FENOC
FirstEnergy Nuclear Operating Company

Davis-Besse Nuclear Power Station
5501 N. State Route 2
Oak Harbor, Ohio 43449

August 17, 2011
L-11-238

10 CFR 54

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

SUBJECT:
Davis-Besse Nuclear Power Station, Unit No. 1
Docket No. 50-346, License Number NPF-3
Reply to Request for Additional Information for the Review of the Davis-Besse Nuclear Power Station, Unit No. 1, License Renewal Application (TAC No. ME4640) and License Renewal Application Amendment No. 13

By letter dated August 27, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML102450565), FirstEnergy Nuclear Operating Company (FENOC) submitted an application pursuant to Title 10 of the *Code of Federal Regulations*, Part 54 for renewal of Operating License NPF-3 for the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS). By letters dated July 12, 2011 (ML11189A043), July 21, 2011 (ML11195A020), July 21, 2011 (ML11196A127), and July 27, 2011 (ML11203A080), the Nuclear Regulatory Commission (NRC) requested additional information to complete its review of the License Renewal Application (LRA).

The content and submittal date of this letter was discussed during telephone conferences with Mr. Samuel Cuadrado de Jesus, NRC Project Manager, and, due to the expanded scope of the letter, the submittal date was deferred to a mutually agreeable submittal date of August 17, 2011. Attachments 1 through 4 provide the FENOC reply to the NRC request for additional information (RAI) by letter, with selected RAIs listed, as follows:

Attachment 1:	3 of 3 RAIs in NRC letter dated July 12, 2011 (ML11189A043)
Attachment 2:	7 of 13 RAIs in NRC letter dated July 21, 2011 (ML11195A020): — Includes RAIs B.2.22-7; B.2.39-10; B.2.40-2; 3.5.2.3.12-3; B.2.25-7; B.2.25-8; and, 2.3.3.18-3
Attachment 3:	4 of 4 RAIs in NRC letter dated July 21, 2011 (ML11196A127)
Attachment 4:	3 of 5 RAIs in NRC letter dated July 27, 2011 (ML11203A080): — Includes RAIs B.2.3-5; B.2.28-1; and, B.2.36-5

Attachment 5 provides the FENOC reply to NRC RAIs discussed during telephone conference calls with the NRC, and requests from NRC Region III Inspectors during the

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NRC Inspection Procedure (IP) 71002 License Renewal Inspection held April 25 - 29, 2011, and May 9 - 13, 2011.

For all Attachments, the NRC request is shown in bold text followed by the FENOC response.

The Enclosure provides Amendment No. 13 to the DBNPS LRA.

There are no regulatory commitments contained in this letter. If there are any questions or if additional information is required, please contact Mr. Clifford I. Custer, Fleet License Renewal Project Manager, at 724-682-7139.

I declare under penalty of perjury that the foregoing is true and correct. Executed on August 17, 2011.

Sincerely,

K W Byrd

Kendall W. Byrd

Attachments:

1. Reply to Request for Additional Information for the Review of the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS), License Renewal Application, from NRC Letter dated July 12, 2011 (ML11189A043)
2. Reply to Request for Additional Information for the Review of the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS), License Renewal Application, from NRC Letter dated July 21, 2011 (ML11195A020)
3. Reply to Request for Additional Information for the Review of the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS), License Renewal Application, from NRC letter dated July 21, 2011 (ML11196A127)
4. Reply to Request for Additional Information for the Review of the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS), License Renewal Application, from NRC Letter dated July 27, 2011 (ML11203A080)
5. Reply to Request for Additional Information for the Review of the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS), License Renewal Application, from NRC Conference Calls and NRC Region III License Renewal Inspection

Enclosure:

Amendment No. 13 to the DBNPS License Renewal Application

cc: NRC DLR Project Manager
NRC Region III Administrator

cc: w/o Attachments or Enclosure
NRC DLR Director
NRR DORL Project Manager
NRC Resident Inspector
Utility Radiological Safety Board

Reply to Request for Additional Information for the Review of the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS), License Renewal Application, from NRC Letter dated July 12, 2011 (ML11189A043)

Question RAI 3.2.2.2.3.6-2

Background:

By letter dated May 2, 2011, the U.S. Nuclear Regulatory Commission (NRC or the staff) issued Request for Additional Information (RAI) 3.2.2.2.3.6-1 requesting that FirstEnergy Nuclear Operating Company (the applicant) provide justification for its use of the One-Time Inspection Program for managing loss of material due to pitting and crevice corrosion of the internal surfaces of stainless steel piping, piping components, piping elements, and tanks exposed to condensation. In its response dated June 3, 2011, the applicant stated that Amendment No. 7 to the license renewal application (LRA) changed the aging management program (AMP) used for the condensation environment to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program. The applicant also stated that the One-Time Inspection Program will still be used to verify the effectiveness of the AMPs credited for managing aging effects above and below the air/water interface.

The staff noted that, for the 13 aging management review (AMR) items that were the subject of RAI 3.2.2.2.3.6-1 (items that reference LRA Table 3.2.1, item 3.2.1-08), the applicant:

- **Changed the AMP to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program for five of the items**
- **Retained the One-Time Inspection Program for two of the items (LRA Table 3.3.2-4, item 158 and Table 3.3.2-5, item 59), citing plant-specific note 0313, which states that the One-Time Inspection Program will confirm the absence of aging effects, or that aging is acting slowly, at the air-water interface**
- **Did not specifically address the remaining six items**

Issue:

The staff agrees with the applicant's amended position which manages stainless steel components exposed to condensation for loss of material due to pitting andcrevice corrosion with the Inspection of Internal Surfaces in Miscellaneous

Piping and Ducting Program. However, the staff has identified the following issues:

1. **For the two items for which the One-Time Inspection Program was retained, the applicant does not age manage the internal surfaces above the air/water interface (i.e., there are no AMR items for the upper portions of the associated tanks). The staff noted that these items originally addressed the upper portions of the tank internal surfaces exposed to condensation, but Amendment No. 7 changed these items to specifically age manage the air/water interface.**

2. **For the six items that Amendment No. 7 did not address, it is unclear to the staff how the applicant will manage loss of material due to pitting and crevice corrosion. These items include components in the containment spray system, core flooding system, decay heat removal and LPI system, component cooling water system, and demineralized water storage system.**

Request:

1. **State how loss of material will be managed for the internal surfaces of LRA Table 3.3.2-4, item 158 and Table 3.3.2-5, item 59 above the air-water interface and subject to condensation.**

2. **State how loss of material will be managed for those items that reference LRA Table 3.2.1, item 3.2.1-08 but were not addressed in Amendment No. 7.**

RESPONSE RAI 3.2.2.2.3.6-2

The LRA is revised as described below to credit the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program for management of loss of material for stainless steel in a moist air environment:

1. Loss of material for the internal surfaces of LRA Table 3.3.2-4, item 158, and Table 3.3.2-5, item 59, subject to condensation is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program.

2. Loss of material for those items that reference LRA Table 3.2.1, item 3.2.1-08 is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program is also added to the list of Aging Management Programs in LRA Sections 3.2 and 3.3 for affected systems.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI 3.3.1.49-2

Background:

By letter dated May 2, 2011, the staff issued RAI 3.3.1.49-1 requesting that the applicant state why loss of material due to microbiologically influenced corrosion (MIC) is not an applicable aging effect for stainless steel heat exchanger components exposed to closed cycle cooling water. In its response dated June 3, 2011, the applicant stated that, because Davis-Besse has no plant-specific operating experience of MIC in its closed cooling water environments, MIC is not an aging effect requiring management.

The EPRI Closed Cooling Water Chemistry Guideline, Revision 1 (1007820) states that MIC is a significant issue in closed cooling water systems. EPRI 1007820 and the EPRI Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 4 (1010639) also state that stagnant loops in closed cooling water systems can accumulate microorganisms and their nutrients, and water chemistry in these areas may be difficult to maintain.

SRP-LR Section A.1.2.1, "Applicable Aging Effects," states that an aging effect should be identified as applicable for license renewal even if there is a prevention or mitigation program associated with that aging effect. GALL AMP XI.M21A "Closed Treated Water Systems" states that, because the control of water chemistry may not be fully effective in mitigating aging effects, visual inspections are conducted.

Issue:

The staff noted that the lack of plant-specific operating experience associated with MIC may be attributable to water chemistry controls and/or the absence of inspections to specifically identify this aging mechanism in areas most prone to MIC (e.g., stagnant loops). The staff also noted that, although water chemistry controls may be responsible for the absence of MIC, the aging effect is still applicable and inspections are appropriate to ensure that the control of water chemistry remains fully effective.

Request:

Include monitoring for MIC in the Closed Cooling Water Chemistry Program to ensure that the control of water chemistry remains fully effective at preventing this aging mechanism or provide technical justification for why MIC is not credible at Davis-Besse, regardless of water chemistry controls.

RESPONSE RAI 3.3.1.49-2

Consistent with the current EPRI water chemistry guidelines, the Closed Cooling Water Chemistry Program monitors specific parameters to assure that corrosion is minimized, microbial activity is suppressed, and corrosion inhibitor stability is maintained. The parameters that are measured include hydrazine, chloride, fluoride, biological activity, corrosion inhibitor and sulfate concentrations, as required.

To clarify the intent of the Closed Cooling Water Chemistry Program, the program descriptions, LRA Sections A.1.8 and B.2.8, both titled "Closed Cooling Water Chemistry Program," are revised to specifically state that monitoring for microbiological activity in accordance with the EPRI Closed-Cycle Cooling Water guidelines is a function of the program.

Item Number 3.3.1-49 in LRA Table 3.3.1 is revised to state that loss of material due to microbiologically influenced corrosion is monitored by the Closed Cooling Water Chemistry Program in accordance with the EPRI Closed-Cycle Cooling Water guidelines.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI 3.3.2.2.5-2

Background:

In its response to RAI 3.3.2.2.5-1, dated May 24, 2011, regarding aging management of elastomeric components the applicant developed a new plant-specific Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program; however, the applicant did not revise the External Surfaces Monitoring Program to include physical manipulation of the external surfaces of elastomers. The amended LRA contains elastomeric components exposed to air-indoor uncontrolled (external) environment in Tables 3.2.2-1 and 3.3.2-1, 6, 12, 13, 14, 15, 21, and 30.

The GALL Report Revision 2, recommends that elastomeric materials exposed to air-indoor uncontrolled (external) be managed for hardening and loss of strength by GALL AMP XI.M36, "External Surfaces Monitoring of Mechanical Components." GALL AMP XI.M36 recommends that elastomeric materials be physically manipulated during inspections to detect hardening and loss of strength and that the manipulation should include 10 percent of the available surface area.

The GALL Report Revision 2 recommends that elastomeric materials exposed to raw water be managed by GALL AMP XI.M20, "Open-Cycle Cooling Water System" which states that elastomeric components be periodically examined consistent with the examinations described in GALL AMP XI.M38. The staff noted that the applicant revised its LRA AMR line items addressing elastomeric materials exposed to raw water to be managed for hardening and loss of strength by a newly-developed plant-specific Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program.

Issue:

The staff agrees with the applicant's position that elastomeric components exposed to an air-indoor uncontrolled (internal) environment be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program for hardening and loss of strength. However, for elastomeric components exposed to an air-indoor uncontrolled (external environment), the GALL Report recommends that the components be periodically inspected using a physical manipulation method. In addition, the applicant should state the minimum available surface area that will be manipulated during inspections when utilizing the External Surfaces Monitoring Program.

The staff does not agree that elastomeric components exposed to raw water can be adequately managed for hardening and loss of strength by the plant-specific Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program because it is opportunistic and therefore may not ensure periodic inspections of elastomeric material are conducted. The staff believes periodic inspections are necessary due to the changing nature of raw water environments.

Request:

a) **Revise the External Surfaces Monitoring Program to include physical manipulation of elastomeric materials and/or:**

   1. **State how it would be effective at determining if hardening or loss of strength has occurred in the absence of physical manipulation, or**

   2. **Propose a periodic inspection program that will physically manipulate elastomeric components.**

b) **Propose a periodic inspection program which includes physical manipulation of elastomeric components exposed to raw water, or state why periodic inspections are not necessary to adequately detect hardening and loss of strength in these materials.**

c) **State the minimum available surface area that will be manipulated during inspections of elastomeric materials. If the minimum available surface area that will be manipulated during inspections of elastomeric materials**

is less than 10 percent, state the basis for how the inspection will sufficiently identify the hardening and loss of strength aging effects.

RESPONSE RAI 3.3.2.2.5-2

a) The External Surfaces Monitoring Program is revised to include physical manipulation of elastomeric materials.

b) The Collection, Drainage and Treatment Components Inspection Program, a periodic inspection program (see response to RAI B.2.9-3 in FENOC Letter dated July 22, 2011 (ML11208C274)), is revised to include physical manipulation of elastomeric components exposed to raw water. In addition, LRA Chapter 3 aging management review line items addressing elastomeric materials exposed to raw water are revised to show that hardening and loss of strength and loss of material will be managed by the Collection, Drainage and Treatment Components Inspection Program.

c) As provided in the revised External Surfaces Monitoring Program and the revised Collection, Drainage and Treatment Components Inspection Program, the minimum available surface area that will be manipulated during inspections of elastomeric materials is 10 percent.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI B.2.22-7

Background:

By letter dated May 24, 2011, the applicant responded to a staff RAI B.2.22-4 regarding the examination of the containment steel penetration sleeves, dissimilar metal welds, and steel components. The applicant stated that in accordance with Title 10 of the Code of Federal Regulations (10 CFR) 50.55a(b)(2)(ix), the examinations of the Category E-B pressure retaining welds and Category E-F pressure retaining dissimilar metal welds are not scheduled since these examinations are optional. However, the inservice Inspection (ISI) – IWE Program does include the Category E-A examinations of Containment surfaces. Additionally, the 10 CFR Part 50, Appendix J Program detects evidence of leakage as part of the Category E-P examinations.

Issue:

Davis-Besse Nuclear Power Station (DBNPS) LRA Section 4.6.2 states a search of the DBNPS current licensing basis did not identify any pressurization cycles or fatigue analyses for containment penetration assemblies. GALL Report, Rev. 2, AMP, XI.S1, "ASME Section XI, Subsection IWE," recommends that stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading but have no current licensing basis fatigue analysis are monitored for cracking.

Request:

Please advise how DBNPS is going to comply with the GALL Report recommendations concerning the inspection of the containment stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading but have no current licensing basis fatigue analysis.

RESPONSE RAI B.2.22-7

The Inservice Inspection (ISI) Program – IWE is revised to include an enhancement to monitor for cracking of Containment stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading, but have no current licensing basis fatigue analysis. The enhancement will be implemented prior to the period of extended operation. LRA Appendix A, "Updated Safety Analysis Report Supplement," and Appendix B, "Aging Management Programs," Sections A.1.22 and

B.2.22, both titled "Inservice Inspection (ISI) Program – IWE," and Table A-1, "Davis-Besse License Renewal Commitments," are revised to include this enhancement and new license renewal future commitment.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI B.2.39-10

Background:

By letter dated May 24, 2011, the applicant responded to a staff RAIs B.2.25-4 and B.2.39-2 regarding operating experience with spent fuel pool (SFP) leakage. In the response the applicant stated that based on visual inspections of walls or floors adjacent to the SFP the current leakage appears to be contained within the leak chase channels. The applicant also committed (Commitment 37) to take core bores prior to the period of extended operation of the two locations where leakage had been identified.

