UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 20, 2011

Barry S. Allen
Vice President, Davis-Besse Nuclear
Power Station
FirstEnergy Nuclear Operating Company
5501 North State Route 2
Oak Harbor, OH 43449

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE DAVIS-BESSE NUCLEAR POWER STATION–BATCH 2 (TAC NO. ME4640)

Dear Mr. Allen:

By letter dated August 27, 2010, FirstEnergy Nuclear Operating Company, submitted an application pursuant to 10 *Code of Federal Regulation* Part 54 for renewal of Operating License NPF-3 for the Davis-Besse Nuclear Power Station. The staff of the U.S. Nuclear Regulatory Commission (NRC or the staff) is reviewing this application in accordance with the guidance in NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants." During its review, the staff has identified areas where additional information is needed to complete the review. The staffs requests for additional information are included in the Enclosure. Further requests for additional information may be issued in the future.

Items in the enclosure were discussed with Cliff Custer, of your staff, and a mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me by telephone at 301-415-2277 or by e-mail at brian.harris2@nrc.gov.

Sincerely,

Brian K. Harris, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure:
As stated

cc w/encl: Listserv

DAVIS-BESSE NUCLEAR POWER STATION
LICENSE RENEWAL APPLICATION
REQUEST FOR ADDITIONAL INFORMATION

RAI Sampling 1.0

Prior to the audit, the staff provided the applicant with a sampling of thirty-five component, material and environment combinations that were selected from license renewal application (LRA) Table 3. These components were chosen at random, in order to give the staff assurance that the information provided in the aging management review results in the applicant's LRA was accurate. The staff notes that accurate identification and independent confirmation of material and environment combinations is necessary to support the applicant's aging management reviews.

During the Scoping and Screening audit, on January 25, 2011, the staff performed a walkdown to confirm if the selected component, material and environment combinations listed in the LRA were accurate. After the completion of the walkdown the staff noted the following:

1. An orifice (component ID DB-RO4989) in the high-pressure injection system (LRA Table 3.2.2-5), exposed to an environment of lubricating oil (internal), was identified as being fabricated from steel. During the walkdown of the system and component, the staff noted that the material was incorrectly identified as steel.

2. Tubing (drain tubing from component ID DB-F86) in the station air system (LRA Table 3.3.2-29), exposed to an environment of air-indoor uncontrolled (external), was identified as being fabricated from steel. During the walkdown of the system and component, the staff noted that the material was incorrectly identified as steel.

The staff requests the following information:

1. The staff requests that the applicant verify the material composition of the components described above and, if necessary, provide an updated aging management review, in accordance with 10 CFR 54.21(a)(1).

2. Based on the identification that the materials of these two components were incorrectly identified in the LRA, clarify the follow-up actions that have been or will be taken to ensure that the aging management review (AMR) results in the LRA are accurate.

RAI 3.3.2.2.5-1

In the LRA, the applicant lists at least 24 Table 2 AMR line items that address elastomeric components exposed to an air-indoor uncontrolled (internal and external), raw water (internal) or treated water >60°C (>140°F) (internal) being managed for hardening and loss of strength by the External Surfaces Monitoring Program supplemented by the One-Time Inspection Program or the One-Time Inspection Program. These line items include, but are not limited to:

- 3.2.2-1, Row 21;
- 3.3.2-6, Row 4; and
- 3.3.2-28, Row 5.

The applicant also lists several line items that address elastomeric components exposed to an air-outdoor, air-indoor, or soil environment being managed for cracking and change in material properties by the Structures Monitoring Program.

LRA Section B.2.15 states that the External Surfaces Monitoring Program consists of periodic visual inspections and surveillance activities. It also states that the acceptance criterion for elastomeric materials is no unacceptable visual indications of cracks or discoloration. LRA Section B.2.30 states that the One-Time Inspection Program will include visual and physical examination, such as manipulation and prodding, of elastomers (flexible connections).

For AMR line items addressing similar material, environment, and aging effects, the Generic Aging Lessons Learned (GALL) Report recommends a periodic inspection program.

Consistent with the GALL Report, one-time inspections are appropriate for managing loss of material where environments are consistent with time such as the fuel oil, lube oil, and water chemistry programs. Where environments may not be consistent with time, such as indoor air or outdoor air, the GALL Report recommends the performance of periodic inspections since a single inspection may not reflect, or predict, the existence of future degradation.

The staff has the following concerns:

- It is not clear to the staff whether only the One-Time Inspection Program will be used to inspect elastomeric components exposed to an air-indoor uncontrolled (internal and external), or if both the External Surfaces Monitoring and One-Time Inspection Programs will be used. The staff noted that for the elastomeric components exposed to raw water and treated water >60°C (>140°F), only the One-Time Inspection Program is credited.
- The External Surfaces Monitoring Program and the Structures Monitoring Program do not include physical manipulation of elastomeric materials and therefore it may not be fully effective at determining if hardening or loss of strength has occurred.
- The staff lacks sufficient information (e.g., thickness of flexible connections and mechanical sealants) to determine whether the inspection of the elastomeric components will detect hardening and loss of strength on the interior surfaces of the component.

The staff requests the following information:

1. Given that the One-Time Inspection Program would not be an effective program for managing hardening and loss of strength for elastomeric components exposed to an

air-indoor uncontrolled (internal and external), raw water (internal) or treated water >60°C (>140°F) (internal), provide details as to what alternative program will be applied to appropriately manage the aging for these material and environment combinations.

2. Provide an assessment of those Table 2 AMR line items containing similar material, environment, and aging effect combinations that might be similarly affected and revise these line items to ensure an appropriate aging management program.

3. If as a result of the response to requests (1) and (2), or due to existing AMR line items, the External Surfaces Monitoring Program or Structures Monitoring Program is used to manage aging of elastomeric components, revise the programs to include physical manipulation of elastomeric materials, or state how they would be effective at determining if hardening or loss of strength has occurred.

4. State the basis for how hardening and loss of strength occurring on the interior surfaces of elastomeric components will be effectively detected with only an inspection of the exterior surface of the component.

RAI 3.3.2.71-2

In the LRA, the applicant lists at least at 41 Table 2 AMR line items that address steel piping and piping components exposed to air (internal), condensation (internal), and moist air (internal) all with an aging effect of loss of material, and all assign the One-Time Inspection Program as the aging management program. These line items include, but are not limited to:

- 3.3.2-12, Row 91,
- 3.3.2-1, Row 34, and
- 3.3.2-31, Row 25.

For AMR line items addressing similar material, environment, and aging effects, the GALL Report recommends a periodic inspection program such as the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage aging effects for these component/material/environment combinations.

Consistent with the GALL Report, one-time inspections are appropriate for managing loss of material where environments are consistent with time such as the fuel oil, lube oil, and water chemistry programs. Where environments may not be consistent with time, such as indoor air or outdoor air, the GALL Report recommends the performance of periodic inspections since a single inspection may not reflect, or predict, the existence of future degradation. Therefore, it is unclear why the applicant has selected the One-Time Inspection Program to manage a loss of material aging effect instead of a program that conduct's periodic inspections.

The staff requests the following information:

1. Given that the One-Time Inspection Program would not be an effective program for managing a loss of material for steel piping and piping components exposed to air (internal), condensation (internal), and moist air (internal), provide details as to what alternative program will be applied to appropriately manage the aging for these material and environment combinations.

2. Provide an assessment of those Table 2 AMR line items containing similar material, environment, and aging effect combinations that might be similarly affected and revise these line items to ensure an appropriate aging management program.

