founded on the common concrete foundation with the shield building. The common concrete foundation with the shield building is classified as Class CC equivalent. The steel ellipsoidal bottom plate of the SCV was erected on top of the common concrete foundation slab with a concrete slab poured on top of the bottom plate. Since the Class CC equivalent concrete foundation slab and the bottom steel plate are inaccessible, they are exempted from examination in accordance with IWL-1220(b) and IWE-1220(b). There are no tendons associated with the WF3 SCV.

The program entails periodic visual and surface examination of pressure-retaining components of the SCV for signs of degradation, assessment of damage, and corrective actions. The program includes managing the effects of aging of surfaces and components such as bolting for containment closures, SCV, containment penetrations (electrical, instrumentation, and control assemblies), mechanical penetrations, penetration bellows at the containment boundary, penetration sleeves at the containment boundary, and the personnel airlock and maintenance hatch. The moisture barrier, which is a sealant between the bottom of the SCV and the base mat, is included within the scope of the program.

Examination methods include visual and surface as required by ASME Code Section XI, Subsection IWE. Observed conditions that have the potential for impacting an intended function are evaluated for acceptability in accordance with ASME Code provisions and corrected in accordance with the corrective action program.

The code of record for the examination of the WF3 Class MC and Class CC components is ASME Code Section XI, Subsections IWE and IWL, 2001 Edition with the 2003 Addenda, as mandated and modified by 10 CFR 50.55a.

RAI 3.5.2-1

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 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 Table 3.5.2-1 "Reactor Building" includes, on LRA page 3.5-52, an aging management review (AMR) line item for component type "Steel components: personnel airlock, escape lock, construction hatch; maintenance hatch: locks, hinges and closure mechanisms" of "carbon steel" material in an "air-indoor uncontrolled" environment for "loss of material" aging effect with generic Note A that claimed consistency with GALL line item II.B4.CP-148 corresponding to SRP-LR Table 3.5-1, item 31.

Issue:

The staff noted that the GALL Report line item II.B4.CP-148 applies to component "pressure-retaining bolting" for BWR containments, and not the components described in the LRA Table 3.5.2-1 line item referenced above. The staff also noted that LRA Table 3.5.2-1 includes, on LRA page 3.5-52, another AMR line item for component type "Steel components: personnel airlock, escape lock, construction hatch; maintenance hatch" with the same material, environment, and aging effect combination that credited GALL Report line item II.A3.C-16 (corresponding to Table 1 item 3.5.1-28) with a generic Note A.

Request:

Clarify the apparent discrepancy and/or duplication in the LRA Table 3.5.2-1 line item for component type "Steel components: personnel airlock, escape lock, construction hatch; maintenance hatch: locks, hinges and closure mechanisms" noted above for the loss of material aging effect, and establish how it is consistent with the GALL Report line item II.B4.CP-148 to justify a generic Note A.

Waterford 3 Response

There is no duplication of line items in the license renewal application (LRA) Table 3.5.2-1. The first line item is for component type "Steel components: personnel airlock, escape lock, construction hatch; maintenance hatch." The second line addresses the locks, hinges and closure mechanisms associated with those components. However, the LRA Table 3.5.2-1 line item for component type "Steel components: personnel airlock, escape lock, construction hatch; maintenance hatch: locks, hinges and closure mechanisms" with the aging effects loss of material on Page 3.5-52 of the LRA, is revised to credit NUREG-1801 line item II.A3.C-16 (corresponding to Table 1 item 3.5.1-28) with a generic Note C.

LRA Table 3.5.2-1 is revised as follows. Additions are shown with underline and deletions with strikethrough.

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: personnel airlock, escape lock, construction hatch; maintenance hatch: locks, hinges, and closure mechanisms	PB,SSR	Carbon steel	Air-indoor uncontrolled	Loss of material	CII-IWE Containment leak rate	~~II.B4.CP-148~~ II.A3.C-16	~~3.5.1-31~~ 3.5.1-28	~~**Error! Reference source not found.**~~ C

RAI B.1.7-1

Background:

NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report," 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.