Issue:

1. **The applicant stated that based on visual inspections, the current leakage appears to be contained within the leak chase channels; however, the applicant did not discuss an increased inspection frequency to continue to verify this, nor did the applicant commit to keeping the leak chase channels and unlined leak trenches clear. The applicant also stated that for small leaks visual observations are insufficient to monitor the leakage status.**

2. **The applicant reported that more comprehensive chemical analyses were performed in the past (e.g., as that carried out in 1996); however, the applicant did not discuss plans to perform comprehensive analyses during the period of extended operation. Chemical analyses performed in a timely fashion for effluent acidity and iron content (e.g., for pH, monthly; iron, semiannually) will assure that the effluent is not contributing to concrete degradation and corrosion of steel leak chase members and rebars. Thus the activity assures the integrity of the spent fuel pool remains during the period of extended operation.**

3. **Although the applicant committed to taking core bores, the response did not provide details about when the cores would be taken, or why the existing condition was acceptable until cores are taken. The response also did not address what would be included in the evaluation of the cores, or the acceptance criteria that would be used in the evaluation.**

4. **Minimal information was provided on the evaluation that will be done on the underside of the SFP (Commitment 38).**

Request:

1. **Explain how leakage will be kept from migrating through the concrete walls. If keeping the leak chase channels clear will be part of the solution, explain how the channels will be kept clear. If this involves a reoccurring activity, justify the frequency between occurrences. Also discuss and provide technical justification whether or not more frequent visual inspections that could include the use of boroscopes will be conducted on the SFP leak chase system assuring its functionality and on the surrounding concrete to verify that overflow leakage from clogged channels is not migrating through the surrounding concrete.**

2. **Provide more details as to why there is no frequent chemical analysis of the collected leakage to assure its acidity/pH remains comparable to that of the pool and its iron content is minimal.**

3. **Provide more details about when the concrete cores will be taken, including the frequency and timing to establish a trend. Explain what evaluations will be done on the cores and what criteria will be used to determine the adequacy of the effected concrete.**

4. **Provide more information on the evaluation discussed in Commitment 38, including possible actions and a preliminary schedule. Provide the criteria for determining the need to repair the cracking located on the underside of the SFP**

RESPONSE RAI B.2.39-10

1. Leakage will be kept from migrating through the concrete walls of the spent fuel pool, the transfer pit and the cask pit by allowing leakage to continuously drain through the leak chase piping, and by keeping the leak chase piping and valves clear. Those activities also include the prevention of leakage through the floors of the spent fuel pool, the transfer pit and the cask pit. FENOC will perform more frequent inspections of the inside of the leak chase piping and of the outside of the walls and floors (from the ceiling side) where those areas are accessible. Also, FENOC currently monitors the inaccessible areas south of the Auxiliary Building wall as part of the FENOC implementation of the Nuclear Energy Institute Groundwater Protection Initiative for Davis-Besse, as described in the response to RAI B.2.25-7.

   With respect to the vertical and horizontal leak chase channels, the leak chase trenches, the horizontal leakage collector tubes and the leak chase piping, the installed configurations of the spent fuel pool, the transfer pit and the cask pit

are the same except for the lower 6.5 feet of the cask pit. The liner walls of the lower 6.5 feet of the cask pit were not used as formwork for pouring the concrete walls of the cask pit. All of the other liner walls were used as formwork for pouring the associated concrete walls. Due to the configuration of the leak chase channels, the leak chase trenches, the leakage collector tubes and the leak chase piping, it is not practicable to verify by 100% visual inspection that the leak chase channels and trenches are clear. The leak chase channels and collector tubes (with the exception of the lower 6.5 feet of the cask pit) are embedded in concrete because they were welded to the spent fuel pool liner walls before the liner walls were used as the formwork for pouring the concrete spent fuel pool walls. The concrete trenches were formed in the concrete floors of the spent fuel pool, transfer pit and cask pit structures and then the liner floors were placed directly on top of the concrete floors. The 21 leak chase zone drain pipes connect to the bottoms of the trenches and to the horizontal leakage collector tubes that are located at the bottoms of the pool and pits. The only possible access to the leak chase trenches is from below through the leak chase piping. The drain pipes connect at the bottoms of the leak chase trenches at a ninety-degree angle. All drain pipes but two have at least two ninety-degree elbows. Even by cutting the pipes at the ceiling (floor of the pools and pits) access for a boroscope would be limited by the required ninety-degree turns. The only possible access to the leakage collector tubes is from below through the leak chase piping or from above through the vertical leak chase channels. Attempts to view the leakage collector tubes from below would be impeded by the bends in the leak chase piping and the ninety-degree turns required for the horizontal entry to the leakage collector tubes. Attempting to view the leakage collector tubes from above is not practicable due to the significant foreign material exclusion concerns that would be introduced by an attempt to gain access the tops of the leak chase channels. Access from above would also be impeded by the need to make ninety-degree turns with a boroscope or other video equipment at the bottoms of the vertical leak chase channels.

Therefore, more frequent inspection of the leak chase zone drain piping will be conducted. A new reoccurring preventive maintenance (PM) activity has been developed to inspect and clean the zone drain piping and valves. FENOC will perform the PM every 18 months beginning prior to entering the period of extended operation. The PM is modeled on a maintenance order that has been performed infrequently in the past to inspect and clean the zone drain piping and valves. The frequency of inspecting and cleaning the leak chase piping pathways is based on plant operating experience. For example, in 2007 when the drain piping and valves were cleaned, only one line was found to be clogged. No migration of water through walls has been identified since 2001. However, in 2007, leakage was identified coming from the ceiling of Room 109, below the spent fuel pool, about 20 months after the last inspection and cleaning of the drain piping. After the 2007 inspection and cleaning of the drain lines, no migration of water through the walls or ceiling was indentified until

2011, about 42 months after the inspection and cleaning of the drain lines. Therefore, the 18-month frequency of the cleaning and inspection is appropriate. In order to further assure the adequacy of the 18-month frequency, FENOC will inspect the accessible outside walls and floor (from the ceiling side) of the pool and pits once a year. This inspection will be a documented inspection performed with the specific intent of identifying indications of leakage migrating through the walls.

In addition to the inspections and cleaning, current practice is to maintain the leakage pathway valves open for those pathways that have the most leakage. This practice allows for enough flow to keep the pathways clear. The total leakage is very small, typically about 2 milliliters/minute and is divided among three to seven of the twenty-one available leak chase pathways. Typically, keeping one or two pathways open would drain most of the leakage.

2. In lieu of providing more details as to why there is no frequent chemical analysis of the collected leakage, FENOC commits to conduct more frequent chemical analysis of spent fuel pool leakage. In the past, for the drainage from the leak chase piping, only boron concentration was measured. FENOC will analyze collected leak chase drainage for pH monthly, and for iron every six months. Because there is no history of chemical analyses for parameters other than boron, the acceptance criteria may have to be adjusted in the future to reflect actual plant-specific operating experience with the analyses. The initial acceptance criteria will be 7.0 to 8.0 for pH. The results for iron will be monitored and trended to insure that there is no indication of corrosion of the reinforcing bars in the walls or floor of the pool and pits. An acceptance criterion for the iron analyses will be developed after three years of measurements.

3. As stated in the May 24, 2011 FENOC response (ML11151A090) to RAI B.2.39-2, FENOC will perform core bores of the ECCS Pump Room No. 1 wall and the Room 109 ceiling. The core bores will be deep enough to expose reinforcing bar in the wall and ceiling. The core samples from the core bores will be examined for signs of corrosion or chemical effects of boric acid on the concrete or reinforcing bars. The examination will include a petrographic examination. The reinforcing steel that will be exposed for a visual inspection will have corrosion products collected for testing. Degradation identified from the samples will be entered into the FENOC Corrective Action Program. The core bores will be performed in areas where leakage has been observed in the past. The first set of core bores will be performed by the end of 2014. The second set of core bores will be performed by the end of 2020. Further core bores will be conducted, if warranted, based on the evaluation of the results of the inspection and testing of the core bores or if SFP leakage through the wall or ceiling recurs after the second set of core bores is performed. If SFP leakage through another wall or ceiling is identified, then core bores will be performed in a manner similar to that stated for the ECCS Pump Room No. 1 wall and the Room 109 ceiling.

4. As noted in the response to part 3 of this RAI, a core bore of the Room 109 ceiling will be performed by the end of 2014. Degradation identified from the samples will be entered into the FENOC Corrective Action Program. The condition of the concrete and the reinforcing steel will be evaluated at that time to assist in determining what repairs, if any, need to be made to the underside of the spent fuel pool concrete. The criterion for determining the need to repair the cracking will be the continued capability of the structures to perform their intended functions during the period of extended operation.

   Plant-specific operating experience has shown that the effect of borated water on concrete and reinforcing steel has been relatively minor. A report prepared by Sargent & Lundy, SL-008105, evaluated the condition of concrete inside containment that had been exposed to borated water from refueling canal leakage. That report determined that even though boric acid had begun to react with the concrete at the cracks through which it had flowed, there was no indication that the amount of scale formed was sufficient to have significantly degraded the concrete through which the boric acid had flowed. The report describes the investigation, including the destructive testing (i.e., core bores), used to evaluate the condition of the refueling canal concrete and reinforcing steel. The report identifies areas of the refueling canal concrete that displayed rust-stained cracks. Those cracks were investigated and it was determined that the reinforcing steel had not been adversely impacted.

   The Davis-Besse plant-specific operating experience has been confirmed by significant industry information that was discussed in the Salem License Renewal Safety Evaluation Report (SER) (ML110900295), Section 3.0.3.2.15, and the Prairie Island License Renewal SER (ML092890209), Section 3.0.3.2.17. The evaluation of the core bores described in the response to part 3 of this RAI will determine whether or not the Davis-Besse SFP leakage has affected the concrete and reinforcing steel in a manner that is not bounded by the industry and Davis-Besse current operating experience.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI B.2.40-2

<u>Background</u>

By letter dated May 24, 2011, the applicant responded to a staff RAI B.2.40-1 regarding operating experience with degradation of the north embankment of the safety-related portion of the intake canal. In the response the applicant stated that a preventive maintenance has been initiated to monitor the embankment for any

changes, both above and below the water. The applicant also stated that long-term plans have been developed for further evaluation of the embankment.

Issue:

Although the applicant stated long-term evaluation plans had been developed, they did not commit to completing the investigation and possible repairs prior to the period of extended operation.

Request:

Commit to completing the investigation, and possible repairs, of the safety-related intake canal embankment prior to the period of extended operation, or explain why it is unnecessary.

RESPONSE RAI B.2.40-2

The investigation of the existing degradation of the north embankment of the safety-related portion of the intake canal is currently in progress. FENOC provides a new license renewal future commitment in LRA Table A-1, "Davis-Besse License Renewal Commitments," to ensure that the investigation is completed prior to the period of extended operation. Upon completion of the investigation, FENOC will evaluate the results and complete needed repairs or modification prior to the period of extended operation.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI 3.5.2.3.12-3

Background:

By letter dated June 3, 2011, the applicant responded to a staff RAI 3.5.2.3.12-1 regarding steel restraints in a backfill environment. The applicant stated that loss of material was not an applicable aging effect and referenced a study related to steel piles in undisturbed soil. The applicant also stated that opportunistic inspections would be conducted of the steel restraints if excavation work uncovers the components.

Issue:

The staff does not agree that the referenced study regarding piles in undisturbed soil applies to steel in structural backfill. Undisturbed soil has low oxygen levels which may limit corrosion. These conditions may not be present in structural

backfill. In addition, the portion of Commitment 20 discussing opportunistic inspections only mentions concrete components.

Request:

1. **Explain why the referenced study is applicable to the steel restraints in backfill, or propose an appropriate aging management program to manage loss of material for the steel restraints. If the proposal involves focused inspections, justify the adequacy of the inspection technique and frequency.**

2. **Explain whether or not the opportunistic inspections apply to components other than concrete, and update the commitment as necessary.**

RESPONSE RAI 3.5.2.3.12-3

1. The steel restraints are steel cables that were used to restrain the Emergency Diesel Generator (EDG) fuel oil storage tanks (week tanks) during plant construction before backfill was placed over the tanks. Once construction was completed, the steel restraints for the EDG week tanks were no longer needed. Therefore the steel restraints have no current licensing basis function and should not have been in scope for license renewal. The LRA is revised to remove the steel EDG Fuel Oil Storage Tank Hold Down Restraints from scope; no aging management program is needed to manage loss of material for the steel restraints.

2. Because the steel restraints in backfill are not in scope for license renewal, there is no need for opportunistic inspections of the steel restraints.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI B.2.25-7

Background:

By letter dated May 24, 2011, the applicant responded to a staff RAI B.2.25-4 regarding the selection of the monthly leakage rate inspection and pointed out that leakages vary from site to site and that there is not industry standard on the monitoring frequency. The applicant further determined that the Davis-Besse frequency of monthly leakage collection is sufficient for monitoring long term changes to the liner and leak chase system.

Issue:

The staff notes that even though operating experience may vary with configuration and status, nevertheless, there are examples of plants with similar leakage rates as DBNPS that perform the task on a daily basis. The staff also notes that the applicant collects 30 gallons of effluent per month from the leak chase system (a gallon a day) the units of the acceptance criteria, however, are in milliliters per minute. The staff further notes that according to IN 2004-05 leakages, if not identified in a timely fashion, could potentially have detrimental effects to SSCs and the environment.

Request:

1. **Explain the discrepancy of units of the collected effluent gallons per day/month vs. the acceptance criteria units of milliliters per minute. Are the milliliters per minute used during the monthly collections of the leakage or these are just averaging units reducing the gallons per day/month to milliliters per minute?**
2. **Identify any actions taken subsequent to the issue of IN 2004-05 and discuss if the leakage rates in excess of 15 milliliters per minute, stated in Commitment 30, would be considered critical enough to consider more frequent monitoring.**

RESPONSE RAI B.2.25-7

1. There is no discrepancy of units in the collected effluent gallons per day/month versus the acceptance criteria units of milliliters per minute. In the response to RAI B.2.25-4, FENOC stated that, "The leak rate from the spent fuel pool monitoring channels is very small, typically ranging from zero to a few milliliters per minute (on the order of one gallon per day)." FENOC included the rough conversion of milliliters per minute to "on the order of one gallon per day" to provide a comparison of the relative sizes of the measured leak rate and the volume of the spent fuel pool. In the response to RAI B.2.25-4, FENOC did not include an estimate of the volume of effluent collected per day or per month.

   The monthly monitoring of leakage is accomplished by collecting and measuring milliliters of leakage in a beaker and then computing a leak rate in milliliters per minute, based on the time recorded for collection of the leakage. The collection time for each zone is at least 40 minutes. There is no direct measurement of gallons per day or per month.

2. Subsequent to the issue of NRC Information Notice (IN) 2004-05, dated March 3, 2004, "Spent Fuel Pool Leakage to Onsite Groundwater"; FENOC initiated Condition Report (CR) 04-01719, dated March 5, 2004, "IN 2004-05 Spent Fuel Pool Leakage to Onsite Groundwater." The purpose of

CR 04-01719 was to evaluate IN 2004-05 for similar concerns at Davis-Besse. The evaluation determined that IN 2004-05 describes the same incident at the Salem Nuclear Generating Station that had been described in an Institute of Nuclear Power Operations (INPO) Operating Experience (OE) Report.