RAI B.2.2-1

The "detection of aging effects" program element of GALL Report aging management program (AMP) XI.M29 "Aboveground Steel Tanks" recommends that potential corrosion of in-scope tank bottoms be determined by conducting thickness measurements whenever the tank is drained and at least once within five years of entering the period of extended operation. LRA Section B.2.2 states that volumetric examination of tank bottoms will be conducted prior to the period of extended operation and that the frequency tank bottom volumetric inspections will be based on the findings of the inspection performed prior to the period of extended operation. It is not clear to the staff that, as a minimum, in-scope tank bottom thickness measurements will be performed whenever the tanks are drained and at least once within five years of entering the period of extended operation.

The staff requests the following information:

1. State the minimum number of times each in-scope tank's bottom will be inspected for thickness during the period of extended operation.

2. Revise LRA Appendix A, "Updated Safety Analysis Report Supplement," Section A.1.2, "Aboveground Steel Tanks Inspection Program," to reflect the fact that in-scope tank bottom thickness measurements will be performed whenever the tanks are drained and at least once within five years of entering the period of extended operation.

RAI B.2.2-2

LRA Table 3.2.2-4, row number 117 states that for the stainless steel borated water storage tank exposed to air-outdoor (external) there is no aging effect and no AMP is proposed. The on-site AMP walkdown revealed that the tank is coated with insulation material.

It is the staff's position that cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements, and tanks exposed to certain outdoor air environments. Such environments include, but are not limited to, those within 1/2 mile of a highway which is treated with salt in the wintertime, areas in which the soil contains more than trace chlorides, plants having cooling towers where the water is treated with chlorine or chlorine compounds, and areas subject to chloride contamination from other agricultural or industrial sources. In addition, although updated final safety analysis report (UFSAR) Section 5.2.3.3 states that the insulation coating the stainless steel borated water storage tank is compatible with the material of construction, there is no information in the LRA or UFSAR on the susceptibility of the insulation to release chlorides which could result in cracking of the stainless steel tank material.

The staff requests the following information:

1. State why the air-outdoor environment will not result in an aging effect requiring management for the stainless steel borated water storage tank (e.g., exposure to chlorides in the atmosphere, road chemical treatments, soil containing more than trace chlorides, cooling tower chemical treatment, local agricultural or industrial sources that could result in chloride contamination).

2. Describe the insulation material applied on the external surface of the stainless steel borated water storage tank and state if it could release halides.

3. If the air-outdoor environment or leached compounds from the insulation could result in an aging effect requiring management, state how the aging effect will be managed.

RAI B.2.2-3

The "preventive actions" program element of GALL AMP XI.M29 "Aboveground Steel Tanks" states that sealant or caulking at the external interface between the tank and concrete or earthen foundation mitigates corrosion of the bottom surface of the tank by minimizing the amount of water and moisture penetrating the interface, which would lead to corrosion of the bottom surface. LRA Section B.2.2 does not state that sealant or caulking was utilized at the external interface between the tank and concrete or earthen foundation.

It is not clear to the staff whether the firewater storage tank, diesel fuel oil storage tanks, and borated water storage tank have sealant or caulking installed at the external interface between the tank and concrete or earthen foundation. It is also not clear to the staff what compensatory measures are being implemented by the applicant to effectively manage aging of the bottom surface of the tanks if sealant or caulking was not installed at the base.

The staff requests the following information:

1. State whether the firewater storage, diesel fuel oil storage, and borated water storage tanks have sealant or caulking installed at the external interface between the tank and concrete or earthen foundation.

2. If these tanks do not have sealant or caulking, revise LRA B.2.2 to state and justify this as an exception to GALL AMP XI.M29.

3. If the tanks do have sealant or caulking, how will their aging effects be managed?

RAI B.2.2-4

LRA Section B.2.2 states that an inspection of the exterior of the diesel oil storage tank in 2002 revealed rust and corrosion at the base flange of the tank and corroded bolted at the lower access plate at the base of the tank.

The applicant did not state the cause of corrosion on the external surface of the tank. State the cause(s) for the external tank surface corrosion that occurred in 2002 associated with the diesel oil storage tank and what extent of condition review was conducted. State how this plant-specific operating experience was incorporated into the Aboveground Steel Tanks Inspection program.

RAI B.2.4-1

GALL AMP XI.M18, "Bolting Integrity," recommends preventive actions and inspections for managing the aging of bolting within the scope of license renewal including: 1) safety-related bolting, 2) bolting for nuclear steam supply system (NSSS) component supports, 3) bolting for other pressure retaining components, including nonsafety-related bolting, and 4) structural bolting (actual measured yield strength > 150ksi). GALL AMP XI.M18 further states that other aging management programs also manage inspection of safety-related bolting and supplement this Bolting Integrity program.

LRA Section B.2.4, "Bolting Integrity," states that the Bolting Integrity program inspections are implemented through the following other aging management programs: Inservice Inspection - IWE; Inservice Inspection – IWF; and Structures Monitoring Program. LRA Sections B.2.22, "Inservice Inspection (ISI) Program- IWE," B.2.23, "Inservice Inspection Program- IWF," and B.2.39, "Structures Monitoring Program," do not include bolting in their program descriptions.

The applicant's B.2.22, B.2.23, and B.2.39 program basis documents do not provide guidance for aging effects related to bolting, associated preventive actions, or recommended inspections. The applicant states in their LRA that the ISI-IWE, ISI-IWF, and Structures Monitoring programs supplement the Bolting Integrity program by implementing inspections of structural bolts.

However, neither the LRA nor the applicant's ISI-IWE, ISI-IWF, and Structures Monitoring program basis documents provide guidance for aging effects related to structural bolting, associated preventive actions, or recommended inspections. The lack of guidance in the LRA and program basis documents brings into question the ability of these programs to manage bolting related aging effects including loss of material, loss of preload, cracking and stress corrosion cracking.

Describe how GALL AMP XI.M18 recommendations in the "preventive actions," "parameters monitored," and "detection of aging effects" program elements are addressed for bolting in the ISI-IWE, ISI-IWF and Structures Monitoring Programs. Include the specific inspection technique utilized by each program to manage loss of material, loss of preload, cracking and stress corrosion cracking. If volumetric or surface examinations are not conducted for SCC susceptible bolts, explain why it is unnecessary.

RAI B.2.4-2

GALL AMP XI.M18, "Bolting Integrity," relies on recommendations for a comprehensive bolting integrity program as delineated in EPRI TR-104213, EPRI NP-5769 and NUREG-1339. LRA section B.2.4 states an exception to the GALL AMP XI.M18, indicating that the applicant does not explicitly address the guidelines outlined in EPRI NP-5769 and NUREG-1339. Instead, the applicant's Bolting Integrity Program only relies on the recommendations contained in EPRI TR-104213 and EPRI TR-111472.

The use of EPRI TR-111472 as guidance in place of the GALL recommended guidance delineated in EPRI NP-5769 and NUREG-1339 requires further clarification to determine how EPRI TR-111472 meets the intent of EPRI NP-5769 and NUREG-1339 as identified in GALL AMP XI.M18, and whether or not its usage will contradict the GALL guidance.

Provide clarification on the use of EPRI TR-111472 as guidance for this program. Specifically, provide an explanation of any contradictions between EPRI TR-111472 and the GALL recommended guidance delineated in EPRI NP-5769 and NUREG-1339 that it is replacing and their impact on this program.