The Waterford 3 LRA B.1.7 "Containment Leak Rate" program states that the applicant has implemented Option B of the 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."

The regulation in 10 CFR Part 54.21(a) requires relevant aging effects (e.g., as described in GALL Report, Rev 2) associated with the containment boundary pressure-retaining components to be adequately managed so that their intended function will be maintained consistent with the current licensing basis (CLB) for the period of extended operation.

Issue:

The LRA AMP B.1.7 Basis Document contains Procedure SEP-APJ-005, "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 are excluded from the "scope of program," program element of LRA AMP B.1.7 "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 excluded components, 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.

Waterford 3 Response

The components for the penetrations listed in the table below are exempted from 10 CFR Part 50, Appendix J local leak rate testing. However, the WF3 license renewal application (LRA) does not credit the Containment Leak Rate Program for managing the effects of aging on the components that are exempted from 10 CFR Part 50, Appendix J local leak rate testing. Therefore, the exemptions have no effect on the programs credited for managing the effects of aging on the affected components. During the period of extended operations, the effects of aging on those components that have been exempted/excluded from 10 CFR Part 50, Appendix J local leak rate testing are managed by the aging management programs identified in the LRA tables for the associated system piping and valves. The aging management review results indicating the credited aging management programs are summarized in the table below using the following notes.

The External Surfaces Monitoring Program is credited with managing the external aging effects of carbon steel and stainless steel components.

Notes

1. Flow-Accelerated Corrosion (FAC) Program [B.1.14] manages the effects of aging on internal surfaces.
2. Water Chemistry Control – Primary and Secondary Program [B.1.41] manages the effects of aging on internal surfaces.
3. Water Chemistry Control – Closed Treated Water Systems Program [B.1.40] manages the effects of aging on internal surfaces.
4. Inservice Inspection Program [B.1.15] – manages the effects of aging on internal surfaces.

Pent #	Description	Material	Environment	LRA Table	Notes
1	Main Steam Line #1	Carbon steel	Steam[int]	3.4.2-4	1,2
2	Main Steam Line #2	Carbon steel	Steam[int]	3.4.2-4	1,2
3	Main Feedwater Line #1	Carbon steel	Treated water[int]	3.4.2-3	2
				3.4.2-2	2
4	Main Feedwater Line #2	Carbon steel	Treated water[int]	3.4.2-3	2
				3.4.2-2	2
5	Blowdown (Stm Gen-1)	Carbon steel	Steam[int]	3.4.2-4	1,2
6	Blowdown (Stm Gen-2)	Carbon steel	Steam[int]	3.4.2-4	1,2
15	Water Supply Fan Cooler 2B	Carbon steel	Treated water[int]	3.3.2-3	3
16	Water Return Fan Cooler 2B	Carbon steel	Treated water[int]	3.3.2-3	3
17	Water Return Fan Cooler 1A	Carbon steel	Treated water[int]	3.3.2-3	3
18	Water Supply Fan Cooler 1A	Carbon steel	Treated water[int]	3.3.2-3	3
19	Water Return Fan Cooler 2A	Carbon steel	Treated water[int]	3.3.2-3	3