IN 2004-05 noted that tritium had been detected in groundwater in two test locations near the Salem Unit 1 Fuel Handling Building. FENOC had initiated CR 03-02360 on March 25, 2003, for the evaluation of the INPO OE Report. The Investigation Summary for CR 04-01719 determined that the corrective actions specified in CR 03-02360 had adequately addressed the issue described in IN 2004-05. Two corrective actions had been specified for CR 03-02360. The first corrective action was to verify that the leak collection isolation valves were not clogged with boric acid. That corrective action included necessary cleaning or replacement of the isolation valves. The work order for that corrective action was completed in 2005. FENOC initiated CR 07-13318 on January 24, 2007, due to boric acid observed on the ceiling of Room 109, which is below the spent fuel pool. Corrective Action #1 for CR 07-13318 to unclog the tell-tail drains to ensure that leakage from the Spent Fuel Pool will not leak onto the ceiling on the 545 foot elevation was completed on August 31, 2007. Valve SF99-T was found to be clogged and was cleaned with a steam cleaner and stiff wire. The other valves and the associated tell-tale drains were not clogged in the area that the work order addressed.

FENOC initiated CR 11-90368 due to boric acid observed on the ceiling of Room 109. In 2011, as corrective action for CR 11-90368, the leak monitoring lines were checked for clogging. Two lines were found to be clogged and they were cleared. Also, as corrective action for CR 11-90368, a preventive maintenance (PM) activity was created to verify that the leak monitoring lines are not clogged and to clean the lines as needed. The frequency of the PM is once every three years.

The second corrective action for CR 03-02360 was to obtain the appropriate number of soil samples to confirm whether there was evidence of contamination in the soil due to leakage of the Spent Fuel Pool or Cask Pit. The south walls of the Spent Fuel Pool and the Cask Pit form the outside wall of the Auxiliary Building. An existing monitoring well about 75 feet from the south wall of the Auxiliary Building was chosen for testing. That well was considered to be an ideal location as there would be a minimal travel distance for any possible tritiated water. Based on the results of the testing, and in comparison with other routine sample results, there was no evidence to indicate that there was or had been leakage from either the Spent Fuel Pool or the Cask Pit to the environment. The Corrective Actions for CR 03-02360 were summarized in the Investigation Summary for CR 04-01719. Based on FENOC management review of CR 04-01719, an activity was created to require periodic sampling of the groundwater from the monitoring well (MW-18) nearest the Spent Fuel Pool for tritium concentration. To date, Monitoring Well MW-18 has been sampled four more

times since the July 28, 2004 sampling in response to CR 03-02360. All of the samples had tritium concentrations lower than observed from the July 28, 2004, sampling. Background tritium levels have been statistically determined by up-gradient groundwater sampling and sampling of Lake Erie waters to be between 178 and 348 picoCuries per liter (pCi/L). The highest of the recent Well MW-18 sample results was 436 pCi/L. The other recent samples have been below the 348 pCi/L background level. Since 2009, the sample results have been reported in the "Onsite Groundwater Monitoring Section" of the Combined Annual Radiological Environmental Operating Report and Radiological Effluent Release Report for the Davis-Besse Nuclear Power Station. The minimum sampling frequency for Well MW-18 is once every five years.

Many other onsite wells are sampled for radionuclides, including tritium, as part of the FENOC implementation of the Nuclear Energy Institute Groundwater Protection Initiative for Davis-Besse. For example, 16 new monitoring wells were installed in August 2007 in six distinct locations. The installation of those wells is described in the Groundwater Monitoring Well Installation and Monitoring Report developed by Engineering Resources Management (ERM) on behalf of FENOC. The ERM report, completed on March 18, 2008, also notes that the Spent Fuel Pool, Fuel Transfer Canal and Cask Pit are potential sources of elevated tritium detected in groundwater due to past instances of leakage.

If the leakage rates in excess of 15 milliliters per minute, stated in license renewal future Commitment 30, were to be exceeded, such a change would be considered critical enough to consider more frequent monitoring. Commitment 30 is revised to include consideration of more frequent monitoring.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI B.2.25-8

Background:

By letter dated May 24, 2011, the applicant responded to a staff RAI B.2.25-6 regarding the Plant-Specific Leak Chase Program USAR supplement. According to the applicant the description provided in A 1.25, is consistent with the SRP-LR recommendations to provide the basis for determining that aging of the liners will be managed, and briefly describe the program activities (i.e., leakage monitoring).

Issue:

The staff notes that the USAR supplement needs to be more descriptive incorporating in its description the applicant's acknowledgement in its response

to RAI B.2.25-6 that the program manages loss of material for the spent fuel pool, the fuel transfer pit, and the cask pit stainless steel liners.

Request:

Please update the USAR supplement to appropriately reflect the material, environment, and aging effect the program manages for the spent fuel pool, the fuel transfer pit, and the cask pit liners.

RESPONSE RAI B.2.25-8

LRA Sections A.1.25 and B.2.25, both titled, "Leak Chase Monitoring Program," are revised to reflect the material, environment, and aging effect the program manages for the spent fuel pool, the fuel transfer pit, and the cask pit liners.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI 2.3.3.18-3

Background:

LRA Section 2.3.3.18, "Makeup and Purification System," states that the letdown coolers, designated as DB-E25-1 and -2, are not subject to aging management review because these components are periodically replaced and evaluated as short-lived components. Since these are normally long-lived passive components subject to aging management review, the staff issued RAI 2.3.3.18-2 requesting the basis for the replacement frequency and the circumstances surrounding the need to replace these heat exchangers.

In its response dated June 3, 2011, Davis-Besse stated that the cooler replacement frequency is based on a qualified life from plant-specific operating experience, and is scheduled approximately every 14 years. The response also stated that the cooler design "has a tendency to develop leaks" after 14 to 16 years. The response further stated that the need to replace the coolers was attributed to fatigue cracking due to flow-induced vibration, and that an extent of condition review determined that the design of these coolers is unique and no other similar heat exchangers are installed at Davis-Besse.

Issue:

As previously noted in RAI 2.3.3.18-2, if the frequency is based on qualified life, then information should be provided to demonstrate that the cooler's intended

function is being maintained consistent with the current licensing basis, at the point in time immediately prior to replacement. The staff notes that in accordance with SRP LR Section A.1.2.3.4, an aging management approach based solely on detecting component failures is not considered an effective program. The staff also notes that in accordance with USAR Section 3.9.2, and Table 3.9-2, the letdown coolers are safety related components constructed to the ASME Code, Section III, Class 3.

In addition, the staff notes that, if the design of the cooler results in "a tendency to develop leaks after...14 to 16 years," then each heat exchanger would have only been replaced twice, so far, at Davis-Besse. With the relatively limited operating experience and the limited number of data points, the ability to reasonably predict the life of the coolers appears to have a large degree of uncertainty. In addition, as noted in RAI 2.3.3.18-2, previous LRAs for other sites have attributed to the fatigue cracking problem in these letdown coolers to be associated with specific operational transients, and, if a similar phenomenon is occurring at Davis-Besse, then a predicted life may need to consider transients in addition to operational time.

Request:

1. **Provide a summary of Davis-Besse's operating experience associated with the letdown coolers, including occurrences of tube leakage and past replacements for each cooler. Consider including the circumstances how the associated leakage from the reactor coolant system into the component cooling water system was detected, and the approximate magnitude(s) of the leakage.**

2. **Provide a summary of any past evaluations of the cause(s) for previous tube leakage, including how leakage was determined to be from fatigue cracks due to flow-induced vibration, and the degree and extent of the cracking identified. Include information regarding the role any operational transients may have played in causing previous tube leakage or how it was concluded that operational transients need not be considered.**

3. **Provide the information that determined the cooler's intended function is being maintained consistent with current licensing basis, at the point in time immediately prior to replacement.**

RESPONSE RAI 2.3.3.18-3

1. In the 1980's, based upon experience at other Babcock & Wilcox (B&W) utilities, Davis-Besse participated with B&W and the other B&W utilities in efforts directed at the review and improvement of the reliability of the letdown coolers. The evaluation reviewed the following areas of concern: stress

considerations, flow induced vibration, tube bundle stress relief, secondary side chemistry, system operational considerations and tube bundle stitch welds. The evaluation reviewed letdown cooler operational considerations and recommended parallel cooler operation. The Davis-Besse normal operating configuration is parallel operation.

The coolers performed satisfactorily from 1977 to 1991. In 1991 Davis-Besse experienced high contamination levels in the Component Cooling Water (CCW) System Pump Room, and indications of reactor coolant leakage of 13 to 30 gallons per day into the CCW System. Troubleshooting was performed which identified a tube leak in the #1 letdown cooler (E25-1). Both coolers were replaced in 1993.

On December 30, 2009 chemistry gamma analysis detected short half-life isotopes in the CCW sample. Indications showed this was a small active Reactor Coolant System (RCS) leak (less than one gallon per day). Chemistry performs CCW samples on a weekly basis. The chemistry sample point is from the in-service CCW heat exchanger. Both letdown coolers were replaced in 2010. A fixed interval replacement preventive maintenance task was created.

2. Industry and site operating experience indicate that, based on the design of the coolers, the letdown coolers have a tendency to develop tube leaks. The B&W report regarding the reliability of letdown coolers identified the cause as fatigue cracking likely initiated by flow-induced vibration.

The overall conclusion from an operating experience review regarding letdown cooler leakage identified similar issues across the industry and at Davis-Besse. Corrective Actions taken regarding leakage through the letdown coolers included plugging of affected tubes and/or replacement of the coolers. The letdown cooler design at Davis-Besse contains 30 helical-type tubes which are not designed to be plugged. The vendor does not support tube plugging in this type of heat exchanger. Additionally there is no operating experience which supports successful plugging of this design in the industry. Therefore, the conclusion reached was to replace the letdown coolers.

A failure analysis to determine the specific leak location/mechanism on the letdown cooler was not performed. Performing a failure analysis becomes a radiation dose concern due to the high dose rates associated with the coolers.

No specific operational transients were identified that played a role in causing the previous tube leakage. One notable transient (D1 and D2 Bus lockout) occurred on October 14, 1998, and is described in Davis-Besse Licensee Event Report (LER) 1998-011-00. The transient resulted in a water-hammer event that caused damage to a CCW letdown cooler overpressure-protection rupture disk. Corrective actions implemented to reduce the consequences of future 'loss of CCW pump' transients included replacement of the rupture disks with a

relief valve. However, it can not be concluded that the water-hammer event contributed to the leaks in the letdown coolers since the leaks began more than 10 years after the event occurred.

3. A Problem Solving Team was formed in January 2010, when it was identified that RCS activity was present in the CCW System based on Chemistry samples. An Operational Decision Making Issue (ODMI) was initiated for monitoring and trending various parameters with specific trigger points. Low level conservative trigger points were established in the ODMI for the monitored parameters. No trigger points were reached during the monitoring period. Based upon CCW activity levels remaining very low, RCS unidentified leakage essentially unchanged, less than the 0.1 gallons per minute trigger established, absence of radiation monitoring alarms, and no unexplained increases in CCW Surge Tank level, the cooler's intended function was maintained consistent with current licensing basis prior to replacement of the coolers.

Question RAI B.2.41-1

Background:

The SRP-LR, Revision 2, Section A.1.2.3.4, describes the recommendations for an acceptable detection of aging effects program element for a plant-specific program and states that "the discussion [of the inspection method or technique] should provide justification, including codes and standards referenced, that the technique and frequency are adequate to detect the aging effects before a loss of SC-intended function."

FirstEnergy Operating Company's (the applicant) Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program, as provided in License Renewal Application (LRA) Section B.2.41 by letters dated May 24, 2011, and June 3, 2011, states that "enhanced visual exams" will be conducted to manage cracking for susceptible stainless steel components. However, the LRA does not state to what predetermined criteria (standard) enhanced visual examinations will be conducted.

Issue:

The LRA does not state the standard that enhanced visual examinations will be conducted against.

Request:

Revise LRA Section B.2.41, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program, to indicate the standard to which enhanced visual examinations will be conducted in order to manage cracking.

RESPONSE RAI B.2.41-1

When required by the ASME Code, inspections are conducted in accordance with the applicable code requirements. In the absence of applicable code requirements, visual inspections are performed of metallic and polymeric component surfaces using plant-specific procedures implemented by inspectors qualified through plant-specific programs. LRA Sections A.1.41 and B.2.41, both titled "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program," are revised to include this information.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI B.2.41-2

Background:

The SRP-LR, Revision 2, Section A.1.2.3.10, describes the recommendations for an acceptable operating experience program element for new aging management programs (AMPs) and states that "an applicant should commit to a review of future plant-specific and industry operating experience for new programs to confirm their effectiveness."

LRA Table A-1, Davis-Besse License Renewal Commitments, does not include a commitment to perform a review of future operating experience to confirm the effectiveness of the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

Issue:

This program's LRA commitment list is not consistent with the current staff position as stated within the SRP-LR, Revision 2, concerning reviews of future operating experience for new aging management programs.

Request:

Revise LRA Table A-1, Davis-Besse License Renewal Commitments, for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to include a commitment to perform a future review of operating experience to confirm the effectiveness of this program or justify why such a review is not necessary.

RESPONSE RAI B.2.41-2

By letter (ML11180A060) dated June 24, 2011, in response to RAI B.1.4-1, FENOC provided license renewal future commitment number 43 to "[e]nsure that the current station operating experience review process includes future reviews of plant-specific and industry operating experience to confirm the effectiveness of the license renewal aging management programs, to determine the need for programs to be enhanced, or indicate a need to develop new aging management programs." Therefore, a separate operating experience commitment for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is not necessary.

Question RAI B.2.41-3

Background:

SRP-LR, Revision 2, Table 3.0-1 states that the recommended description for the final safety analysis report (FSAR) supplement for a plant-specific AMP should include the bases for determining that aging effects will be managed during the period of extended operation.

The applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program's updated safety analysis report (USAR) supplement provided in LRA Section A.1.41 by letters dated May 24, 2011, and June 3, 2011, does not state what type of inspections will be used to manage the program's aging effects.

Issue:

The USAR supplement for the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program does not state the type of inspections that will be used to manage the program's aging effects, and therefore does not adequately describe the basis for how the program will manage aging effects during the period of extended operation.

Request:

Revise the USAR supplement associated with the Internal Surfaces in Miscellaneous Piping and Ducting Program to include the type of inspections that will be used to manage the program's aging effects, consistent with SRP-LR, Revision 2, or justify why the revision is not necessary.