RAI B.2.4-3

GALL AMP XI.M18 "Bolting Integrity" indicates that use of molybdenum disulfide (MoS_2) as a lubricant on closure bolting within the scope of license renewal is a potential contributor of stress corrosion cracking and should not be used. The applicant's Bolting Integrity program basis documents state that certain instances were identified where lubricants containing MoS_2 were approved for use, but the operating experience review did not show cases where lubricants had caused degradation.

The use of MoS_2 is known to be a contributor to stress corrosion cracking and should not be used. The extent of usage of MoS_2 as a lubricant on closure bolting within the scope of license renewal is not clear. It is also not clear if the applicant will be replacing lubricants containing MoS_2 with an alternate lubricant for use on closure bolting within the scope of license renewal.

The staff requests the following information:

1. Identify the extent to which MoS_2 is currently used as a lubricant on closure bolts within the scope of license renewal.

2. Are there plans to replace MoS_2 with an alternate lubricant for use on closure bolting within the scope of license renewal? If no replacement is planned, the staff would consider this to be an exception to the recommendations of GALL AMP XI.M18 requiring an appropriate justification as to why stress corrosion cracking would not be of concern.

RAI B.2.7-1

LRA Section B.2.7 states that the Buried Piping and Tanks Inspection Program, is an existing program with no exceptions and eight enhancements, and is consistent with GALL AMP XI.M34. In light of recent industry operating experience, the staff is concerned about the continued susceptibility to failure of buried piping that is within the scope of 10 CFR 54.4 and subject to aging management for license renewal. Most of the events could have been avoided with the effective implementation of one or more preventive actions consisting of cathodic protection, effective coatings and quality of backfill. The staff integrated this operating experience into the recommendations contained in GALL AMP XI.M41, "Buried and Underground Piping and Tank Inspections."

The staff identified the following issues:

1. In order to evaluate an applicant's buried pipe and underground piping inspection programs, the staff must be aware of plant-specific operating experience which might include examples beyond those listed in the LRA.

2. GALL AMP XI.M41 Sections 4.b.iii. and 4.c.iii. state that inspection locations should be risk informed based on susceptibility to degradation and consequence of failure. The staff does not have sufficient information to determine if the applicant will utilize risk informed criteria to inspection locations.

3. GALL AMP XI.M41, Table 2a, states that buried in-scope steel piping should be cathodically protected. The LRA and UFSAR do not contain enough details to determine if the buried in-scope service water piping is cathodically protected. In addition, UFSAR 9.5.4.2 states, "Corrosion of the tanks [fuel oil storage] will be prevented by protective coatings, and by cathodic protection if necessary." Therefore it is not clear to the staff if the fuel oil tanks are cathodically protected. The LRA does not state the availability of the cathodic protection system and what periodic testing is conducted on the cathodic protection system.

4. GALL AMP XI.M41, Table 2a, states that the backfill within six inches of buried in-scope steel piping should meet Section 5.2.3 of NACE SP0169-2007. The LRA does not describe the quality of the backfill in the vicinity of buried in-scope piping.

5. GALL AMP XI.M41, Table 2a, states that steel piping should be coated; however, if a buried fire protection piping system was designed to NFPA-24 and is tested to NFPA-25, then the coating preventive measures of Table 2a does not apply. The staff noted that UFSAR, Table 9.0-1 states that the fire protection piping and components were installed to NFPA requirements, but it did not specify NFPA-24. The staff also noted that LRA Section B.2.1.18 (Fire Water Program) states that periodic flow testing is conducted in accordance with NFPA-25, but also states that some portions are not flow tested. The

staff does not have sufficient information to determine that the buried in-scope fire protection piping was constructed to NFPA-24 and is periodically tested to the requirements of NFPA-25.

6. LRA Section B.2.7 describes two instances of coating degradation, a 1995 example associated with a fuel oil piping leak and a 2008 example associated with a condensate demineralizer backwash line. The applicant did not state the cause of the coating degradation. In addition, the LRA describes the discovery of four different coating holidays. The staff needs to understand the causes of the failures in order to evaluate the effectiveness of the applicant's program.

7. Enhancements three through six state that one inspection of a buried in-scope coated and wrapped piping segment or tank, and one inspection of uncoated cast iron piping will be conducted in the ten-year period prior to extended operation and be repeated once in the first ten-year period of extended operation. The sample size proposed by the applicant may not provide a reasonable basis for assurance that the piping will meet its intended license renewal function(s) if a piping system is not cathodically protected.

8. LRA Section B.2.7 and Commitment No. 3 state that approximately ten linear feet of piping will be exposed for inspections. The staff believes that a minimum inspection length should be established to ensure that an adequate length of piping is inspected.

9. The staff reviewed LRA Section A.1.7 and UFSAR Update for the Buried Piping and Tanks Inspection Program and noted that it does not state that preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings and cathodic protection.

10. Given that the LRA Section B.2.7 describes a 1995 fuel oil leak, 2002 holiday (i.e., location of missing coating) in a fuel oil line, 2008 fuel oil line holidays leading to pitting and minor corrosion, and a 2008 condensate demineralizer backwash line coating damage, it is not clear to the staff how the applicant is informing the number of required inspections based on plant-specific operating experience. GALL AMP XI.M41, Section 4.f.iv. states that if adverse conditions (e.g., leaks, material thickness less than minimum, presence of coarse backfill within six inches of the pipe that resulted in coating degradation, general or local degradation that resulted in exposure of the base material) are discovered during the inspection of in-scope buried pipe, that the sample size is doubled and if subsequent inspections find further adverse conditions that the inspection size continues to be doubled. LRA Section B.2.7 states that degradation or leakage found during inspections is entered into the corrective action program to ensure evaluations are performed and appropriate corrective actions are taken, but it does not state the expansion of scope size.

11. LRA Section B.2.20, Fuel Oil Chemistry Program, states that the effectiveness of the Fuel Oil Chemistry Program is verified by the One-Time Inspection program, which includes ultrasonic thickness measurement of a sample fuel oil tank bottom to ensure that significant degradation is not occurring. If the fuel oil tanks are cathodically protected, the staff believes that to effectively detect aging effects of a buried tank each fuel oil tank should have a periodic internal visual inspection and if the visual inspection detects signs of degradation on the surfaces of the tank, a volumetric examination on the interior surfaces of the tank should be conducted.

12. LRA Table 3.3.2-12, row number 102, states that there is steel piping external exposed to soil. It is not clear whether the internal environment is fuel oil, lubricating oil, or air.

13. LRA Section B.2.15, External Surfaces Monitoring Program, states that, "Surfaces that are inaccessible or not readily visible during either plant operations or refueling outages, such as surfaces that are insulated, will be inspected opportunistically during the period of extended operation." Based on a review of the LRA, it is not clear to the staff which systems have underground piping or tanks (i.e., below grade but are contained within a tunnel or vault such that they are in contact with air and are located where access for inspection is restricted) and the length of piping or number of tanks that are underground. GALL Report AMP XI.41 recommends a minimum number of inspections of underground piping based on material type and function of the piping (i.e., code class/safety-related, contains hazardous materials) and each steel tank. Given the "opportunistic" statement in the LRA, it is not clear to the staff that the applicant's program will inspect an adequate sample of underground piping and tanks. In addition, GALL AMP XI.M41, Section 4.c.iv., states that underground piping is visually inspected to detect external corrosion and volumetrically examined to detect internal corrosion. The staff does not have sufficient information to determine if and to what extent the applicant will conduct volumetric examinations of underground piping.