Pent #	Description	Material	Environment	LRA Table	Notes
20	Water Supply Fan Cooler 2A	Carbon steel	Treated water[int]	3.3.2-3	3
21	Water Return Fan Cooler 1B	Carbon steel	Treated water[int]	3.3.2-3	3
22	Water Supply Fan Cooler 1B	Carbon steel	Treated water[int]	3.3.2-3	3
27	Charging Line	Stainless steel	Treated borated water[int]	3.3.2-1	2
			Treated borated water >140° F[int]	3.1.2-3	2,4
32	Safety Injection Sump Recirculation Pipe Train A	Stainless steel	Treated borated water[int]	3.2.2-2	2
33	Safety Injection Sump Recirculation Pipe Train B	Stainless steel	Treated borated water[int]	3.2.2-2	2
36	LP Safety Injection, Loop 1A	Stainless steel	Treated borated water >140° F[int]	3.2.2-2	2
		CASS	Treated borated water >140° F[int]	3.1.2-3	2,4
37	LP Safety Injection, Loop 1B	Stainless steel	Treated borated water >140° F[int]	3.2.2-2	2
		CASS	Treated borated water >140° F[int]	3.1.2-3	2,4
38	LP Safety Injection, Loop 2A	Stainless steel	Treated borated water >140° F[int]	3.2.2-2	2
		CASS	Treated borated water >140° F[int]	3.1.2-3	2,4
39	LP Safety Injection, Loop 2B	Stainless steel	Treated borated water >140° F[int]	3.2.2-2	2
		CASS	Treated borated water >140° F[int]	3.1.2-3	2,4
52	Steam Generator 1 Sample Line	Stainless steel	Steam[int]	3.4.2-4	2
54	Containment Pressure Wide Range Monitor (Inst. Conn)				(*)
55	HP Safety Injection, Loop 1A	Stainless steel	Treated borated water[int]	3.2.2-2	2
		CASS	Treated borated water >140°F[int]	3.1.2-3	2,4
		Stainless steel	Treated borated water >140°F[int]	3.1.2-3	2,4
56	HP Safety Injection, Loop 1B	Stainless steel	Treated borated water[int]	3.2.2-2	2
		CASS	Treated borated water >140°F[int]	3.1.2-3	2,4
		Stainless steel	Treated borated water >140°F[int]	3.1.2-3	2,4
57	HP Safety Injection, Loop 2A	Stainless steel	Treated borated water[int]	3.2.2-2	2
		CASS	Treated borated water >140°F[int]	3.1.2-3	2,4
		Stainless steel	Treated borated water >140°F[int]	3.1.2-3	2,4

Pent #	Description	Material	Environment	LRA Table	Notes
58	HP Safety Injection, Loop 2B	Stainless steel	Treated borated water[int]	3.2.2-2	2
		CASS	Treated borated water >140°F[int]	3.1.2-3	2,4
		Stainless steel	Treated borated water >140°F[int]	3.1.2-3	2,4
68	Steam Generator 2 Sample Line	Stainless steel	Steam[int]	3.4.2-4	2
69	Safety Injection Hot Leg Inj.	Stainless steel	Treated borated water[int]	3.2.2-2	2
		CASS	Treated borated water >140° F[int]	3.1.2-3	2,4
		Stainless steel	Treated borated water >140° F[int]	3.1.2-3	2,4
70	Safety Injection Hot Leg Inj.	Stainless steel	Treated borated water[int]	3.2.2-2	2
		CASS	Treated borated water >140° F[int]	3.1.2-3	2,4
		Stainless steel	Treated borated water >140° F[int]	3.1.2-3	2,4
34 A & B	Containment Spray Header	Stainless steel	Treated borated water[int]	3.2.2-1	2
35 A & B	Containment Spray Header	Stainless steel	Treated borated water[int]	3.2.2-1	2

(*Penetration 54, Containment Pressure Wide Range Monitor (Inst. Conn), consists of stainless steel capillary tubing (oil filled) for a containment pressure transmitter. There are no credible aging effects for stainless steel in oil in a sealed, self-contained application. This hydraulic oil is not subject to water contamination or the potential for water pooling or separation. For this application there are no other applicable aging mechanisms for stainless steel in oil.)

RAI B.1.11-1

Background:

By letter dated December 16, 2008, the staff issued NRC Regulatory Issue Summary (RIS) 2008-30, which discusses the staff's concern that the use of certain simplified analysis methodology to demonstrate compliance with the ASME Code fatigue acceptance criteria could be nonconservative. When a license renewal applicant has used the simplified methodology, the staff considers that confirmatory analysis is needed to demonstrate that the simplified analysis provides acceptable results.