RESPONSE RAI B.2.41-3

LRA Section A.1.41, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program, is revised to include the following table showing the types of inspections to be performed based on aging effect and aging mechanism:

Parameters Monitored or Inspected And Aging Effect for Specific Component			
Aging Effect	**Aging Mechanism**	**Parameter Monitored**	**Inspection Method (1)**
Loss of Material	Crevice Corrosion	Surface Condition, Wall Thickness	Visual (VT-1 or equivalent) and/or Volumetric (RT or UT)
Loss of Material	Galvanic Corrosion	Surface Condition, Wall Thickness	Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)

Parameters Monitored or Inspected And Aging Effect for Specific Component, cont.			
Aging Effect	**Aging Mechanism**	**Parameter Monitored**	**Inspection Method** [(1)]
Loss of Material	General Corrosion	Surface Condition, Wall Thickness	Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)
Loss of Material	MIC	Surface Condition, Wall Thickness	Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)
Loss of Material	Pitting Corrosion	Surface Condition, Wall Thickness	Visual (VT-1 or equivalent) and/or Volumetric (RT or UT)
Loss of Material	Erosion	Surface Condition, Wall Thickness	Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)
Reduction of Heat Transfer	Fouling	Tube Fouling	Visual (VT-3 or equivalent) or Enhanced VT-1 for CASS
Cracking	SCC or Cyclic Loading	Surface Condition, Cracks	Enhanced Visual (EVT-1 or equivalent) or Surface Examination (magnetic particle, liquid penetrant, or Volumetric (RT or UT)

(1) When required by the ASME Code, inspections are conducted in accordance with the applicable code requirements. In the absence of applicable code requirements, visual inspections are performed of metallic and polymeric component surfaces using plant-specific procedures implemented by inspectors qualified through plant-specific programs.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI 4.6-1

Background:

In LRA Section 4.6.1, "Containment Vessel," the applicant states that:

> **Analysis of 400 pressure cycles (from -25 to 120 psi) and 400 temperature cycles (from 30°F to 120°F) were performed against the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section III, Paragraph N-415.1. The applicant also states that the values of 400 pressure and temperature cycles used to exclude fatigue analyses will not be exceeded for 60 years of operation and thus the TLAAs associated with the exclusion of the containment vessel from fatigue analysis per ASME Section III, Paragraph N-415.1 will remain valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i)**

In LRA Section 4.6.2, "Permanent Canal Seal Plate", the applicant states that:

> **The fatigue analysis of the permanent canal seal plate seal membrane shows that the maximum fatigue usage factor is based on 50 full heatup/cooldown cycles.**

Issue:

The staff reviewed LRA Section 4.6, 4.3.1, and the applicant's USAR Section 3.8 and did not find the design basis information regarding:

1. **The total number of transients used to determine that requirements of a fatigue waiver per Subparagraph N-415.1 were met for the containment vessel**

2. **The basis for the number of transients used in the original fatigue analysis of the permanent canal seal plate**

The staff needs more information to confirm that fatigue evaluations for the containment vessel will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1). The staff also needs more information to verify the number of cycles used in the design of the permanent canal seal plate.

Request:

Provide the following information:

1. **A description of the original design basis used to determine that requirements of a fatigue waiver per Subparagraph N-415.1 were met for the containment vessel.**

2. **The basis for the LRA statement that the maximum fatigue usage factor for the permanent canal seal plate is based on 50 cycles.**

RESPONSE RAI 4.6-1

Response to request number 1:

The fatigue waiver calculation for the containment vessel was performed in accordance with N-415.1(a) through N-415.1(f) of the ASME Code, Section III. This calculation verified the requirements of N-415.1 against 400 pressure cycles (from -25 to 20 psi)

and 400 temperature cycles (from 30°F to 120°F) as follows:

N-415.1(a)

The number of times (including startup and shutdown) that the pressure will be cycled from atmospheric pressure to operating pressure and back to atmospheric pressure must not exceed the number of cycles on Figure N-415(A) corresponding to an S_a value of 3 times S_m .

3 S_m is equal to 56,250 psi and from Figure N-415(A) the corresponding number of cycles is equal to 1,800. The specified number of 400 pressure cycles is less than the 1,800 cycles from Figure N-415(A). Therefore, the condition in N-415.1(a) is met.

N-415.1(b)

Specified full range of pressure fluctuations may not exceed the quantity 1/3 x design pressure x S_a/S_m. S_a is the value from Figure N-415(A) for 400 cycles.

1/3 x 36 x 125,000/18,750 = 80 psi

Specified full range of pressure fluctuations is 45 psi (-25 to 20 psi) and is less than 80 psi. Therefore, the condition in N-415.1(b) is met.

N-415.1(c)

The temperature difference in degrees F between any two adjacent points during normal operation and during startup and shutdown must not exceed $Sa/(2E\alpha)$.

For a mean temperature of 70°F, $120{,}000/2(27.9 \times 10^6)(6.07 \times 10^{-6}) = 358$°F

Temperature cycle range of 90°F (from 30°F to 120°F) is less than 358°F. Therefore, the condition in N-415.1(c) is met.

N-415.1(d)

The temperature difference in degrees F between any two adjacent points does not change during normal operation by more than $Sa/(2E\alpha)$.

For a mean temperature of 70°F, $120{,}000/2(27.9 \times 10^6)(6.07 \times 10^{-6}) = 358$°F

Temperature cycle range of 90°F (from 30°F to 120°F) is less than 358°F. Therefore, the condition in N-415.1(d) is met.

N-415.1(e)

During normal operation, components fabricated from materials of differing moduli of elasticity and/or coefficients of thermal expansion may not fluctuate more than $Sa/2[(E_1 \alpha_1) - (E_2 \alpha_2)]$.

For 18-8 stainless steel jointed to low carbon steel the range is
125,000/2[(9.11)(27.4) – (6.07)(27.9)] = 780°F

The value of 780°F is greater than the 120°F specified. Therefore, the condition in N-415.1(e) is met.

N-415.1(f)

The specified full range of mechanical loads must not result in stresses exceeding S_a for 400 cycles .

3 S_m is equal to 56,250 psi and is less than S_a of 125,000 psi for 400 cycles from Figure N-415(A). Therefore, the condition in N-415.1(f) is met.

The pressure cycle range used in the fatigue waiver evaluation is from -25 to 20 psi, for a full range pressure fluctuation of 45 psi. However, the possible full range pressure fluctuation is from -0.67 to 45 psig based on the containment vessel design allowable negative pressure of -0.67 psig and the containment vessel pneumatic test pressure of 45 psig (design pressure of 36 psig times 1.25). This adjusted full range pressure fluctuation of 45.67 psi is less than the 80 psi value determined in N-415.1(b), above. Therefore, the condition in N-415.1(b) is met. In addition, clarification is needed that the 60-year projected cycles for plant heatup and cooldown are less than the 400 pressure cycles and 400 temperature cycles specified in the fatigue waiver analysis.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Response to request number 2:

The original reactor cavity seal plate required critical path time for installation and removal during refueling outages. The original reactor cavity seal plate was replaced in 2004 with a new design that allowed for permanent installation. The fatigue analysis of the permanent reactor cavity seal plate shows that the maximum fatigue usage factor is at the inner leg to the reactor vessel seal ledge weld. This maximum fatigue usage factor is 1.2 and is based on 60 heatup/cooldown cycles and 50 operating basis earthquake (OBE) cycles. The ASME Code requires that the fatigue usage factor not exceed 1.0. To satisfy this requirement, the allowable for the heatup/cooldown cycles is established at 50 cycles. The OBE cycles have a negligible contribution to the fatigue usage factor.

As shown in LRA Table 4.3-1 for Transient 31A, the permanent reactor cavity seal plate is projected to experience 51 heatup/cooldown cycles by the end of the period of extended operation. In addition, as shown in Table 4.3-1 for Transient 31B, the assumption of 50 OBE cycles remains valid for the period of extended operation. Since the heatup/cooldown cycles are projected to exceed the allowable of 50 cycles by the end of the period of extended operation, the effects of fatigue will be managed by the Fatigue Monitoring Program in accordance with 10 CFR 54.21(c)(1)(iii).

Question RAI B.2.3-5

Background:

In response to a U.S. Nuclear Regulatory Commission (NRC or the staff) Request for Additional Information (RAI) B.2.3-2, in its letter dated June 3, 2011, FirstEnergy Nuclear Operating Company (the applicant) stated that periodic testing of contaminants by the Air Quality Monitoring Program is performed each year, and that the frequency of testing is based on the recommendations of the Institute of Nuclear Power Operations (INPO) Supplemental Operating Experience Report (SOER) 88-1, "Instrument Air System Failures," which recommends periodic monitoring of air quality at several points throughout the instrument air system. Additionally, the SOER recommends that system air quality, as measured at the discharge of the air dryers and after filters, should be maintained within the requirements of ANSI Standard ISA-S7.3. ANSI Standard ISA-S7.3 has been withdrawn and replaced with ANSI/ISA-7.0.01-1996. While ISA-S7.3 did not specify a frequency for checking the dew point, ANSI/ISA-7.0.01-1996 recommends per shift monitoring of the dew point if a monitored alarm is not available.

Generic Aging Lessons Learned (GALL) Aging Management Program (AMP), XI.M24, "Compressed Air Monitoring," under the "Detection of Aging Effects," program element states:

> **[t]he program periodically samples and tests the air quality in the compressed system for moisture in accordance with industry standards, such as ANSI/ISAS7.0.01-1996. Typically, compressed systems have in-line dew point instrumentation that either checks continuously using an automatic alarm system or is checked at least daily to ensure that moisture content is within specifications.**

Issue:

If the dew point is not maintained well below the system operating temperature (at least 18 degrees F below the minimum local ambient temperature), condensation could occur. As recommended in the GALL Report, steel and stainless steel piping, piping components, and piping elements exposed to condensation should be managed for loss of material, and the Compressed Air Monitoring Program is an acceptable program to manage aging.

Based on the current industry standard and recommendations in the GALL Report, it is not clear to the staff how periodic testing once a year ensures that the

dew point is maintained well below the system operating temperature during normal operation, and that condensation is not occurring internally.

Request:

Justify how periodic testing once a year ensures that the dew point is maintained well below the system operating temperature during normal operation, as well as during outages and maintenance, such that the environment remains "dry-air."

RESPONSE RAI B.2.3-5

Instrument Air is designed to have a dew point of 18°F below the minimum local ambient temperature at 100 psig. In response to Generic Letter 88-014, Davis-Besse committed to maintaining the Instrument Air System with a dew point of at least 35°F below zero. A Control Room annunciator exists for Instrument Air Dryer Trouble, with one of the actuating devices being high moisture content in the desiccant.

In addition to the periodic testing of contaminants performed each year, monthly dew point readings are taken downstream of each of the air dryers.

Question RAI B.2.28-1

Background:

License renewal application (LRA) Section B.2.28 describes the existing Nickel-Alloy Management Program as plant-specific. The applicant states that their program manages primary water stress corrosion cracking for nickel-alloy pressure boundary components, other than reactor vessel closure head nozzles and steam generator tubes, exposed to reactor coolant. The applicant notes that NUREG-1801 Rev. 1, Section XI.M11, "Nickel-Alloy Nozzles and Penetrations," does not contain program elements. The staff notes that in NUREG-1801 Rev. 2, Section XI.M11B "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components," a guideline for existing requirements has been defined for this aging management program.

Issue:

The staff reviewed program elements one through six of the applicant's program against the acceptance criteria for the corresponding elements as stated in SRP-LR Section A.1.2.3, and has determined that the following information is needed in order to complete its review of the applicants aging management program.

Request:

On June 21, 2011, the NRC published a final rule, NRC-2008-0554, which, in part, established new requirements, under 10 CFR 50.55a(g)(6)(ii)(F), for the inspection of American Society of Mechanical Engineer's Boiler and Pressure Vessel Code (ASME Code) Class 1 nickel-alloy butt welds in the reactor coolant pressure boundary.

The staff requests that the applicant confirms incorporation of the requirements of Title 10 of the Code of Federal Regulations 50.55a(g)(6)(ii)(F), which implements ASME Code Case N-770-1, with certain conditions, into the applicant's Nickel-Alloy Management Program.

RESPONSE RAI B.2.28-1

Davis-Besse has not implemented ASME Code Case N-770-1, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1," at this time.

As provided in 10 CFR 50.55a(g)(6)(ii)(F)(1), "Licensees of existing, operating pressurized-water reactors as of July 21, 2011 shall implement the requirements of ASME Code Case N–770–1, subject to the conditions specified in paragraphs (g)(6)(ii)(F)(2) through (g)(6)(ii)(F)(10) of this section, by the first refueling outage after August 22, 2011." The first refueling outage after August 22, 2011 for Davis-Besse is the Cycle 17 refueling outage that is presently scheduled for mid-year 2012.

Therefore, the following enhancement will be implemented in the "Detection of Aging Effects" and "Monitoring and Trending" program elements for the Nickel-Alloy Management Program prior to the period of extended operation:

> "Provide for inspection of dissimilar metal butt welds in accordance with the requirements of ASME Code Case N-770-1, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1," as modified by the Code of Federal Regulations, 10 CFR 50.55a Section (g)(6)(ii)(F)."

This enhancement is included as a new license renewal future commitment in LRA Appendix A, "Updated Safety Analysis Report Supplement," Table A-1, "Davis-Besse License Renewal Commitments."

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI B.2.36-5

Background:

The applicant's Selective Leaching Inspection is a new program that will be consistent with GALL AMP XI.M33, "Selective Leaching of Materials." The SRP-LR, Revision 2, Section A.1.2.3.10 states that "for new programs, an applicant may *need to consider the impact of relevant* [operating experience] OE that results from the past implementation of its existing AMPs that are existing programs and the impact of relevant generic [operating experience] OE on developing the program elements" and that "an applicant should commit to a review of future plant-specific and industry operating experience for new programs to confirm their effectiveness."

In its response to RAI B.2.36-3, dated May 24, 2011, the applicant stated that "The program does not consist of ongoing activities, but will end upon completion of one-time inspections of the sample set of components. Therefore, a future confirmation of program effectiveness is not applicable to the Selective Leaching Inspection. If plant-specific operating experience indicates the potential for selective leaching after program completion, it will be addressed using the Corrective Action Program."

Issue:

Even though the Selective Leaching Inspection is a one-time inspection program, the results of the inspections and industry operating experience should be reviewed to assess the effectiveness of the program at identifying selective leaching prior to loss of component intended function. If any deficiencies are identified, a review should be performed to determine whether the program should be enhanced or a new program should be developed. It is unclear to the staff how operating experience will be incorporated into the Selective Leaching Inspection to confirm the effectiveness of the program.

Request:

State how future plant-specific and industry operating experience related to the Selective Leaching Inspection will be reviewed to confirm the effectiveness of the program, evaluate the need for the program to be enhanced, or indicate a need to develop a new aging management program.

RESPONSE RAI B.2.36-5

By letter (ML11180A060) dated June 24, 2011, in response to RAI B.1.4-1, FENOC provided license renewal future commitment number 43 to "[e]nsure that the current station operating experience review process includes future reviews of plant-specific and industry operating experience to confirm the effectiveness of the license renewal aging

management programs, to determine the need for programs to be enhanced, or indicate a need to develop new aging management programs." Therefore, a separate operating experience commitment for the Selective Leaching Inspection Program is not necessary.

Question RAI B.1.4-1 Supplemental Response – Operating Experience Statement in Appendix A

The NRC initiated a telephone conference call with FENOC on July 12, 2011, to discuss the FENOC response to RAI B.1.4-1 (submitted in FENOC letter dated June 24, 2011 (ML11180A060)) on operating experience. The NRC staff stated that their preference is that a statement be added to License Renewal Application (LRA) Appendix A, "Updated Safety Analysis Report Supplement," regarding how FENOC plans to address the review and incorporation of operating experience into the license renewal aging management programs, not as a commitment, but rather as a separate discussion in the beginning paragraphs of LRA Appendix A.