14. GALL AMP XI.M41, Table 2b, states that underground piping should be coated in accordance with Table 1 of NACE SP0169-2007 or the applicant should justify the alternative coating methodology. The staff does not have sufficient information to determine if the applicant's coatings for underground piping meet Table 1 of NACE SP0169-2007 Table 1.

15. GALL AMP XI.M41, Section 6.c, states that, if coated or uncoated metallic piping or tanks show evidence of corrosion, the remaining wall thickness in the affected area is determined to ensure that the minimum wall thickness is maintained. LRA Section B.2.7 states that degradation found during inspections is entered into the corrective action program to ensure evaluations are performed and appropriate corrective actions are

taken, but it does not state the remaining wall thickness in the affected area is determined to ensure that the minimum wall thickness is maintained.

The staff requests the following information:

1. Provide a list and brief summary, including cause, of any leaks or adverse conditions (e.g., leaks, material thickness less than minimum, presence of coarse backfill within six inches of the pipe that resulted in coating degradation, general or local degradation that resulted in exposure of the base material) which have occurred in buried piping or tanks at the station in the past five years that were entered in your corrective action program but are not included in your LRA.

2. State whether buried and underground in-scope piping inspection locations will be selected based on risk factors considering susceptibility to degradation and consequences of failure. If inspection locations are not risk informed, state how the inspections that are conducted will be representative of piping locations that are most susceptible to degradation and result in the worst adverse consequences.

3. For buried in-scope steel piping respond to the following:

   i. State whether the service water system and emergency diesel generator fuel oil storage tanks are cathodically protected, including, if portions of a system are protected, what portions are not protected.

   ii. State the availability of the cathodic protection system, and if portions of the system are not available 90% of the time or will be allowed to be out of service for greater than 90 days in any given year, state how the piping will meet or exceed the minimum design wall thickness throughout the period of extended operation.

   iii. State whether annual ground potential surveys of the cathodic protection system are conducted and what acceptance criteria is utilized, or if annual ground potential surveys are not conducted, state how the piping will meet or exceed the minimum design wall thickness throughout the period of extended operation.

   iv. State what cathodic protection system inspection/testing parameters will be trended and evaluated for adverse changes. If these parameters do not include potential difference and current measurements state how the effectiveness of the systems and/or coatings will be evaluated.

4. Based on plant-specific installation specifications and the results of inspections conducted to date, state if the backfill within six inches of buried in-scope steel piping meets NACE SP0169-2007. If the backfill does not meet NACE SP0169-2007, state how the buried pipe coatings will not be potentially damaged by the backfill.

5. State the following for buried in-scope uncoated fire protection cast iron piping:

   i. What specific NFPA code was used for the design and installation of the in-scope buried fire protection piping. If the design and installation code required that cast iron piping be coated, state why there is a reasonable assurance that the uncoated cast iron piping will meet its current CLB function(s) throughout the period of extended operation.

   ii. State whether all portions of the buried in-scope fire protection piping will be periodically flow tested in accordance with NFPA-25. If all or some portions of the buried in-scope fire protection piping will not be periodically flow tested in accordance with NFPA-25, state why there is a reasonable assurance that the uncoated cast iron piping will meet its current CLB function(s) throughout the period of extended operation.

6. State the cause for the coating degradation that occurred in a 1995 example associated with a fuel oil piping leak and a 2008 example associated with a condensate demineralizer backwash line. State the basis for having a reasonable assurance that planned inspections represent an adequate quantity to identify coating damage and holidays before leaks occur.

7. For buried in-scope piping, respond to the following:

   i. What minimum number of inspections of buried in-scope piping is planned during the 30 – 40, 40 – 50, and 50 – 60 year operating period? When describing the minimum number of planned inspections, differentiate between material, code/safety-related piping, and potential to contain hazardous material category piping inspection quantities of buried in-scope piping.

   ii. State which inspections will be conducted by excavated direct visual inspection of the buried piping.

   iii. State the length of each buried in-scope piping system.

   iv. If there are no planned inspections for piping containing hazmat materials, state why it is acceptable to not inspect in-scope pipe containing hazardous materials.

8. State the minimum inspection length of excavated buried piping inspections. If the length is shorter than ten feet, state the basis for why this length will provide an adequate representative length of piping. Revise LRA Commitment No. 3 to state the minimum inspection length of piping.

9. Revise LRA Section A.1.7 to state that preventive measures are in accordance with standard industry practice for maintaining external coatings/wrappings and cathodic protection, and state the number of inspections and frequency of buried in-scope piping.

10. State the sample size increase of the inspection in-scope buried pipe that will occur if adverse conditions (e.g., leaks, material thickness less than minimum, presence of coarse backfill within six inches of the pipe that resulted in coating degradation, general or local degradation that resulted in exposure of the base material) are discovered during inspections. If the inspection sample size is not initially doubled and then doubled again if adverse conditions are discovered in the initial and subsequent inspections, state why there is a reasonable assurance that the extent of condition has been discovered and evaluated.

11. For the buried in-scope steel fuel oil tanks state whether each fuel oil tank will have a periodic internal visual inspection and if the visual inspection detect signs of degradation on the surfaces of the tank, a volumetric examination on the interior surfaces of the tank will be conducted, or state why it is acceptable to not conduct these inspections. In addition, state the frequency of inspection of the tanks. If the frequency of tank inspections exceeds ten years, state the basis for why the test frequency provides a reasonable assurance that the tank will not leak or be able to meet its CLB function(s).

12. State whether the piping in LRA Table 3.3.2-12, row number 102, has an internal environment of fuel oil, lubricating oil, or air.

13. State the systems, function (e.g., safety related, Code required, contains hazmat material, nonsafety-related), material type and length of in-scope underground piping and state the number of underground steel tanks. State how many and the extent of visual and volumetric inspections that will be conducted of underground piping and steel tanks.

14. State whether underground piping and tanks are coated in accordance with Table 1 of NACE SP-0169-2007 or justify why the existing coating or lack of coating provides a reasonable assurance that the uncoated piping will meet its current CLB function(s) throughout the period of extended operation.

15. If coated or uncoated metallic piping or tanks show evidence of corrosion, state whether the remaining wall thickness in the affected area will be determined to ensure that the minimum wall thickness is maintained. If the remaining wall thickness will not be measured, state how there is reasonable assurance that the extent of corrosion is understood.

RAI B.2.8-1

In the program description for LRA Section B.2.8, the applicant stated that the Closed Cooling Water Chemistry Program will be supplemented by the One-Time Inspection Program; however, in the exception for this program, the applicant stated that opportunistic inspections will be conducted. The GALL AMP XI.M21 "Closed-Cycle Cooling Water System" element 4 "detection of aging effects" states that the control of water chemistry does not preclude corrosion or stress corrosion cracking and that the extent and schedule of inspections and testing should assure detection of these aging effects before the loss of the intended function.

Based on the program description in LRA Section B.2.8, it is unclear to the staff whether the applicant will conduct a one-time inspection, periodic inspections of opportunity, or a combination of the two, as the description of the inspection activity differs within the program summary.

The guidance in the GALL Report maintains that one-time inspections should not be used for structures or components with known age-related degradation mechanisms or when the environment is not consistent with time. In these cases, periodic inspections are recommended where a single inspection may not reflect, or predict, the lack of degradation in the future. It is the staff's current position that inspections conducted in conjunction with the closed-cycle cooling water systems should be conducted whenever the system is opened and that a representative sample of piping and components should be inspected at an interval not to exceed ten years.

The staff requests the following information:

1. Confirm whether the program will include a one-time inspection, periodic inspections of opportunity, or a combination of the two.