Issue:

LRA Section B.1.11 discusses the applicant's Fatigue Monitoring Program. The staff noted that the LRA does not address how the staff's concerns in RIS 2008-30 have been addressed at Waterford.

Request:

State whether the simplified methodology was used to demonstrate compliance with the ASME code fatigue acceptance criteria for Waterford 3 license renewal application. If the simplified methodology was used, describe how the staff's concerns in RIS 2008-30 have been addressed for the Waterford 3 license renewal application.

Waterford 3 Response

In Regulatory Issue Summary 2008-30, "Fatigue Analysis of Nuclear Power Plant Components," the NRC staff identified a concern regarding the method used by some license renewal applicants to demonstrate the ability of nuclear power plant components to withstand the cyclic loads associated with plant transient operations for the period of extended operation. The concern involves use of only one component of stress for the evaluation of actual plant transients. A detailed stress analysis considers six stress components, as discussed in ASME Code, Section III, Subsection NB, Subarticle NB-3200. Simplification of the analysis to consider only one component of the stress can provide acceptable results; however, it also requires judgment by the analyst to ensure that the simplification provides a conservative result.

As described in LRA Section 4.3.1, the WF3 Fatigue Monitoring Program monitors transient cycles that contribute to fatigue usage. The WF3 Fatigue Monitoring Program does not credit simplified stress-based fatigue usage calculations. Therefore, the staff's concerns in RIS 2008-30 do not apply to the Waterford 3 Fatigue Monitoring Program.

RAI B.1.17-01

Background:

Title 10 of the Code of Federal Regulations Part 50.34(h)(3), "Conformance with the Standard Review Plan (SRP)," states:

[t]he SRP was issued to establish criteria that the NRC staff intends to use in evaluating whether an applicant/licensee meets the Commission's regulations. The SRP is not a substitute for the regulations, and compliance is not a requirement. Applicants shall identify differences from the SRP acceptance criteria and evaluate how the proposed alternatives to the SRP criteria provide an acceptable method of complying with the Commission's regulations.

Table 3.0-1, "FSAR Supplement for Aging Management of Applicable Systems," of NUREG 1800, Revision 2, "Standard Review Plan for Review of License renewal Applications for Nuclear Power Plants," (SRP-LR) outlines the FSAR acceptance criteria for an AMP to be consistent with NUREG 1801, "Generic Aging Lessons learned (GALL) Report," Revision 2, AMP XI.M23 FSAR. The SRP-LR for the GALL Report AMP XI.M23 FSAR acceptance criteria states, "[t]he number and magnitude of lifts made by the hoist or crane are also reviewed."

Issue:

The Waterford 3 LRA AMP B.1.17 FSAR, LRA Section A.1.17, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program," does not provide for the review of the number of lifts made for the scoped-in hoists or cranes. It is not clear how the applicant intends to meet the FSAR acceptance criteria for the GALL Report AMP XI.M23 as outlined in the SRP-LR, for LRA Section A.1.17.

Request:

1. Identify the number and magnitude of lifts made for scoped-in hoists and cranes as specified by GALL Report AMP XI.M23 FSAR acceptance criteria. Alternatively, identify differences from the SRP acceptance criteria with evaluation of how the alternative to the SRP criteria would be considered acceptable.

Waterford 3 Response

1. During evaluation of license renewal time-limited aging analyses (TLAAs), Entergy treated crane cycle limits as TLAAs. The evaluation of the crane cycle TLAAs included a review of the number and magnitude of lifts made by hoists or cranes designed to CMAA-70. As stated in LRA Sections 4.7.1 and A.2.5.1, the expected number of applicable crane cycles at the end of the period of extended operation (PEO) is below the top of the lowest cyclic loading range in CMAA-70 of 100,000 cycles. For the polar crane main hook, the estimate through the end of the PEO is 850 lifts. For the polar crane auxiliary hook, the estimate is 84,500 lifts. For the fuel handling building (FHB) crane main hook, the estimate is 875 lifts. For the FHB crane east auxiliary hook, the estimate is 50,000 lifts. For the FHB crane west auxiliary hook, the estimate is 75,000 lifts. All estimated numbers of lifts are through the end of the PEO. All lifts are assumed within the crane rated capacity.