RESPONSE RAI B.1.4-1 Supplemental Response – Operating Experience Statement in Appendix A

LRA Appendix A is revised to add the operating experience statement that was previously added to Appendix B in response to NRC RAI B.1.4-1 (ML11180A060) to the entry paragraphs of LRA Appendix A.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question Supplemental Response – steam generator aging management review tube fouling

The NRC initiated a telephone conference call with FENOC on July 12, 2011, to discuss primary side fouling of steam generator tubes. NRC stated that, during a public meeting on February 18, 2011, industry Steam Generator Task Force representatives indicated that primary side fouling of steam generator tubes is not an issue in the United States (refer to the meeting summary in ADAMS under accession number ML110670317). In the applicant's license renewal application, reduction of heat transfer of the steam generator tubes in a borated reactor coolant environment is addressed as an aging mechanism. Has there been any information gained by the industry since the February 18, 2011, meeting that would suggest that primary side loss of heat transfer has become an issue? If there is additional information, please provide it. If not, discuss your plans to withdraw the aging management review line item that deals with reduction in heat

transfer of nickel alloy tubing and sleeves in a borated reactor coolant environment.

RESPONSE Supplemental Response – steam generator aging management review tube fouling

FENOC has not experienced reduction in heat transfer of the primary side of the nickel alloy tubing and sleeves for the Davis-Besse steam generators. In addition, FENOC is not aware of any industry operating experience that would suggest that primary side loss of heat transfer of the steam generator tubes in a borated reactor coolant environment has become an issue. Therefore, FENOC is withdrawing the aging management review line items that are associated with reduction in heat transfer of nickel alloy tubing and sleeves in a borated reactor coolant environment.

Rows 30 and 31 of LRA Table 3.1.2-4, "Aging Management Review Results – Steam Generators," are revised to show as "Not Used."

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI 4.3-17 Supplemental Response – Integrated F_{en} [footnote]

The NRC initiated a telephone conference call with FENOC on July 12, 2011, to discuss the FENOC response to RAI 4.3-17 (submitted in FENOC letter dated June 17, 2011 (ML11172A389)). NRC indicated they had reviewed the FENOC response for RAI 4.3-17, and noted that the RAI response for the Surge Line Piping states, "Global F_{en} is calculated by dividing the U_{en} by the in-air CUF," which is the same method as that stated in MRP-47. LRA page 4.3-28, and footnote 2 in LRA Table 4.3-2, "Davis-Besse CUFs for NUREG/CR-6260 Locations," state, "adjusted CUF is obtained by dividing the U_{en} by the global F_{en}."

Original RAI 4.3-17 Question

LRA Section 4.3.4.2 states that the surge line piping and high pressure injection/makeup (HPI/MU) nozzle and safe end were evaluated using an integrated F_{en} approach consistent with EPRI Technical Report MRP-47, "Guidelines for Addressing Fatigue Environmental Effects in a License Renewal Application," Revision 1, Section 4.2.

***The staff noted that consistent with MRP-47, Section 4.2,* the CUF and U_{en} are computed for each load pair and an effective F_{en} is calculated by dividing the U_{en} by the CUF. LRA Section 4.3.4 states that the maximum U_{en} is calculated with a**

global F_{en} and the adjusted CUF is then obtained by dividing the U_{en} by the global F_{en}.

The staff noted that EPRI Technical Report MRP-47 has not been reviewed and approved by the NRC. Furthermore, the applicant stated that in footnote 2 of LRA Table 4.3-2 the global F_{en} is calculated using the method from Section 4.2 of MRP-47. However, the term "global F_{en}" is not discussed in MRP-47. The staff further noted that the process of calculating global F_{en} is not discussed in the LRA.

Therefore, it is not clear to staff how the applicant determined the environmentally adjusted CUF for the surge line piping and HPI/MU nozzle and safe end.

The staff requests the following information:

1. **Justify that use of the integrated F_{en} approach in the EPRI MRP-47 is applicable and adequately conservative to calculate U_{en} for the period of extended operation.**
2. **Clarify the term "global F_{en}" and how it is calculated for each component. Provide its relationship with U_{en} calculation methodology discussed in MRP-47.**

RESPONSE RAI 4.3-17 (Integrated F_{en} [footnote]) Supplemental Response

Based on the information provided and the discussion of the topic with the NRC, FENOC agreed during the conference call that footnote 2 of LRA Table 4.3-2 should be revised.

Upon further review, FENOC determined that additional changes are required to LRA Section 4.3.4.2, "Davis-Besse Evaluation," and Table 4.3-2, as related to the environmentally-assisted fatigue (EAF) evaluation results for the surge line piping.

Footnote 2 of LRA Table 4.3-2 is revised to state that the adjusted CUF was calculated using 60-year projected cycles (except for best-estimate 60-year project cycles of 114 used for heatup and cooldown events).

Footnote 9 is added to LRA Table 4.3-2 to state that F_{en} was determined for each transient pair (integrated F_{en} approach), and the U_{en} for each pair is determined by multiplying the in-air usage (adjusted CUF) for that transient pair by the F_{en} calculated for that pair. The U_{en} for each transient pair were summed to come up with cumulative U_{en} for that specific location. F_{en} presented in the table is a global F_{en} calculated by dividing the cumulative U_{en} by the adjusted CUF.

LRA Section 4.3.4.2, subsection titled, "Surge Line Fatigue Results," is revised to indicate that the in-air CUF (adjusted CUF) values were based on 60-year projected cycles (except for best-estimate 60-year project cycles of 114 used for heatup and cooldown events).

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question Supplemental Response – steam generator aging management review tube-to-tubesheet weld

The NRC initiated a telephone conference call with FENOC on July 13, 2011, to obtain clarification on how FENOC manages cracking due to primary water stress corrosion cracking (PWSCC) of the Davis-Besse steam generator tube-to-tubesheet welds in comparison with NUREG-1801 (Generic Aging Lessons Learned (GALL) Report) and NUREG-1800 (Standard Review Plan for License Renewal).

RESPONSE Supplemental Response – steam generator aging management review tube-to-tubesheet weld

Upon further review after the conference call with the NRC, FENOC determined that the tube-to-tubesheet welds (Alloy 600 welds) for the Davis-Besse steam generators do not have a license renewal intended function and therefore, are not subject to an aging management review. The Davis-Besse steam generators are Babcock & Wilcox Model 177-FA, once through design. The tubes and the tubesheets of the steam generators form the pressure boundary between the fluid in the secondary system and the reactor coolant system. As provided in USAR Section 5.5.2.3, the tubes are expanded (to a partial depth) into the tubesheet and the tubes are seal welded to the tubesheet near the tube ends. The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, Division 1, 1995 Edition with 1996 Addenda, IWA-9000 defines a seal weld as a nonstructural weld intended to prevent leakage, where the strength is provided by a separate means. The "separate means" in this case being the tube-to-tubesheet expansion joint which forms the pressure boundary. The tube-to-tubesheet welds are seal welds and therefore, are not part of the pressure boundary. No revision to the DBNPS LRA is required.

Question RAI 4.1-2 (Code Case N-481) Revised Response

The NRC initiated a telephone conference call with FENOC on July 15, 2011, to discuss the FENOC response to RAI 4.1-2 (submitted in FENOC letter dated June 17, 2011 (ML11172A389)). NRC stated they did not agree with the entire response. In the response to RAI 4.1-2, FENOC stated that the flaw tolerance analysis for the reactor coolant pump (RCP) casings that was used to support the ASME Code Case N-481 alternate augmented visual inspection bases for the RCP casings was not a time-limited aging analysis (TLAA). The NRC agrees that the J-integral aspect of the analysis is not a TLAA. However, the NRC does not agree that the cycle-dependent fatigue flaw growth analysis is not a TLAA. Although the 2000 analyzed cycles excessively bound the 240 design cycles, the analysis indicates it is applicable to a 40-year design life.

Original Question

LRA Section 4.3.2.2.4 discusses the fatigue TLAA for the reactor coolant pump (RCP) casings and states that they were analyzed for fatigue by the OEM to meet the requirements of the ASME Code Section III, 1968 Edition through Winter-1968 Addenda. LRA Table 3.1.1 item 3.1.1-55 states that these pump casings will be managed by the applicant's Inservice Inspection Program.

The applicant's licensing basis includes a flaw tolerance analysis for the RCP casings that was used to support ASME Code Case N-481's alternate augmented visual inspection bases for the RCP casings. The staff noted that this flaw tolerance analysis is documented in Structural Integrity Associates (SIA) Topical Report No. SIR-99-040, Revision 1, "ASME Code Case N-481 of Davis-Besse Reactor Coolant Pumps." (ADAMS Accession No. ML011200090, dated April 23, 2001).

The staff noted that the evaluation in Report No. SIR-99-040 includes a cycle-dependent fatigue flaw growth analysis for the pump casings welds that is based on a 40-year design life; however, the applicant did not identify this analysis as a TLAA.

Justify why the fatigue flaw growth analysis for the RCP pump casing welds in SIA Topical Report No. SIR-99-040, Revision 1, does not need to be identified as a TLAA in accordance with 10 CFR 54.21(c)(1).

RESPONSE RAI 4.1-2 (Code Case N-481) Revised Response

During the telephone conference call, FENOC agreed with the NRC's position, and stated that the response to RAI 4.1-2 would be revised. The revised response is as follows:

The reactor coolant pumps (RCPs) are the only ASME Code Class 1 pumps installed at Davis-Besse. The pump casings are constructed of cast austenitic stainless steel. The applicable ASME Code for the current Third Ten-Year Inspection Interval for Davis-Besse is ASME Section XI, 1995 Edition, through the 1996 Addenda, as modified by 10 CFR 50.55a or relief granted in accordance with 10 CFR 50.55a. Examination Category B-L-1 of this Code year requires volumetric examination on pump casing welds. ASME Code Case N-481, "Alternative Examination Requirements for Cast Austenitic Pump Casings," provides an alternative to the volumetric examination requirement. This code case allows the replacement of volumetric examinations of primary loop pump casings with fracture mechanics-based integrity evaluation (Item (d) of the code case) supplemented by specific visual examinations. Davis-Besse has invoked the use of Code Case N-481 in place of the volumetric examination requirements of Code Category B-L-1. The NRC has accepted Code Case N-481 for use in inservice inspection programs.

Code Case N-481 requires an evaluation to demonstrate the safety and serviceability of the pump casings. The evaluation for the Davis-Besse RCPs required by Code Case N-481 is documented in Structural Integrity Associates (SIA) report SIR-99-040. This evaluation assumed a quarter thickness flaw, with length six times its depth, and showed that the flaw will remain stable considering the stresses and material properties of the pump casing. To determine stability of the postulated flaw, a fracture mechanics evaluation was performed that included a fatigue crack growth analysis to demonstrate that a small initial assumed flaw (10 percent through-wall), corresponding to the acceptance standards of ASME Code, Section XI, Subarticle IWB-3500, would not grow to quarter thickness during plant life. There are two potential time-dependencies in the Code Case N-481 evaluation:

1. The fracture toughness of the cast austenitic stainless steel is not time-dependent as the analysis used a lower bound fracture toughness of 139-ksi$\sqrt{in}$ that bounds the saturated fracture toughness of the Davis-Besse material.

2. The fatigue crack growth analysis is based on design cycles for a 40-year plant life, and is therefore a TLAA requiring analysis and disposition for license renewal.

The fatigue crack growth analysis assumed an initial flaw size corresponding to the acceptance standards of ASME Code Section XI and considered all the significant plant transients. This analysis examined the design cycles and determined there were 240 cycles that were significant to flaw growth in the RCPs. Then 2000 cycles were conservatively analyzed, and flaw growth (initial 10 percent assumed through-wall had grown only to 15 percent through-wall) remained well below the quarter thickness postulated flaw. The analyzed cycles of 2000 bound the 60-year projected cycles shown in LRA Table 4.3-1, and the fatigue crack growth TLAA associated with the ASME Code

Case N-481 evaluation will therefore remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question RAI XI.S8-1 Supplemental Response – Nuclear Safety-Related Protective Coatings Program

The NRC initiated a telephone conference call with FENOC on July 27, 2011, to discuss the FENOC response to RAI XI.S8-1 (submitted in FENOC letter dated June 17, 2011 (ML11172A389)). The NRC staff asked for clarification as to why ASTM D5163 specifies a year-of-issue designator in part of the submittal but is not consistent throughout the response.

RESPONSE RAI XI.S8-1 Supplemental Response – Nuclear Safety-Related Protective Coatings Program

LRA Section B.2.42, "Nuclear Safety-Related Protective Coatings Program," is revised to include the year-of-issue designator for (e.g., -91) to ASTM International (ASTM) standard numbers that did not include year-of-issue designators.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question Supplemental Response – Abandoned Equipment

The NRC initiated a telephone conference call with FENOC on July 27, 2011, to discuss the FENOC response to RAI 2.1-3 (submitted in FENOC letter dated April 29, 2011 (ML11126A016)). The NRC staff was unclear from the FENOC response to RAI 2.1-3 if FENOC is aware of all the abandoned equipment. The NRC staff stated that the current FENOC response does not meet the NRC's expectations and is not consistent with other applications. The NRC staff described some methods that could meet the NRC's expectations:

1. **Identify all abandoned potentially fluid-filled equipment and verify that it is drained;**
2. **Place all of the abandoned potentially fluid-filled equipment in scope and subject it to aging management review; or,**

3. Combinations of the two methods above.

RESPONSE Supplemental Response – Abandoned Equipment

LRA Table A-1, "Davis-Besse License Renewal Commitments," Commitment 26, is revised to ensure that abandoned equipment is identified, and either isolated and drained or included within the scope of license renewal and subject to aging management review prior to receipt of the renewed license.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question Supplemental Response – Methods for One Time Inspections

The NRC initiated a telephone conference call with FENOC on July 27, 2011, to discuss FENOC's response to RAI 3.3.2.2.4.3-1 and corresponding LRA Section B.2.30 amendment in letter dated June 3, 2011 (ML11159A132). The amendment to LRA Section B.2.30 states that the "scope" program element is to include visual and volumetric inspections of the stainless steel makeup pump casings for cracking due to cyclic loading, but it does not state what type of visual examinations will be used to detect cracking. The GALL [NUREG-1801] AMP XI.M32, "One-Time Inspection" states in the "detection of aging effects" program element that the program manages cracking due to cyclic loading using enhanced visual (EVT-1 or equivalent), surface, or volumetric examinations. However, some types of visual examination may not be sufficient to identify cracking, and it is unclear what visual examinations will be performed to meet this need. The NRC requests the type of visual examination that will be used to identify cracking as part of the One Time Inspection Program.