2. If periodic inspections will not be conducted, provide technical justification for the selection of the One-Time Inspection Program rather than a program that uses periodic inspections.

3. If periodic inspections will be conducted, state whether the inspection results will be reviewed to ensure that a representative sample of piping and components has been inspected at an interval not to exceed ten years. Absent a minimum inspection interval, state how inspections of opportunity will provide assurance that corrosion or stress corrosion cracking will be detected before the component's loss of intended function.

RAI B.2.10-1

Standard Review Plan (SRP)-LR Rev. 2, Table 3.0-1, provides the recommended FSAR Supplement Description for GALL AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems." The SRP-LR recommends the following wording: "The number and magnitude of lifts made by the hoist or crane are also reviewed."

The Davis-Besse LRA Updated Safety Analysis Report Supplement Section A.1.10, "Cranes and Hoists Inspection Program" description does not address a review of the number and magnitude of lifts made by a hoist or crane.

Update the UFSAR Supplement wording to reflect the fact that the Cranes and Hoists Inspection Program includes a review of the number and magnitude of lifts made by a hoist or crane.

RAI B.2.10-2

GALL AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems," scope of program states that this program manages the effect of loss of preload of bolted connections. Bolted connections are also addressed in elements 3, 4, and 10 of this AMP.

During the audit, the staff reviewed the applicant's B.2.10 Cranes and Hoists Inspection Program and its references and found that although loss of preload of bolted connections for cranes and hoists is addressed in the program inspections and preventive maintenance procedures, it is not included in the LRA program description or other program elements nor are there any AMR line items addressing a loss of preload of bolted connections for overhead cranes and hoists.

The staff requests the following information:

1. If the Cranes and Hoist Inspection AMP is intended to be used to manage a loss of preload for bolted connections of cranes and hoists, revise the LRA and associated programs elements to reflect this.

2. Clarify why crane and hoist program inspections and preventive maintenance procedures discuss loss of preload as an aging effect despite the fact that there are currently no AMR line items related to a loss of preload for bolted connections for overhead cranes and hoists.

RAI B.2.16-1

LRA Section B.2.16, "Fatigue Monitoring Program," states that it manages fatigue of select primary and secondary components, including the reactor vessel, reactor internals, pressurizer, and steam generators, by tracking thermal cycles as required by Technical Specification (TS) 5.5.5, "Component Cyclic or Transient Limit." LRA Section 4.3 states that the 14 original design transients for the RCS are found in USAR Table 5.1-8. Furthermore, the design cycles that are significant contributors to fatigue usage are included in the Fatigue Monitoring Program and are provided in LRA Table 4.3-1.

The staff reviewed the applicant's program implementation procedure for tracking transients during its on-site audit. After reviewing the applicant's procedure, TS 5.5.5, USAR Table 5.1-8, and LRA Table 4.3-1 the staff noted that various transients, descriptions, and cycle counts were not consistent with each other. In order to verify which transients are monitored and are fatigue-significant, the connection between the applicant's procedure, LRA Table 4.3-1, TS 5.5.5, and the USAR need to be consistent.

The staff noted that TS 5.5.5, Amendment 279 (Adams Accession No. ML053110490), was titled "Allowable Operating Transient Cycles Program," which is not consistent with the title "Component Cyclic or Transient Limit" as described in LRA Section B.2.16. It is not clear to the staff which revision of TS 5.5.5 is currently in place.

The staff requests the following information:

1. Clarify and justify the discrepancies between the program implementation procedure, TS 5.5.5, USAR Table 5.1-8, and LRA Table 4.3-1 with respect to the transient descriptions, transients monitored, and all cycle limits. In lieu of a justification, amend the appropriate documents such that the transients being monitored by the Fatigue Monitoring Program and the transients used in the related fatigue time-limited aging analyses (TLAAs) are consistent (e.g., TS, USAR, LRA and program implementation procedure). Clarify if there are transients that require monitoring by TS 5.5.5 and USAR Section 5 that are not or will not be monitored by the Fatigue Monitoring Program. If these types of transients exist, justify why these transients do not need to be monitored currently and during the period of extended operation, as required by TS 5.5.5 and USAR Section 5. Update USAR Section 5, as needed, to ensure that the basis for not monitoring these required transients is documented.

RAI B.2.16-2

The "scope of program" program element of GALL (NUREG 1801, Rev. 2) AMP X.M1 recommends that the program should include, for a set of sample reactor coolant system components, fatigue usage calculations that consider the effects of the reactor water environment. This sample set should include the locations identified in NUREG/CR-6260 and additional plant-specific component locations in the reactor coolant pressure boundary if they may be more limiting than those considered in NUREG/CR-6260.

During its audit and review of LRA Section B.2.16, "Fatigue Monitoring Program," and supporting program basis documents, the staff did not find any identification of additional component locations other than those from NUREG/CR-6260, or a confirmation that the NUREG/CR-6260 locations were bounding for the applicant's site. Furthermore, the staff noted that the applicant's plant-specific configuration may contain locations that should be analyzed for the effects of the reactor coolant environment other than those identified in NUREG/CR-6260. This may include locations that are limiting or bounding for a particular plant-specific configuration, or that have calculated cumulative usage factor (CUF) values that are greater when compared to the locations identified in NUREG/CR-6260.

The staff requests the following information:

1. Justify that the plant-specific locations listed in LRA Table 4.3-2 are bounding for the generic NUREG/CR-6260 components.

2. Confirm and justify that the locations selected for environmentally assisted fatigue analyses in LRA Table 4.3-2 consists of the most limiting locations for the plant (beyond the generic components identified in the NUREG/CR-6260 guidance). If these locations are not bounding, clarify the locations that require an environmentally assisted fatigue analysis and the actions that will be taken for these additional locations. If the identified limiting location consists of nickel alloy, state whether the methodology used to perform the environmentally-assisted fatigue calculation for nickel alloy is consistent with NUREG/CR-6909. If not, justify the method chosen.

RAI B.2.16-3

LRA Section B.2.16, "Fatigue Monitoring Program," states that it uses the systematic counting of plant transient cycles to ensure that the design cycles are not exceeded, thereby ensuring that component fatigue usage limits are not exceeded. The acceptance criterion is to maintain the number of counted transient cycles below the design cycles for each transient.

The preventive actions" program element of GALL (NUREG 1801, Rev. 2) AMP X.M1 recommends the program to ensure that the fatigue usage does not exceed the Code design limit of 1.0. The number of actual plant transients exceeding the numbers used in the fatigue analyses or the actual transient severity exceeding the bounds of the design transient definitions can cause the fatigue usage to exceed the Code design limit.

The "detection of aging effects" program element of GALL (NUREG 1801, Rev. 2) AMP X.M1 recommends that the fatigue monitoring program provide for periodic updates of the fatigue usage calculations, on as-needed basis, if an allowable cycle limit is approached. The staff noted that this ensures that the fatigue usage calculations remain valid and the Code design limit is not exceeded.

Based on the applicant's description of the Fatigue Monitoring Program, it only keeps track of cycle counts; therefore, it is not clear to the staff how the applicant's program confirms that the severity of actual transients is bounded by the severity assumed in the design analysis. Also, it is not clear how the program accounts for any differences in the number of "design cycles," as listed in LRA Table 4.3-1, and the number of cycles that were used in a fatigue analyses.