RAI B.1.33-1

Background:

LRA Section B.1.33 describes the Reactor Vessel Internals Program as an existing program, that when enhanced, will be consistent with the program elements in GALL Report AMP XI.M16A, "PWR Vessel Internals." The reactor vessel internals components at WF3 were designed by Combustion Engineering Company (CE). The AMP is based on the inspection and evaluation criteria in EPRI MRP Report No. 1022863, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)," dated December 2012. During the audit of this AMP on July 25 – 28, 2016, the staff reviewed the applicant's program basis documents to verify consistency with the program elements in GALL AMP XI.M16A.

Issue:

1. The "detection of aging effects" program element of LRA WF3-EP-14-00006 section 4.5 identifies that the program will implement the inspection criteria in the following tables in the MRP-227-A report, as defined by the ERPI MRP: (a) Table 4-3 for "primary" reactor vessel internal components, (b) Table 4-6 for "expansion" RVI components, and (c) Table 4-9 for "existing program" RVI components. The tables referenced in the "detection of aging effects" element are those for RVI components in Westinghouse-designed PWRs. The appropriate CE-design table references for the "primary," "expansion," and "existing program" RVI components at WF3 are Tables 4-2, 4-5, and 4-8 in the MRP-227-A report.

2. The "acceptance criteria" program element in LRA WF3-EP-14-00006 section 4.5 identifies that the program will implement the evaluation and acceptance criteria in Table 5-1 of the MRP-227-A report. The appropriate CE-design table reference for the RVI components at WF3 is Table 5-2 in the MRP-227-A report.

Request:

1. Clarify whether LRA AMP B.1.33, "Reactor Vessel Internals Program," will be implementing the inspection criteria in the following tables in EPRI MRP Report MRP-227-A: (a) Table 4-2 for "primary" reactor vessel internal components, (b) Table 4-5 for "expansion" RVI components, and (c) Table 4-8 for "existing program" RVI components. If not, justify why the AMP will be implementing the inspection criteria in Tables 4-3, 4-6, and 4-9 of the MRP-227-A report, as stated in the "detection of aging effects" element discussion of the AMPER basis document for this AMP.

2. Clarify whether LRA AMP B.1.33, "Reactor Vessel Internals Program," will be implementing the evaluation and acceptance criteria in Table 5-2 of the MRP-227-A report. If not, justify why the AMP will be implementing the evaluation and acceptance criteria in Table 5-1 report, as stated in the "acceptance criteria" element discussion of the AMPER basis document for this AMP.

Waterford 3 Response

1. As stated in LRA Section A.1.33 and B.1.33, "The Reactor Vessel Internals Program implements the Electric Power Research Institute (EPRI) Technical Report N0. 1022863, "Materials Reliability Program: Pressurized Water Reactor (PWR) Internals Inspection and Evaluation Guidelines" (MRP-227-A), and EPRI Technical Report No. 1016609, "Materials Reliability Program: Inspection Standard for PWR Internals" (MRP-228), to manage the aging effects on the WF3 RVI components.

WF3 is a CE nuclear steam supply system (NSSS) design." Therefore, LRA AMP B.1.33, "Reactor Vessel Internals Program," will implement the inspection criteria for a CE NSSS design in the following tables in EPRI MRP Report MRP-227-A: (a) Table 4-2 for "primary" reactor vessel internal components, (b) Table 4-5 for "expansion" RVI components, and (c) Table 4-8 for "existing program" RVI components.

2. LRA AMP B.1.33, "Reactor Vessel Internals Program," will implement the evaluation and acceptance criteria for a CE NSSS design in Table 5-2 of the MRP-227-A report.