RESPONSE Supplemental Response – Methods for One Time Inspections

LRA Sections A.1.30 and B.2.30, both titled "One-Time Inspection," are revised to include a table that identifies the type of inspection that will be used for detection of aging effects.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question Supplemental Response – OIN-352 – External Surfaces Monitoring Program

During the NRC Region III Inspection Procedure (IP) 71002, "License Renewal Inspection," held the week of April 25, 2011, NRC Inspectors requested that the Davis-Besse External Surfaces Monitoring Program document include a number of enhancements. The FENOC License Renewal Project created Open Item Number (OIN)-352 to track the request, listed as follows:

- **Accessible components that credit the ESM Program for aging management shall be inspected at least once per fuel cycle**
- **Add acceptance criteria to the System Walkdown Check List**
- **Add inspection parameters to the System Walkdown Check List, as follows:**
  - **corrosion and material wastage (loss of material)**
  - **leakage from or onto external surfaces**
  - **worn, flaking, or oxide-coated surfaces**
  - **corrosion stains on thermal insulation**
  - **protective coating degradation (cracking and flaking)**
- **Add a record retention requirement to retain the System Walkdown Check List to document the results of the inspection**

LRA Sections affected are A.1.15, B.2.15 and LRA Table A-1, "Davis-Besse License Renewal Commitments," Commitment 8 (enhancement commitment for the External Surfaces Monitoring Program).

RESPONSE Supplemental Response – OIN-352 – External Surfaces Monitoring Program

LRA Sections A.1.15 and B.2.15, both titled "External Surfaces Monitoring Program," and LRA Table A-1, "Davis-Besse License Renewal Commitments," Commitment 8, are revised to include the items identified above.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question Supplemental Response – OIN-368 Fuel Oil Chemistry

During the NRC Region III Inspection Procedure (IP) 71002, "License Renewal Inspection," held the week of May 9, 2011, NRC Inspectors requested that FENOC revise the Fuel Oil Chemistry Program description to state that the program monitors and trends water and particulate contamination concentrations in accordance with the plant's technical specifications. Also, include an enhancement to the program to monitor and trend biological activity quarterly.

RESPONSE Supplemental Response – OIN-368 Fuel Oil Chemistry

LRA Sections A.1.20 and B.2.20, both titled "Fuel Oil Chemistry Program," and LRA Table A-1, "Davis-Besse License Renewal Commitments," Commitment 28, are revised to address the identified items.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Question Supplemental Response – OIN-369 Reactor Vessel upper head lift lugs

During the NRC Region III Inspection Procedure (IP) 71002, "License Renewal Inspection," held the week of May 9, 2011, NRC Inspectors identified that, contrary to the information provided in LRA Section 2.3.1.1, the reactor pressure vessel upper head lifting lugs have a "support" intended function relative to a heavy lift. Therefore, the lifting lugs are subject to aging management review, and a change to the LRA is required.

RESPONSE Supplemental Response – OIN-369 Reactor Vessel upper head lift lugs

FENOC agrees that the reactor pressure vessel (RPV) upper head lifting lugs have a "support" intended function relative to a heavy lift over safety related equipment. Therefore, the lifting lugs are subject to aging management review. LRA Section 2.3.1.1, "Reactor Pressure Vessel," is revised to show that the RPV upper head lifting lugs are subject to aging management review. Also, LRA Table 2.3.1-1, "Reactor Pressure Vessel Components Subject to Aging Management Review," is revised to include upper head lifting lugs with an intended function of support. In addition, a LRA Table 3.1.2-1, "Aging Management Review Results – Reactor Pressure Vessel," is revised to include the aging management review results of the upper head lifting lugs.

See the Enclosure to this letter for the revision to the DBNPS LRA.

Enclosure

Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS)

Letter L-11-238

Amendment No. 13 to the DBNPS License Renewal Application

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The Enclosure identifies the change to the License Renewal Application (LRA) by Affected LRA Section, LRA Page No., and Affected Paragraph and Sentence. The count for the affected paragraph, sentence, bullet, etc. starts at the beginning of the affected Section or at the top of the affected page, as appropriate. Below each section the reason for the change is identified, and the sentence affected is printed in *italics* with deleted text ~~*lined-out*~~ and added text *underlined*.

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
2.3.1.1, and Table 2.3.1-1	**Pages 2.3-7 thru 2.3-9**	**Reactor Vessel External Attachments; Components Subject to AMR; and, New Table Row**

During the NRC Region III Inspection Procedure (IP) 71002, "License Renewal Inspection," held the week of May 9, 2011, NRC Inspectors identified that, contrary to the information provided in LRA Section 2.3.1.1, the reactor pressure vessel upper head lifting lugs have a "support" intended function relative to a heavy lift (OIN-369). LRA Section 2.3.1.1, "Reactor Pressure Vessel," and Table 2.3.1-1, "Reactor Pressure Vessel Components Subject to Aging Management Review," are revised to read as follows:

LRA Page 2.3-7:

Reactor Vessel External Attachments

There are multiple external attachments to the reactor pressure vessel, including the ~~top~~ *upper* head lifting lugs, insulation support pads, vessel handling lugs, and the CRDM support skirt.

LRA Page 2.3-8:

Components Subject to AMR

In addition to those components specifically excluded in 10 CFR 54.21(a)(1)(i), such as instruments, the following components of the reactor pressure vessel are in the scope of license renewal, but are not subject to AMR:

- O-rings and gaskets
- ~~*Top Head Lifting Lugs*~~
- Vessel Insulation Support Pads
- Vessel Handling Lugs

The internal attachments provide support to their respective components and all of the internal attachments are subject to AMR. External attachments are subject to AMR if they are load bearing attachments connected to pressure retaining

portions of the vessel *with the exception of upper head lifting lugs. The upper head lifting lugs have a "support" intended function relative to a heavy lift over safety-related equipment and therefore, are subject to AMR.* The ~~lifting lugs,~~ insulation support pads~~,~~ and vessel handling lugs do not bear significant weight during power operation and are not subject to AMR. In addition, o-rings and gaskets are not designed for the life of the plant and are periodically replaced.

LRA Page 2.3-9:

Table 2.3.1-1
Reactor Pressure Vessel
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
Upper head lifting lugs	*Support*

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
Table 2.4-12	**Page 2.4-46**	**EDG Fuel Oil Storage Tank Hold Down Restraints row**

In response to RAI 3.5.2.3.12-3, LRA Table 2.4-12, "Yard Structures Components Subject to Aging Management Review," is revised to delete the row for the emergency diesel generator fuel oil storage tank hold down restraints, to read as follows:

Table 2.4-12
Yard Structures
Components Subject to Aging Management Review

Component Type	Intended Function (as defined in Table 2.0-1)
~~*EDG Fuel Oil Storage Tank Hold Down Restraints*~~	~~*SSR*~~

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
Table 3.1.2-1	**Page 3.1-59**	**New Row 100**

During the NRC Region III Inspection Procedure (IP) 71002, "License Renewal Inspection," held the week of May 9, 2011, NRC Inspectors identified that, contrary to the information provided in LRA Section 2.3.1.1, the reactor pressure vessel upper head lifting lugs have a "support" intended function relative to a heavy lift (OIN-369). LRA Table 3.1.2-1, "Aging Management Review Results – Reactor Pressure Vessel," is revised to add a new row (Row No. 100) to address aging management of the upper head lifting lugs, and reads as follows:

Table 3.1.2-1 Aging Management Review Results – Reactor Pressure Vessel

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
100	*Upper Head Lifting Lugs*	*Support*	*Steel*	*Air with borated water leakage (External)*	*Loss of material*	*Boric Acid Corrosion*	*IV.A2-13*	*3.1.1-58*	*A*

<u>Affected LRA Section</u> **<u>LRA Page No.</u>** **<u>Affected Paragraph and Sentence</u>**

Table 3.1.2-4 **Page 3.1-169** **Rows 30 and 31**

The NRC initiated a telephone conference call with FENOC on July 12, 2011, to discuss primary side fouling of steam generator tubes. In this Supplemental Response to the teleconference request, Rows 30 and 31 of LRA Table 3.1.2-4, "Aging Management Review Results – Steam Generators," are revised to show as "Not used." LRA Table 3.1.2-4 now reads as follows:

Table 3.1.2-4 Aging Management Review Results – Steam Generators									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801, Volume 2 Item**	**Table 1 Item**	**Notes**
30	~~Primary Side; Tube and Sleeve~~ *<u>Not used</u>*	~~Heat transfer~~	~~Nickel Alloy~~	~~Borated reactor coolant (Internal)~~	~~Reduction in Heat Transfer~~	~~PWR Water Chemistry~~	~~N/A~~	~~N/A~~	~~H~~
31	~~Primary Side; Tube and Sleeve~~ *<u>Not used</u>*	~~Heat transfer~~	~~Nickel Alloy~~	~~Borated reactor coolant (Internal)~~	~~Reduction in Heat Transfer~~	~~Steam Generator Tube Integrity~~	~~N/A~~	~~N/A~~	~~H~~

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
3.2.2.1.3	**Page 3.2-5**	**"Aging Management Programs" subsection**

In response to RAI 3.2.2.2.3.6-2, the "Aging Management Programs" subsection of LRA Section 3.2.2.1.3, "Core Flooding System," is revised to read as follows:

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Core Flooding System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program
- *Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Program*
- One-Time Inspection
- PWR Water Chemistry Program

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
3.2.2.1.4	**Page 3.2-6**	**"Aging Management Programs" subsection**

In response to RAI 3.2.2.2.3.6-2, the "Aging Management Programs" subsection of LRA Section 3.2.2.1.4, "Decay Heat Removal and Low Pressure Injection System," is revised to read as follows:

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Decay Heat Removal and Low Pressure Injection System:

- Aboveground Steel Tanks Inspection
- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- *Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Program*
- Lubricating Oil Analysis Program
- One-Time Inspection
- PWR Water Chemistry Program
- Selective Leaching Inspection

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
3.2.2.2.3.6	**Page 3.2-9**	**Entire section**

In response to RAI 3.2.2.2.3.6-2, Section 3.2.2.2.3.6, "Stainless Steel Piping, Piping Components, Piping Elements, and Tanks – Internal Condensation," previously revised in FENOC Letter dated May 24, 2011 (ML11151A090), is revised to read as follows:

3.2.2.2.3.6 Stainless Steel Piping, Piping Components, Piping Elements, and Tanks – Internal Condensation

Loss of material from pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to internal condensation. Moist air is enveloped by the NUREG-1801 Chapter IX definition of condensation. *At Davis-Besse, loss of material ~~at air-water interfaces~~ for stainless steel piping, piping components, piping elements, and tanks that are exposed internally to moist air ~~will be detected and characterized by the One-Time Inspection. Loss of material where contaminants may be concentrated by frequent wetting and drying for stainless steel piping, piping components, tubing, and valve bodies that are exposed internally to moist air, which is enveloped by the NUREG 1801 Chapter IX definition of condensation,~~ will be managed by the plant-specific Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program.*

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
Table 3.2.1	**Page 3.2-17**	**Row 3.2.1-08 “Discussion”**

Text in “Discussion” column is revised based on the response to RAI 3.2.2.2.3.6-2. LRA Table 3.2.1, “Summary of Aging Management Programs for Engineered Safety Systems Evaluated in Chapter VII of NUREG-1801,” and now reads as follows:

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-08	Stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant-specific	Consistent with NUREG-1801. *Loss of material due to pitting and crevice corrosion ~~at air-water interfaces~~ in stainless steel piping, piping components, piping elements, and tanks that are exposed to moist air (internal) ~~will be detected and characterized by the One-Time Inspection.~~* *~~Loss of material where contaminants may be concentrated by frequent wetting and drying for stainless steel piping, piping components, tubing, and valve bodies that are exposed internally to moist air (internal)~~ will be managed by the plant-specific Inspection of Internal Surfaces in*

Table 3.2.1 Summary of Aging Management Programs for Engineered Safety Features Systems Evaluated in Chapter V of NUREG-1801					
Item Number	**Component/Commodity**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
					Miscellaneous Piping and Ducting Program. Further evaluation is documented in Section 3.2.2.2.3.6.

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
Table 3.2.2-2	**Page 3.2-53**	**Row 21**

In response to RAI 3.2.2.2.3.6-2, row 21 of LRA Table 3.2.2-2, "Aging Management Review Results – Containment Spray System," is revised as follows:

Table 3.2.2-2 Aging Management Review Results – Containment Spray System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801, Volume 2 Item**	**Table 1 Item**	**Notes**
21	Piping	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	~~One-Time Inspection~~ *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting*	V.A-26	3.2.1-08	E ~~*0202*~~ 0210

Affected LRA Section | **LRA Page No.** | **Affected Paragraph and Sentence**

Table 3.2.2-3 | **Page 3.2-63** | **Row 25**

In response to RAI 3.2.2.2.3.6-2, row 25 of LRA Table 3.2.2-3, "Aging Management Review Results – Core Flooding System," is revised as follows:

Table 3.2.2-3 Aging Management Review Results – Core Flooding System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801, Volume 2 Item**	**Table 1 Item**	**Notes**
25	Piping	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	~~One-Time Inspection~~ *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting*	V.D1-29	3.2.1-08	E ~~0202~~ 0210

<u>**Affected LRA Section**</u>	<u>**LRA Page No.**</u>	<u>**Affected Paragraph and Sentence**</u>
Table 3.2.2-4	**Pages 3.2-86 & 3.2-87**	**Rows 113 & 119**

In response to RAI 3.2.2.2.3.6-2, rows 113 and 119 of LRA Table 3.2.2-4, "Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System," is revised as follows:

Table 3.2.2-4	**Aging Management Review Results – Decay Heat Removal and Low Pressure Injection System**								
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801, Volume 2 Item**	**Table 1 Item**	**Notes**
113	Tank – BWST (DB-T10)	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	~~One-Time Inspection~~ <u>*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting*</u>	V.D1-29	3.2.1-08	E 0210 ~~*0211*~~
119	Tank – Incore instrument tank (DB-T92)	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	~~One-Time Inspection~~ <u>*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting*</u>	V.D1-29	3.2.1-08	E 0210 ~~*0211*~~

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
Section 3.2 Plant-Specific Notes	**Page 3.2-118**	**Row 0211**

In response to RAI 3.2.2.2.3.6-2, row 0211 of Section 3.2, "Plant-Specific Notes," is no longer used, and is revised as follows:

Plant-Specific Notes:	
0211	~~*The One-Time Inspection will confirm, for components subject to a "Moist air (Internal)" environment at the air-water interface, the absence of aging effects or that aging is slow acting so as to not affect the subject component's intended function during the period of extended operation, which verifies the effectiveness of aging management programs credited above and below this interface.*~~ *Not used*

<u>**Affected LRA Section**</u>	<u>**LRA Page No.**</u>	<u>**Affected Paragraph and Sentence**</u>
3.3.2.1.4	**Page 3.3-9**	**"Aging Management Programs" subsection**

In response to RAI 3.2.2.2.3.6-2, the "Aging Management Programs" subsection of LRA Section 3.3.2.1.4, "Boron Recovery System," is revised to read as follows:

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Boron Recovery System:

- Bolting Integrity Program
- Closed Cooling Water Chemistry Program
- <u>*Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Program*</u>
- One-Time Inspection
- PWR Water Chemistry Program

<u>**Affected LRA Section**</u>	<u>**LRA Page No.**</u>	<u>**Affected Paragraph and Sentence**</u>
3.3.2.1.5	**Page 3.3-10**	**"Aging Management Programs" subsection**

In response to RAI 3.2.2.2.3.6-2, the "Aging Management Programs" subsection of LRA Section 3.3.2.1.5, "Chemical Addition System," is revised to read as follows:

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Chemical Addition System:

- Bolting Integrity Program
- <u>*Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Program*</u>
- One-Time Inspection
- PWR Water Chemistry Program

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
3.3.2.1.6	**Page 3.3-11**	**"Aging Management Programs" subsection**