During its audit, the staff noted that the applicant's plant procedure, implementing the Fatigue Monitoring Program, describes that, when the count for a transient reaches a certain fraction of the corresponding "design cycles," Design Engineering is contacted for re-evaluation of the allowed cycles. However, the specific actions that would be taken, and in what timeframe, with regard to the updating of allowable cycles, or an alternate course of action, were not discussed. There may be a potential for exceeding the number of cycles used in the analysis if they are less than the "design cycles" listed in LRA Table 4.3-1.

The staff requests the following information:

1. Provide the details and basis for the process used to verify that the severity of an actual transient is bound by the severity of the design transient. If this process is not in place,

justify how the actual severity of a transient is confirmed to be bounded by the design severity, to ensure that the fatigue analysis remains valid.

2. Confirm that the severity of all transients that have occurred to date, since initial plant operation, have been bounded by the design severity. If there have been instances where the actual severity exceeded the design severity, discuss the actions taken to assure that the Code design limit has not been exceeded and that the fatigue analysis remains valid.

3. Confirm that the "design cycles" monitored by the Fatigue Monitoring Program," are in fact the ones used in the fatigue analysis. If not, justify why the "design cycles" listed in LRA Table 4.3-1 are monitored by the Fatigue Monitoring Program, to ensure that the fatigue usage limit is not exceeded in a given analysis.

4. Clarify the actions or measures taken as part of the Fatigue Monitoring Program if the actual transient severity exceeds the design severity and if the actual cycle count approaches or exceeds the number of cycles used in the analysis.

RAI B.2.16-4

LRA Section B.2.16, "Fatigue Monitoring Program," proposes an enhancement to the "preventive action" program element which states that for locations, including NUREG/CR-6260 locations, projected to exceed a CUF of 1.0, the program may implement an option that will "manage the effects of aging due to fatigue at the affected locations by an inspection program that will be reviewed and approved by the Nuclear Regulatory Commission (NRC) (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC)."

The objective of GALL AMP X.M1 is to ensure that the fatigue usage does not exceed the Code design limit during period of extended operation. It is not clear to the staff how the proposed option of managing the aging due to fatigue by an inspection program is consistent with the objective in GALL AMP X.M1, to prevent cumulative fatigue usage from exceeding the Code design limit.

Furthermore, the enhancement implies that it encompasses all locations, including the NUREG/CR-6260 specific locations. However, during its audit, the staff noted that this enhancement may only be applicable to the NUREG/CR-6260 specific locations.

The staff requests the following information:

1. Provide the basis for using an inspection program, as an option, to manage fatigue usage for during period of extended operation.

2. Clarify how the use of an inspection program is consistent with the objective of GALL AMP X.M1, to maintain fatigue usage below the Code design limit. Clarify how the use of this option will be used as a preventative action and how this is consistent with the "preventive action" program element. Clarify if the options described in the

enhancement are meant to be corrective actions if the Fatigue Monitoring Program provides indications that the CUF may exceed 1.0.

3. Clarify if the options described in this enhancement are applicable only for the NUREG/CR-6260 locations, and, if so, specify and justify the actions taken if the CUF exceeds 1.0 for all other locations.

RAI B.2.16-5

LRA AMP B.2.16, "Fatigue Monitoring Program," includes an enhancement to the "parameters monitored and inspected" program element of GALL AMP X.M1 which states "The Fatigue Monitoring Program will be enhanced to monitor any transient where the 60-year projected cycles were used in an environmentally-assisted fatigue evaluation and to establish an administrative limit that is equal to or less than the 60-year projected cycles."

The need for the first part of this enhancement is not clear to the staff since consistency with the GALL AMP X.M1 ensures monitoring of all plant transients that are fatigue-significant and not just those transients where the 60-year projected cycles were used in an environmentally-assisted fatigue evaluation.

The second part of this enhancement deals with establishing an administrative limit and it is not clear to the staff why such a limit is to be established only for those transients used in the environmentally-assisted fatigue evaluations. Also, establishing a limit solely on the 60-year projected cycles, without referencing the CUF value, may not ensure that the acceptance criterion for CUF will be met through the period of extended operation. In particular, if the environmental or transient strain rate conditions are adversely exceeded for some duration, and/or the actual cycles analyzed are less than the design limit cycles.

The staff requests the following information:

1. Clarify if monitoring any transient that was used in an environmentally assisted fatigue evaluation with 60-year projected cycles should be an enhancement to GALL AMP X.M1, which recommends monitoring all transients that are significant contributors to fatigue usage.

2. Justify why establishing the administrative limit only for those transients used in an environmentally assisted fatigue evaluation is adequate to ensure that the acceptance criterion for CUF will be met through the period of extended operation.

3. Justify why establishing the administrative limit solely on the basis of 60-year projected cycles, without reference to the actual analyzed cycles and the CUF value/estimation that may be affected by possible adverse environmental or strain rate conditions, is sufficient to ensure that the acceptance criterion for CUF will be met through the period of extended operation, consistent with the GALL AMP X.M1.

RAI B.2.16-6

LRA Section B.2.16, "Fatigue Monitoring Program," discusses the operating experience associated with fatigue issues focusing, primarily, on industry initiatives and NRC/vendor information that caused the applicant to assess thermal stratification of the pressurizer surge line which resulted in changes to the fatigue analyses of record and to the cycles being counted under its Fatigue Monitoring Program.

During its audit, the staff reviewed the applicant's operating experience and condition reports and noted that in-service fatigue issues had occurred, such as thermal sleeve cracking and welded plug cracking, that were identified by the existing program. The staff noted that LRA Section B.2.16 did not discuss these in-service fatigue issues, the corrective actions taken and how the existing Fatigue Monitoring Program was modified based on the operating experience.

Justify the effectiveness of the existing Fatigue Monitoring Program with examples and sufficient details from plant-specific experience to demonstrate that timely identification of observed fatigue degradation was achieved, and the corrective actions taken to prevent the recurrence of such failures. Discuss any improvements that were incorporated into the Fatigue Monitoring Program based on this plant-specific experience.

RAI B2.16-7

LRA Sections 4.7.1.1, 4.7.4, 4.7.5.1, and 4.7.5.2 credit the applicant's Fatigue Monitoring Program to manage the aging effects associated with the TLAA. In accordance with 10 CFR 54.21(c)(1)(iii), the effects of aging on the intended functions will be adequately managed for the period of extended operation.

LRA Section B.2.16 states:

> The Fatigue Monitoring Program is an existing program that, with enhancement, will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801, Section X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary."

The applicant includes the aforementioned enhancement in Commitment No. 9, which is associated with the applicant's cycle counting activities, action limits and corrective actions for those components that are included in the applicant's cumulative usage factor (CUF) calculations. The applicant's UFSAR Supplement for the Fatigue Monitoring Program in LRA Section A.1.16 is also associated with the program's cycle counting activities for design basis CUFs and the environmentally-adjusted CUFs.

The staff noted that the applicant's Fatigue Monitoring Program is based on GALL AMP X.M1, which is limited to the use of cycle counting for CUF analyses (e.g. ASME Code Section III CUF analyses and environmentally-assisted CUF analyses). The use of cycle counting to manage flaw growth of either a postulated or existing macro flaw is not covered by GALL AMP X.M1.

The applicant has expanded its Fatigue Monitoring Program to use cycle counting for fatigue flaw growth analyses (described in LRA Sections 4.7.1, 4.7.4, 4.7.5.1, and 4.7.5.2) without the inclusion of enhancements to the applicable program elements (e.g. "scope of program," "parameters monitored or inspected," "monitoring and trending," "acceptance criteria," or "corrective action"). These enhancements should provide justification for all cycle counting design transients that were assumed in these fatigue flaw growth or cycle dependent flaw tolerance analyses.