RAI B.1.33-2

Background:

In the applicant's June 18, 2015, supplement to their RVI inspection plan (ADAMS Accession number ML15170A377), the applicant indicated that it would implement periodic measurements of the replaced incore instrumentation (ICI) thimble tubes in order to monitor the growth of the thimble tubes. Since the aging effect requiring management is irradiation growth (i.e., changes in dimension due to distortion, or void swelling), the staff agrees that physical measurements are appropriate as condition monitoring techniques for the components. These components are listed as "incore instrumentation, thimble – lower part" in Table 3.1.2-2 of the LRA.

Issue: The applicant has not defined the type of physical measurements that will be performed on the ICI thimble tubes or the acceptance criteria that will be used to assess the results of the measurements.

Request: Define the type of physical measurements that will be used to monitor for changes in dimension (due to grain growth, void swelling, or distortion) of the "ICI thimble tubes – lower" components in the plant design, and the inspection schedule or frequency that is or will be applied to the physical measurements of these components. Provide and justify the acceptance criteria that will be used to assess the results of the measurements.

Waterford 3 Response

In 2009, 53 of the 56 ICI thimbles were replaced. At that time, baseline physical measurements were taken on nine of the ICI thimbles. The measurement uses a measuring cable with a ball on its end. The cable is inserted into the thimble until the ball bottoms out at the end of the thimble. The top flange of the ICI cluster is used as a reference point. The distance from the ball to the top flange of the ICI cluster indicates the length of the thimble.

ICI thimble growth is a slow process. The new ICI thimbles are 7.5 inches shorter than the original ICI thimbles. Based on the length of the new shorter ICI thimbles and the expected thimble growth rate, no thimble length measurements are necessary until 2024. Based on the results of measurements at that time, the need for further inspections and the schedule for those inspections will be determined. The acceptance criterion will be that the ICI thimble length is such that it does not reach the fuel assembly lower end fitting during reactor operation.

RAI B.1.35-1

Background:

LRA Sections A.1.35 and B.1.35, which concern inspections for loss of material due to selective leaching, state that, "follow-up for unacceptable inspection findings includes an evaluation using the corrective action program and possible expansion of the inspection sample size and location."

Issue:

The "corrective actions" program element of the GALL Report AMP XI.M33 recommends that, "[u]nacceptable inspection findings result in additional inspection(s) being performed, which may be on a periodic basis, or in component repair or replacement." LRA Section B.1.35 is not consistent with GALL Report AMP XI.M33, which recommends that additional inspections will be conducted when inspections result in unacceptable results; whereas, the LRA AMP and FSAR Supplement state that there might be additional inspections.

Request:

State the criteria, and its basis, for determining that an expansion of the inspection sample size and location would not occur if unacceptable inspection findings are detected during inspections for loss of material due to selective leaching.

Waterford 3 Response

Conflicting statements appear within the GALL Report description for the selective leaching aging management program. Element 7, Corrective Actions states "Unacceptable inspection findings result in additional inspection(s) being performed, which may be on a periodic basis, or in component repair or replacement." Element 4, Detection of Aging Effects states that follow-up of unacceptable inspection findings includes a possible expansion of the sample size and location. To more closely align with the recommendations of Element 7, Corrective Actions, the WF3 LRA will be revised to indicate that follow-up of unacceptable inspection findings includes an evaluation using the corrective action program and expansion of the sample size and location.

LRA Sections A.1.35 and B.1.35 are revised as follows. Additions are shown with underline and deletions with strikethrough.

A.1.35 Coating Integrity

Follow-up of unacceptable inspection findings includes an evaluation using the corrective action program and ~~possible~~ expansion of the inspection sample size and location.

B.1.35 Coating Integrity

Follow-up for unacceptable inspection findings includes an evaluation using the corrective action program and ~~possible~~ expansion of the inspection sample size and location.