In response to RAI 3.3.2.2.5-2, and to correct the inadvertent assignment of the Flow-Accelerated Corrosion (FAC) Program in FENOC Letter dated May 24, 2011 (ML11151A090), the "Aging Management Programs" subsection of LRA Section 3.3.2.1.6, "Circulating Water System," is revised to read as follows:

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Circulating Water System:

- Bolting Integrity Program
- *Collection, Drainage, and Treatment Components Inspection Program*
- External Surfaces Monitoring Program
- ~~*Flow-Accelerated Corrosion (FAC) Program*~~
- Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Program
- Open-Cycle Cooling Water Program

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
3.3.2.1.7	**Page 3.3-12**	**"Aging Management Programs" subsection**

In response to RAI 3.2.2.2.3.6-2, the "Aging Management Programs" subsection of LRA Section 3.3.2.1.7, "Component Cooling Water System," is revised to read as follows:

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Component Cooling Water System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- Closed Cooling Water Chemistry Program
- External Surfaces Monitoring Program
- *Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Program*
- One-Time Inspection
- Open-Cycle Cooling Water Program

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
3.3.2.1.11	**Page 3.3-15 & 3.3-16**	**"Aging Management Programs" subsection**

In response to RAI 3.2.2.2.3.6-2, the "Aging Management Programs" subsection of LRA Section 3.3.2.1.11, "Demineralized Water Storage System," is revised to read as follows:

Aging Management Programs

The following aging management programs manage the aging effects for subject mechanical components of the Demineralized Water Storage System:

- Bolting Integrity Program
- Boric Acid Corrosion Program
- External Surfaces Monitoring Program
- *Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Program*
- One-Time Inspection
- PWR Water Chemistry Program

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
Table 3.3.1	**Pages 3.3-80**	**Row 3.3.1-49, "Discussion" column**

Text in "Discussion" column is revised based on the response to RAI 3.3.1.49-2. LRA Table 3.3.1, "Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801," now reads as follows:

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-49	Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water	Loss of material due to microbiologically influenced corrosion	Closed-Cycle Cooling Water System	No	~~Not applicable.~~ *Based on plant-specific operating experience,* ~~L~~loss of material due to microbiologically influenced corrosion is not identified as an aging effect requiring management for stainless steel heat exchanger components that are exposed to closed cycle cooling water. *However, the existing Closed Cooling Water Chemistry Program requires that systems within the scope of the program are monitored for the presence of microbiological activity in accordance with the EPRI Closed-Cycle Cooling Water guidelines.* In addition, there are no steel with stainless steel cladding heat exchanger components that are

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					exposed to closed cycle cooling water and subject to aging management review.

<u>**Affected LRA Section**</u>	<u>**LRA Page No.**</u>	<u>**Affected Paragraph and Sentence**</u>
Table 3.3.1	**Pages 3.3-98**	**Row 3.3.1-75, "Discussion" column**

Text in "Discussion" column is revised based on the response to RAI 3.3.2.2.5-2. LRA Table 3.3.1, "Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801," now reads as follows:

Table 3.3.1 Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component/Commodity	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-75	Elastomer seals and components exposed to raw water	Hardening and loss of strength due to elastomer degradation; loss of material due to erosion	Open-Cycle Cooling Water System	No	Consistent with NUREG-1801, but a different aging management program is assigned. *Hardening and loss of strength for elastomer components that are exposed to raw water will be managed by the ~~Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program~~ <u>Collection, Drainage, and Treatment Components Inspection Program</u>.*

Affected LRA Section | **LRA Page No.** | **Affected Paragraph and Sentence**

Table 3.3.2-4 | **Page 3.3-211** | **Row 158**

In response to RAI 3.2.2.2.3.6-2, row 158 of LRA Table 3.3.2-4, “Aging Management Review Results – Boron Recovery System,” is revised as follows:

Table 3.3.2-4 Aging Management Review Results – Boron Recovery System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801, Volume 2 Item**	**Table 1 Item**	**Notes**
158	Tank - Concentrates storage tank (DB-T16)	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	~~*One-Time Inspection*~~ *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting*	V.D1-29	3.2.1-08	E ~~*0313*~~ 0332

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
Table 3.3.2-5	**Page 3.3-225**	**Row 59**

In response to RAI 3.2.2.2.3.6-2, row 59 of LRA Table 3.3.2-5, "Aging Management Review Results – Chemical Addition System," is revised as follows:

Table 3.3.2-5 Aging Management Review Results – Chemical Addition System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801, Volume 2 Item**	**Table 1 Item**	**Notes**
59	Tank – Boric acid addition tanks (DB-T7-1 & 2)	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	~~*One-Time Inspection*~~ *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting*	V.D1-29	3.2.1-08	E ~~*0313*~~ 0332

<u>Affected LRA Section</u> **<u>LRA Page No.</u>** **<u>Affected Paragraph and Sentence</u>**

Table 3.3.2-6 **Page 3.3-231** **Row 4 and 1 [New] Row**

In response to RAI 3.3.2.2.5-2, row 4 and a previously added "raw water" row (see FENOC Letter dated June 3, 2011 (ML11159A132)) of LRA Table 3.3.2-6, "Aging Management Review Results – Circulating Water System," are revised as follows:

Table 3.3.2-6 Aging Management Review Results – Circulating Water System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
4	Flexible Connection	Structural integrity	Elastomer	Raw water (Internal)	Hardening and loss of strength	~~*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting*~~ *Collection, Drainage, and Treatment Components Inspection*	VII.C1-1	3.3.1-75	E
--	Flexible Connection	Structural integrity	Elastomer	Raw water (Internal)	Loss of material	~~*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting*~~ *Collection, Drainage, and Treatment Components Inspection*	VII.C1-2	3.3.1-75	E

Affected LRA Section | **LRA Page No.** | **Affected Paragraph and Sentence**

Table 3.3.2-7 | **Page 3.3-246** | **Row 80**

In response to RAI 3.2.2.2.3.6-2, row 80 of LRA Table 3.3.2-7, “Aging Management Review Results – Component Cooling Water System,” is revised as follows:

Table 3.3.2-7 Aging Management Review Results – Component Cooling Water System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801, Volume 2 Item**	**Table 1 Item**	**Notes**
80	Tank – Chemical pot feeder (DB-T13)	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	~~One-Time Inspection~~ _Inspection of Internal Surfaces in Miscellaneous Piping and Ducting_	V.D1-29	3.2.1-08	E ~~0312~~ 0332

Affected LRA Section | **LRA Page No.** | **Affected Paragraph and Sentence**

Table 3.3.2-11 **Page 3.3-276** **Row 29**

In response to RAI 3.2.2.2.3.6-2, row 29 of LRA Table 3.3.2-11, "Aging Management Review Results – Demineralized Water Storage System," is revised as follows:

Table 3.3.2-11 Aging Management Review Results – Demineralized Water Storage System									
Row No.	**Component Type**	**Intended Function(s)**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801, Volume 2 Item**	**Table 1 Item**	**Notes**
29	Tank – Lab demin. water storage tank (DB-T108)	Structural integrity	Stainless Steel	Moist air (Internal)	Loss of material	~~One-Time Inspection~~ <u>*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting*</u>	V.D1-29	3.2.1-08	E ~~0312~~ 0332

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
Table 3.3.2-14	**Page 3.3-334**	**Row 172 and 1 [New] Row**

In response to RAI 3.3.2.2.5-2, row 172 and a previously added "raw water" row (see FENOC Letter dated June 3, 2011 (ML11159A132)) of LRA Table 3.3.2-14, "Aging Management Review Results – Fire Protection System," are revised as follows:

Table 3.3.2-14 Aging Management Review Results – Fire Protection System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
172	Flexible Connection	Pressure boundary	Elastomer	Raw water (Internal)	Hardening and loss of strength	~~*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting*~~ *Collection, Drainage, and Treatment Components Inspection*	VII.C1-1	3.3.1-75	E
--	Flexible Connection	Pressure boundary	Elastomer	Raw water (Internal)	Loss of material	~~*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting*~~ *Collection, Drainage, and Treatment Components Inspection*	VII.C1-2	3.3.1-75	E

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
Table 3.3.2-21	**Page 3.3-405**	**Row 16 and 1 [New] Row**

In response to RAI 3.3.2.2.5-2, row 16 and a previously added "raw water" row (see FENOC Letter dated June 3, 2011 (ML11159A132)) of LRA Table 3.3.2-21, "Aging Management Review Results – Miscellaneous Liquid Radwaste System," are revised as follows:

Table 3.3.2-21 Aging Management Review Results – Miscellaneous Liquid Radwaste System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
16	Flexible Connection	Structural integrity	Elastomer	Raw water (Internal)	Hardening and loss of strength	~~*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting*~~ *Collection, Drainage, and Treatment Components Inspection*	VII.C1-1	3.3.1-75	E
--	Flexible Connection	Structural integrity	Elastomer	Raw water (Internal)	Loss of material	~~*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting*~~ *Collection, Drainage, and Treatment Components Inspection*	VII.C1-2	3.3.1-75	E

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
Table 3.3.2-31	**Page 3.3-533**	**Row 20**

During the development of the response to RAI 3.2.2.2.3.6-2, an inadvertent omission was identified in FENOC letter dated May 24, 2011 (ML11151A090). Specifically, in the Enclosure to the letter, page 110 of 206, row 20 of LRA Table 3.3.2-31, "Aging Management Review Results – Station Plumbing, Drains, and Sumps System," plant-specific note 0332 should have been included in the revised row "Notes" column. Row 20 of LRA Table 3.3.2-31 is revised to include plant-specific note 0332 as follows:

Table 3.3.2-31 Aging Management Review Results – Station Plumbing, Drains, and Sumps System

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
20	Piping	Pressure boundary	Stainless Steel	Moist air (Internal)	Loss of material	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting	V.D1-29	3.2.1-08	E *0332* 0334

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
Table 3.5.2-12 and Plant-specific Notes	**Page 3.5-112**	**Rows 7 and 8, and Note 0531**

In response to RAI 3.5.2.3.12-3, LRA Table 3.5.2-12, "Aging Management Review Results – Yard Structures," is revised to delete rows 7 and 8 for the emergency diesel generator fuel oil storage tank hold down restraints. Also, as part of this revision, Plant-specific Note 0531 is no longer used, and is deleted. LRA Table 3.5.2-12 and Table 3.5.2 Plant-Specific Notes are revised to read as follows:

Table 3.5.2-12 Aging Management Review Results – Yard Structures

Row No.	Component Type	Intended Function(s)	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801, Volume 2 Item	Table 1 Item	Notes
7	~~*EDG Fuel Oil Storage Tank Hold Down Restraints*~~ *Not used*	~~*SSR*~~	~~*Carbon Steel*~~	~~*Concrete*~~	~~*None*~~	~~*None*~~	~~*VII.J-21*~~	~~*3.3.1-96*~~	~~*C*~~
8	~~*EDG Fuel Oil Storage Tank Hold Down Restraints*~~ *Not used*	~~*SSR*~~	~~*Carbon Steel*~~	~~*Structural backfill*~~	~~*None*~~	~~*Structures Monitoring*~~	~~*N/A*~~	~~*N/A*~~	~~*H 0531*~~

Plant-Specific Notes:	
0531	~~*NUREG-1801 does not list a structural backfill environment for steel components. No aging effects requiring management were identified for the EDG Fuel Oil Storage Tank hold down wire rope in a structural backfill environment. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation. The structural backfill is above grade and the elevation location of the wire rope is above the site's groundwater elevation.*~~ *Not used*

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
Table 4.1-1	**Page 4.1-4**	**New row**

The NRC initiated a telephone conference call with FENOC on July 15, 2011, to discuss the FENOC response to RAI 4.1-2 (ML11172A389). The NRC does not agree that the cycle-dependent fatigue flaw growth analysis is not a time-limited aging analysis. FENOC provides this supplemental response to RAI 4.6-1 to add a new LRA Section 4.7.6, "ASME Code Case N-481 Evaluation." LRA Table 4.1-1, "Time-Limited Aging Analyses," is revised to include a new row to disposition new LRA Section 4.7.6, as follows:

Table 4.1 1 Time-Limited Aging Analyses

Results of TLAA Evaluation by Category	54.21(c)(1) Paragraph	LRA Section
Other Plant-Specific Time-Limited Aging Analyses		4.7
ASME Code Case N-481 Evaluation	*(i)*	*4.7.6*

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
4.3.4.2	**Page 4.3-28**	**Entire section**
Table 4.3-2	**Page 4.3-31**	**Table values and footnotes**

The NRC initiated a telephone conference call with FENOC on July 12, 2011, to discuss the FENOC response to RAI 4.3-17 (ML11172A389) related to the environmentally-assisted fatigue (EAF) evaluation results for the surge line piping. FENOC provides this supplemental response to RAI 4.3-17 to revise LRA Section 4.3.4.2, "Davis-Besse Evaluation – Surge Line Fatigue Results," and LRA Table 4.3-2, "Davis-Besse CUFs for NUREG/CR-6260 Locations," which now read as follows:

4.3.4.2 Davis-Besse Evaluation

Surge Line Fatigue Results

The bounding environmentally adjusted cumulative usage factors for the surge line are as follows:

- The maximum design CUF for the stainless steel pipe adjacent to the outboard end of the hot leg surge nozzle is 0.179. *In-air CUF (adjusted CUF) based on 60-year projected cycles (except for best estimate 60-year project cycles of 114 used for HU/CDs events) is 0.066.* Using the integrated F_{en} approach described above, the U_{en} for the stainless steel pipe adjacent to the outboard end of the hot leg surge nozzle weld overlay is 0.387 with a global F_{en} of 5.83.~~An adjusted CUF of 0.07 is obtained by dividing the U_{en} of 0.387 by the global F_{en} of 5.83.~~
- The maximum design CUF for the elbows is 0.643. *In-air CUF (adjusted CUF) based on 60-year projected cycles (except for best estimate 60-year project cycles of 114 used for HU/CDs events) is 0.239.* Using the integrated F_{en} approach described above, the maximum U_{en} for the elbows is 0.996 with a global F_{en} of 4.17.~~An adjusted CUF of 0.239 is obtained by dividing the U_{en} of 0.996 by the global F_{en} of 4.17.~~
- The maximum design CUF for the straight pipe is 0.764. *In-air CUF (adjusted CUF) based on 60-year projected cycles (except for best estimate 60-year project cycles of 114 used for HU/CDs events) is 0.336.* Using the integrated F_{en} approach described above, the maximum U_{en} for the straight pipe is 0.846 with a global F_{en} of 2.52.~~An adjusted CUF of 0.336 is obtained by dividing the U_{en} of 0.846 by the global F_{en} of 2.52.~~

- The maximum design CUF for the stainless steel weld that connects the surge line to the pressurizer surge nozzle safe end is 0.51. *In-air CUF (adjusted CUF) based on 60-year projected cycles (except for best estimate 60-year project cycles of 114 used for HU/CDs events) is 0.073.* Using the integrated F_{en} approach described above, the U_{en} for the stainless steel weld that connects the surge line to the pressurizer surge nozzle safe end is 0.644 with a global F_{en} of 8.84. ~~*An adjusted CUF of 0.073 is obtained by dividing the U_{en} of 0.644 by the global F_{en} of 8.84.*~~

See the revision to LRA Table 4.3-2 on the next page.