It is not clear to the staff if the applicant's basis for cycle counting design transients has been captured in the applicable documents (e.g. Technical Specification, UFSAR, and cycle counting procedure) describing the management of fatigue flaw growth during the period of extended operation. In addition, LRA Section A.1.16 does not currently discuss the use of cycle counting for these fatigue flaw growth or cycle dependent flaw tolerance analyses in LRA Sections 4.7.1, 4.7.4, 4.7.5.1, and 4.7.5.2.

The staff requests the following information:

1. Clarify all fatigue flaw growth, cycle-dependent flaw tolerance or fracture mechanics TLAAs that are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii) and credit the Fatigue Monitoring Program. For each identified analysis: (a) provide the reference in the CLB that forms the basis for the analysis; and (b) identify the transients that were assumed and, for each transient, provide the assumed cumulative number of cycles.

2. Justify the use of cycle counting, as described in the Fatigue Monitoring Program, for the analyses identified in request (1) and dispositioning the associated TLAA in accordance with 10 CFR 54.21(c)(1)(iii) without: (a) an update to the applicable documents (e.g. Technical Specification, UFSAR, and cycle counting procedure), and (b) the inclusion of enhancements to the applicable program elements (e.g. "scope of program," "parameters monitored or inspected," "monitoring and trending," "acceptance criteria," or "corrective action").

   If enhancements and applicable commitments in LRA Appendix A are necessary, provide the following for each analysis: (a) justification for the use of cycle counting activities, (b) definition of the transients that need to be monitored when implementing cycle counting of design transients that were assumed, (c) action limits associated with the assumed transients, and (d) corrective action(s) that will be taken if an action limit is reached.

(c) Justify why LRA Section A.1.16 does not include a summary description on the use of the Fatigue Monitoring Program's cycle counting activities for the design transients that were assumed in the fatigue flaw growth or cycle dependent flaw tolerance analyses described in the LRA Section 4.

RAI B.2.18-1

GALL AMP XI.M27, "Fire Water System," states in the "scope of program" element that the Fire Water System Program manages loss of material due to corrosion, MIC or biofouling, and includes flow testing, visual inspections, and non-intrusive examinations to detect these aging effects. LRA Section B.2.18 states that the applicant's Fire Water Program will manage loss of material as well as cracking of susceptible materials. The applicant's program basis documents state that cracking due to stress corrosion cracking of copper alloy (greater than 15 percent zinc) will be managed by the same testing and inspection activities that identify and manage the loss of material. The staff noted that flow tests and visual inspections are not industry-accepted methods to detect cracking.

It is unclear to the staff what technique the applicant plans to use in its Fire Water System Program that will adequately manage cracking of susceptible copper alloy (greater than 15 percent zinc) components.

In light of the fact that flow tests and visual inspections are not industry accepted methods to detect cracking, provide additional information regarding the technique to be used to detect cracking of copper alloy (greater than 15 percent zinc) fire water system components.

RAI B.2.24-1

GALL AMP XI.M1 states that the components described in Subsections IWB-1220, IWC-1220, and IWD-1220 are exempt from the volumetric and surface examination requirements, but not exempt from visual exam requirements of ASME Code Section XI, Subsections IWB-2500, IWC-2500, and IWD-2500.

During its audit, the staff noted that the applicant's program basis document for the Inservice Inspection Program states that the components described in ASME Section XI Subsections IWB-1220, IWC-1220, and IWD-1220 are exempt from the examination requirements of Subsections IWB-2500, IWC-2500, and IWD-2500 per the Third Ten-Year Inservice Inspection Program Plan.

Based on the applicant's program basis document, the Third Ten-Year Inservice Inspection Program exempts visual inspection for components described in ASME Section XI Subsections IWB-1220, IWC-1220, and IWD-1220, which is not consistent with the recommendations in the GALL Report. The staff also noted that the applicant did not provide an "exception" to GALL AMP XI.M1, with sufficient justification, for exempting visual inspections of the components described above.

Clarify if the components described in ASME Section XI Subsections IWB-1220, IWC-1220, and IWD-1220 are exempt from the visual inspections requirements of Subsections IWB-2500, IWC-2500, and IWD-2500. Provide sufficient justification for this "exception" to the recommendations of GALL AMP XI.M1 which requires visual examinations of the components described in ASME Section XI Subsections IWB-1220, IWC-1220, and IWD-1220. If these components are not exempt from GALL AMP XI.M1, provide sufficient information demonstrating that visual inspections are conducted for these components.

RAI B.2.31-1

GALL AMP XI.M20, "Open-Cycle Cooling Water System," states that this program addresses the aging effects of loss of material, fouling due to micro- or macro-organisms, and various corrosion mechanisms generally found in the open cycle cooling water system. The GALL Report AMP does not address cracking, and although it was not identified as an exception or enhancement; the LRA states that copper alloy (with greater than 15 percent zinc) will be managed for cracking by the Open-Cycle Cooling Water Program. The LRA also states that the program consists of inspections, surveillances, and testing to detect and evaluate aging effects including cracking, and it is combined with chemical treatments and cleaning activities to minimize aging effects including cracking.

The LRA does not describe the inspection, surveillance, or testing method(s) that will be used to detect and evaluate cracking of the copper alloy (with greater than 15 percent zinc) components exposed to open cycle cooling water. In addition, the LRA does not describe the chemical treatments and cleaning activities that will be used to minimize cracking.

The staff requests the following information:

1) Describe the aging management activities in the Open-Cycle Cooling Water Program that will be used to manage cracking of the copper alloy (with greater than 15 percent zinc) components with greater than 15 percent zinc that are exposed to raw water.

2) If the Open-Cycle Cooling Water Program will remain, the program used to manage cracking of copper alloy (with greater than 15 percent zinc) components, then the LRA should be updated to reflect this as an exception to GALL AMP XI.M20.

RAI B.2.33-1

The GALL AMP XI.M2, "Water Chemistry," states in program element 3, "Parameters Monitored/Inspected," that the applicant should utilize the EPRI water chemistry guidelines to determine the concentrations of corrosive impurities monitored to mitigate loss of material, cracking, and reduction in heat transfer. The GALL AMP XI.M2 Program Description references EPRI 1016555 (PWR Secondary Water Chemistry Guidelines – Revision 7). The applicant's basis document states that its pressure water reactor (PWR) Water Chemistry Program is consistent with the Revision 5 of the EPRI guidelines concerning secondary water chemistry. The applicant's basis documents further states that the program is periodically updated to the latest guidelines. The applicant's 2009 self-assessment of its secondary water chemistry guidelines states that program documents should be revised based on the EPRI Revision 7 document on PWR Secondary Water Chemistry.

It appears to the staff that the applicant's Water Chemistry Program implementing procedures and basis documents have not been updated to reflect the updated EPRI PWR Secondary Water Chemistry Guidelines, Revision 7, despite the information in the Program Description for GALL AMP XI.M2 and despite the recommendations from the applicant's own 2009 self-assessment of its secondary water chemistry guidelines. Clarify if and/or when the Water Chemistry Program implementing procedures and basis documents will be updated to reflect the requirements of EPRI's PWR Secondary Water Chemistry Guidelines, Revision 7. If these procedures and documents will not be updated, provide a justification supporting the continued use of Revision 5 of EPRI's PWR Secondary Water Chemistry Guidelines as it relates to determining the concentrations of corrosive impurities monitored to mitigate loss of material, cracking, and reduction in heat transfer.

RAI B.2.36-1

Because selective leaching is a slow acting corrosion process, the "detection of aging effects" program element of GALL AMP XI.M33, "Selective Leaching," recommends the inspection be conducted within the last five years prior to the period of extended operation. LRA Section B.2.36 states that selective leaching inspection activities will be conducted "before the beginning of the period of extended operation."

The description of the timing of the performance of selective leaching inspections in LRA Section B.2.36 does not ensure these inspections will be conducted within the last five years prior to the period of extended operation, as suggested GALL AMP XI.M33.

The staff requests the following information:

1. In light of the fact that selective leaching is a slow acting process, clarify the planned timing of the conduct of selective leaching inspections relative to the beginning of the period of extended operation.

2. Revise LRA Appendix A, "Updated Safety Analysis Report Supplement," Section A.1.36, "Selective Leaching Inspection," to reflect the fact that inspections required by this program will be conducted within the last five years prior to the period of extended operation.

RAI B.2.36-2

The "detection of aging effects" program element of GALL AMP XI.M33, "Selective Leaching," recommends that the inspection includes a representative sample (e.g., 20 percent of the population with a maximum sample of 25) of the system population with focus on the components most susceptible to aging due to time in service, severity of operating conditions, and lowest design margin. Otherwise, a technical justification of the methodology and sample size used for selecting components should be included as part of the program's documentation. LRA Section B.2.36 states that the selective leaching inspection activities include determination of the sample size based on an assessment of materials of fabrication, environment/conditions, time in service, and operating experience, as well as identification of the inspection locations in the susceptible system or component.

It is not clear to the staff whether the extent and scope of the selective leaching inspection activities are consistent with the GALL AMP XI.M33 recommendation.

The staff requests the following information:

1. Revise LRA Section B.2.36 to indicate that a representative sample (e.g., 20 percent of the population with a maximum sample of 25) of the system population will be selected for inspection to demonstrate the absence of selective leaching.
2. Describe the methodology used to ensure the representative sample focuses on the components most susceptible to aging due to time in service, severity of operating conditions, and lowest design margin.
3. As an alternative to Requests 1 and 2 above, update LRA Section B.2.36 to include a technical justification for the methodology and sample size used for selecting components.

RAI B.2.36-3

SRP Section A.1.2.3.10.3 states that the applicant should commit to a review of future plant-specific and industry operating experience for new programs to confirm their effectiveness. LRA Section B.2.36 describes the Selective Leaching Inspection Program as a new one-time inspection that will be consistent with the 10 elements of an effective aging management program as described in NUREG-1801. LRA Section B.2.36 also states that a review of Davis-Besse operating experience did not identify any instances of loss of material due to selective leaching, graphitization, or dezincification for any in-scope components.

The "operating experience" program element of LRA Section B.2.36 does not include substantive operating experience examples confirming the effectiveness of the new Selective Leaching Inspection Program nor does the applicant otherwise commit to a review of future plant-specific and industry operating experience to confirm the program's effectiveness.

Revise LRA Table A-1, "Davis-Besse License Renewal Commitments," Item 18, to include the performance of a review of future plant-specific and industry operating experience to confirm the effectiveness of the new Selective Leaching Inspection Program.

RAI B.2.37-1

GALL AMP XI.M35 states that the program is applicable to systems that have not experienced cracking of ASME Code Class 1 small-bore piping. This program can also be used for systems that experienced cracking but have implemented design changes to effectively mitigate cracking. For systems that have experienced cracking and operating experience indicate that design changes have not been implemented to effectively mitigate cracking, periodic inspection is proposed, as managed by a plant-specific AMP.

The applicant stated in LRA Section B.2.37, "Small Bore Class 1 Piping Inspection Program," that two instances of small bore piping cracking related to stress corrosion cracking have been identified at Davis-Besse. The staff noted that, since the applicant has plant-specific operating experience for cracking in its small-bore piping at its site, a one-time inspection program may not be applicable.

Based on the plant-specific operating experience, justify the use of a one-time inspection program to manage cracking in ASME Code Class 1 small-bore piping. Otherwise, in lieu of a justification, provide a plant-specific program to perform periodic inspections of ASME Code Class 1 small-bore piping.

RAI B.2.37-2

LRA Section B.2.37, "Small Bore Class 1 Piping Inspection Program," states that the program will be implemented "prior to period of extended operation." In addition, Commitment No. 19 in LRA Table A-1 states that this program will be implemented on April 22, 2017. However, GALL AMP XI.M35 states that the one-time inspection should be completed within the six-year period prior to the period of extended operation. The specified six-year time frame is to ensure timely completion of the inspections and to allow a more realistic assessment of material conditions prior to entering the period of extended operation.

Based on LRA Section B.2.37, it is not clear to the staff when the applicant's Small Bore Class 1 Piping Inspection Program will be implemented at this site, and if this implementation of the program is consistent with the recommendations of GALL AMP XI.M35 which requires the completion of the one-time inspections within the six-year period prior to the period of extended operation.

Clarify the implementation schedule of the one-time inspections to be performed by the Small Bore Class 1 Piping Inspection Program. If the implementation schedule is not consistent with the recommendations in GALL AMP XI.M35, justify why the one-time inspections do not need to be completed within the six-year period prior to the period of extended operation. Amend the LRA and Commitment No.19, as needed, in response to this RAI.

RAI B.2.37-3

GALL AMP XI.M35 provides specific guidance regarding small bore piping inspection sampling. LRA Section B.2.37, "Small Bore Class 1 Piping Inspection Program," states that the program will perform volumetric examinations of a representative sample of small bore piping locations that are susceptible to cracking.

The staff noted that the applicant has not provided specific information regarding the small bore piping weld population, or the inspection sampling size. This information is needed to evaluate consistency of the applicant's program with the recommendations of GALL AMP XI.M35.

Clarify the total population of Class 1 small bore butt welds and socket welds such that the sample size is described as a percentage of welds for each type. In addition, justify the adequacy of the sampling methodology in the Small Bore Class 1 Piping Inspection Program if the percentage is less than the sampling guidelines, as described in GALL AMP XI.M35.

Barry S. Allen
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SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE DAVIS-BESSE NUCLEAR POWER STATION – BATCH 2 (TAC NO. ME4640)

Dear Mr. Allen:

By letter dated August 27, 2010, FirstEnergy Nuclear Operating Company, submitted an application pursuant to 10 *Code of Federal Regulation* Part 54 for renewal of Operating License NPF-3 for the Davis-Besse Nuclear Power Station. The staff of the U.S. Nuclear Regulatory Commission (NRC or the staff) is reviewing this application in accordance with the guidance in NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants." During its review, the staff has identified areas where additional information is needed to complete the review. The staff's requests for additional information are included in the Enclosure. Further requests for additional information may be issued in the future.

Items in the enclosure were discussed with Cliff Custer, of your staff, and a mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me by telephone at 301-415-2277 or by e-mail at brian.harris2@nrc.gov.

Sincerely,

Brian K. Harris, Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure:
As stated

cc w/encl: Listserv

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NAME:	SFigueroa	BHarris	BPham	BHarris
DATE:	4/18/11	4/18/11	4/20/11	4/20/11

OFFICIAL RECORD COPY

Letter to B. Allen from B. Harris Dated April 20, 2011

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE DAVIS-BESSE NUCLEAR POWER STATION – BATCH 2 (TAC NO. ME4640)

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B. Harris
P. Cooper
B. Harris (OGC)
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