Table 4.3-2 Davis-Besse CUFs for NUREG/CR-6260 Locations

NUREG/CR-6260 generic locations	Davis-Besse plant-specific locations	Material type	Design CUFs	Adjusted CUFs	F_{en}	U_{en}
1 Reactor vessel shell and lower head	Vessel shell and lower head	LAS	0.024	NA[8]	2.45	0.059
	Incore instrument nozzle	NBA	0.770	0.206[5]	4.16	0.857
2 Reactor vessel inlet and outlet nozzles	Reactor vessel inlet nozzle	LAS	0.829	0.146[1]	2.45	0.358
	Reactor vessel outlet nozzle	LAS	0.768	0.335[1]	2.45	0.821
3 Pressurizer surge line	Hot leg surge nozzle inside radius	CS	0.445	NA[8]	1.74	0.774
	Piping adjacent to outboard end of hot leg surge nozzle	SS	0.179	~~0.07[2]~~ 0.066[2]	5.83[9]	0.387[9]
	Piping elbows	SS	0.643	0.239[2]	4.17[9]	0.996[9]
	Piping straights	SS	0.764	0.336[2]	2.52[9]	0.846[9]
	Piping to pressurizer surge nozzle safe end weld,	SS	0.51	0.073[2]	8.84[9]	0.644[9]
	Pressurizer surge nozzle inside radius	CS	0.182	NA[8]	1.74	0.317
	Pressurizer surge nozzle, safe end	SS	0.108	0.058[1]	15.35	0.892
4 HPI/Makeup nozzle	HPI/Makeup nozzle	CS	0.589	0.348[3]	1.74	0.606
	HPI/Makeup nozzle safe end	SS	0.664	0.550[4]	8.03[6]	4.417[7]
5 Reactor vessel core flood nozzle	Nozzle	LAS	0.0504	NA[8]	2.45	0.123
6 Decay heat Class 1 piping	Decay heat to core flood tee	SS	0.233	NA[8]	2.55	0.595

1. Adjusted CUF obtained by identifying incremental fatigue contribution attributed to the full NSSS design transient cycles for design CUF and reducing those incremental contributions based on the 60-year cycle projections.
2. ~~Adjusted CUF obtained by dividing U_{en} by global F_{en}. Global F_{en} calculated using method from Section 4.2 of MRP-47, Revision 1 as described above for the pressurizer surge line.~~ *Adjusted CUF was calculated using 60-year projected cycles (except for best estimate 60-year project cycles of 114 used for HU/CDs events).*
3. Design CUF reduced from 0.589 to 0.348 by removing conservatisms in the original calculation. Full set of design cycles were used for the calculation.
4. Design CUF reduced from 0.664 to 0.550 by removing conservatisms in the original calculation. Full set of design cycles were used for the calculation.
5. Adjusted CUF obtained by applying the alternating stresses from the original design calculation to the new in-air design curve in NUREG/CR-6909 for stainless steel.
6. This is a global F_{en} obtained by dividing U_{en} by the CUF (4.417/ 0.550).
7. 4.417 is >1.0 and is unacceptable for the period of extended operation. (See Section 4.3.4.2, Location 4).
8. Adjusted CUF was not required. Design CUF multiplied by F_{en} resulted in an U_{en} of < 1.0.
9. *F_{en} was determined for each transient pair (integrated F_{en} approach), the U_{en} for each pair is determined by multiplying the in-air usage (adjusted CUF) for that transient pair by the F_{en} calculated for that pair. The U_{en} for each transient pair were added to come up with cumulative U_{en} for that specific location. F_{en} presented in the Table is a global F_{en} calculated by dividing the cumulative U_{en} by the adjusted CUF.*

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
4.6.1	**Page 4.6-1**	**Second paragraph**

In response to RAI 4.6-1, LRA Section 4.6.1, "Containment Vessel," second paragraph, is revised to read as follows:

4.6.1 CONTAINMENT VESSEL

The containment vessel is a cylindrical steel pressure vessel with hemispherical dome and ellipsoidal bottom which houses the reactor vessel, reactor coolant piping, pressurizer, pressurizer quench tank and coolers, reactor coolant pumps, steam generators, core flooding tanks, letdown coolers, and normal ventilating system. The containment vessel is a Class B vessel as defined in the ASME Section III, Paragraph N-132, 1968 Edition through Summer 1969 Addenda.

The containment vessel is designed to resist dead loads, LOCA loads, operating loads, external pressure load, temperature and pressure, impingement force and missiles, wind loads, seismic loads, gravity loads, and live loads. The containment vessel meets the requirements of ASME Section III, Paragraph N-415.1; thereby justifying the exclusion of cyclic or fatigue analyses in the design of the containment vessel. Analysis of 400 pressure cycles (from *-0.67 psig to 45 psig* ~~*-25 to 120 psi*~~) and 400 temperature cycles (from 30°F to 120°F) were performed against the requirements of ASME Section III, Paragraph N-415.1. ~~*To date, the containment vessel has not seen any pressure cycles from -25 to 120 psi.*~~ *The 60-year projected cycles for plant heatup and cooldown are 128 (shown in Table 4.3-1) and are less than the specified 400 pressure cycles and 400 temperature cycles. Therefore, t*he values of 400 pressure and temperature cycles used to exclude fatigue analyses will not be exceeded for 60 years of operation. Thus, the TLAAs associated with exclusion of fatigue analyses for the containment vessel will remain valid for the period of extended operation.

Disposition: 10 CFR 54.21(c)(1)(i) The TLAAs excluding the containment vessel from fatigue analysis per ASME Section III, Paragraph N415-1 will remain valid through the period of extended operation.

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
4.7.6,	**Page 4.7-6**	**New Section**
4.8	**Page 4.8-2**	**New Reference**
LRA Table of Contents	**Page xii**	**New entry**

The NRC initiated a telephone conference call with FENOC on July 15, 2011, to discuss the FENOC response to RAI 4.1-2 (ML11172A389). The NRC does not agree that the cycle-dependent fatigue flaw growth analysis is not a time-limited aging analysis. FENOC provides this supplemental response to RAI 4.6-1 to add a new LRA Section 4.7.6, "ASME Code Case N-481 Evaluation." LRA Section 4.8 is revised to include a new reference to support new Section 4.7.6. The LRA Table of Contents, not presented below, is revised to include new Section 4.7.6. New LRA Section 4.7.6 and the new reference in LRA Section 4.8 read as follows:

4.7.6 ASME CODE CASE N-481 EVALUATION

The reactor coolant pumps (RCPs) are the only ASME Code Class 1 pumps installed at Davis-Besse. The pump casings are constructed of cast austenitic stainless steel. The applicable ASME Code for the current Third Ten-Year Inspection Interval for Davis-Besse is ASME Section XI, 1995 Edition, through the 1996 Addenda, as modified by 10 CFR 50.55a or relief granted in accordance with 10 CFR 50.55a. Examination Category B-L-1 of this Code year requires volumetric examination on pump casing welds. ASME Code Case N-481, "Alternative Examination Requirements for Cast Austenitic Pump Casings," provides an alternative to the volumetric examination requirement. This code case allows the replacement of volumetric examinations of primary loop pump casings with fracture mechanics-based integrity evaluation (Item (d) of the code case) supplemented by specific visual examinations. Davis-Besse has invoked the use of Code Case N-481 in place of the volumetric examination requirements of Code Category B-L-1. The NRC has accepted Code Case N-481 for use in inservice inspection programs.

Code Case N-481 requires an evaluation to demonstrate the safety and serviceability of the pump casings. The evaluation for the Davis-Besse RCPs required by Code Case N-481 is documented in Structural Integrity Associates (SIA) report SIR-99-040 [Reference 4.8-18]. This evaluation assumed a quarter thickness flaw, with length six times its depth, and showed that the flaw will remain stable considering the stresses and material properties of the pump casing. To determine stability of the postulated flaw, a fracture mechanics

evaluation was performed that included a fatigue crack growth analysis to demonstrate that a small initial assumed flaw (10 percent through-wall), corresponding to the acceptance standards of ASME Code, Section XI, Subarticle IWB-3500, would not grow to quarter thickness during plant life. There are two potential time-dependencies in the Code Case N-481 evaluation.

1. *The fracture toughness of the cast austenitic stainless steel is not time dependent as the analysis used a lower bound fracture toughness of 139 ksi$\sqrt{in}$ that bounds the saturated fracture toughness of the Davis-Besse material.*
2. *The fatigue crack growth analysis is based on design cycles for a 40 year plant life and therefore, is a TLAA requiring analysis and disposition for license renewal.*

The fatigue crack growth analysis assumed an initial flaw size corresponding to the acceptance standards of ASME Code Section XI and considered all the significant plant transients. This analysis examined the design cycles and determined there were 240 cycles that were significant to flaw growth in the RCPs. Then 2000 cycles were conservatively analyzed, and flaw growth (initial 10 percent assumed through-wall had grown only to 15 percent through-wall) remained well below the quarter thickness postulated flaw. The analyzed cycles of 2000 bound the 60-year projected cycles shown in LRA Table 4.3-1 and therefore, the fatigue crack growth TLAA associated with the ASME Code Case N-481 evaluation will remain valid for the period of extended operation.

Disposition: *10 CFR 54.21(c)(1)(i)* *The fatigue crack growth TLAA associated with ASME Code Case N-481 evaluation will remain valid through the period of extended operation.*

4.8 REFERENCES

4.8-18 Structural Integrity Associates Report SIR-99-040, "ASME Code Case N-481, Evaluation of Davis-Besse Reactor Coolant Pumps" Rev. 1, September 2000 (ADAMS Accession No. ML011200090)

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
A.1	**Page A-9**	**New third paragraph**

The NRC initiated a telephone conference call with FENOC on July 12, 2011, to discuss the FENOC response to RAI B.1.4-1. FENOC provides this supplemental response to RAI B.1.4-1 to add a new third paragraph to LRA Section A.1, "Summary Descriptions of Aging Management Programs and Activities," as follows:

A.1 SUMMARY DESCRIPTIONS OF AGING MANAGEMENT PROGRAMS AND ACTIVITIES

Existing FENOC processes require reviews of relevant site and industry operating experience and periodic benchmarking to ensure program enhancements are identified and implemented. Such ongoing reviews identify potential needs for aging management program revisions to ensure their effectiveness throughout the period of extended operation.

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
A.1.8	**Page A-11**	**Second paragraph, new last sentence**

In response to RAI 3.3.1.49-1, the second paragraph of LRA Section A.1.8, "Closed Cooling Water Chemistry Program," previously revised in FENOC Letter dated May 24, 2011 (ML11151A090), is revised to read as follows:

A.1.8 CLOSED COOLING WATER CHEMISTRY PROGRAM

Also, the Closed Cooling Water Chemistry Program includes corrosion rate measurement at selected locations in the closed cooling water systems. In addition, periodic inspections of opportunity will be conducted when components are opened for maintenance, repair, or surveillance, to ensure that the existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation. A representative sample of piping and components will be inspected on a 10-year interval, with the first inspection taking place prior to entering the period of extended operation. *Systems within the scope of this program are monitored for the presence of microbiological activity in accordance with the EPRI Closed-Cycle Cooling Water guidelines.*

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
A.1.9	**Page A-11**	**First paragraph – new sentence**

In response to RAI 3.3.2.2.5-2, LRA Section A.1.9, "Collection, Drainage, and Treatment Components Inspection Program," is revised to read:

A.1.9 COLLECTION, DRAINAGE, AND TREATMENT COMPONENTS INSPECTION PROGRAM

The Collection, Drainage, and Treatment Components Inspection Program consists of visual and volumetric inspections. This program will be implemented via periodic inspections of a representative sample. These inspections will ensure that the existing environmental conditions in collection, drainage, and treatment service are not causing material degradation that could result in a loss of component intended function during the period of extended operation. Visual inspections will be conducted using visual (VT-1 or equivalent) inspection methods, capable of detecting loss of material, cracking, or reduction in heat transfer. This program will also include volumetric inspections of inaccessible surfaces (e.g., tank bottoms sitting on concrete). *The aging effects for elastomers, exposed to raw water, will be monitored through a combination of visual inspection and manual or physical manipulation (at least 10 percent of available surface) of the material.* Inspections will be performed by qualified personnel following procedures consistent with the pertinent ASME code of record and 10 CFR 50, Appendix B.

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
A.1.15	Page A-17	Entire section

In response to RAI 3.3.2.2.5-2, LRA Section A.1.15, "External Surfaces Monitoring Program," is revised to include physical manipulation of elastomers. Additionally, NRC Region III License Renewal 71002 Inspection Open Item OIN-352 changes are included in this revision to enhance the program to include inspection parameters and record retention requirements. LRA Section A.1.15 is replaced in its entirety to read as follows:

A.1.15 EXTERNAL SURFACES MONITORING PROGRAM

The External Surfaces Monitoring Program manages the aging of external surfaces, and internal surfaces in cases where environment is the same, of mechanical components within the scope of license renewal.

The External Surfaces Monitoring Program is a condition monitoring program that consists of periodic visual inspections and surveillance activities of component external surfaces to manage cracking and loss of material. The program includes components located in plant systems within the scope of license renewal that are constructed of aluminum, copper alloy (copper, brass, bronze, and copper-nickel), stainless steel (including cast austenitic stainless steel (CASS)), and steel (carbon and low-alloy steel and cast iron) materials. Cracking and loss of material from the external surfaces of these metals will be evidenced by surface irregularities, leakage, or localized discoloration and be detectable prior to loss of intended function. Surfaces that are inaccessible or not readily visible during either normal plant operations or refueling outages, such as surfaces that are insulated, are inspected opportunistically during the period of extended operation. Surfaces that are accessible are inspected at a frequency not to exceed one refueling cycle. System inspection and walkdown documentation includes inspection parameters and acceptance criteria for polymers, elastomers and metallic components as applicable. This documentation is retained in plant records.

The External Surfaces Monitoring Program, supplemented by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program, performs inspection and surveillance of elastomers and polymers that are exposed to air-indoor uncontrolled and air-outdoor environments, but are not replaced on a set frequency or interval (i.e., are long-lived), for evidence of cracking, change in material properties (hardening and loss of strength), and loss of material due to wear. The aging effects for elastomers are monitored through a combination of

visual inspection and manual or physical manipulation (at least 10 percent of available surface) of the material. Acceptance criteria for these components consists of no unacceptable visual indications of cracks or discoloration that would lead to loss of function prior to the next scheduled inspection and of no hardening as evidenced by a loss of suppleness during manipulation.

The External Surfaces Monitoring Program performs inspection and surveillance of the CREVS air-cooled condensing unit cooling coil tubes and fins and the SBODG radiator tubes and fins for visible evidence of external surface conditions that could result in a reduction in heat transfer. Acceptance criteria for these components consists of no unacceptable visual indications of fouling (build up of dirt or other foreign material) that would lead to loss of function prior to the next scheduled inspection.

The External Surfaces Monitoring Program manages cracking of copper alloys with greater than 15 percent zinc and stainless steel components exposed to an outdoor air environment through plant system inspections and walkdowns for evidence of leakage. Acceptance criteria for surfaces consists of no unacceptable visual indications of cracks that would lead to loss of function prior to the next scheduled inspection.

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
A.1.20	**Page A-16**	**Second paragraph, new second sentence**

During the NRC Region III Inspection Procedure (IP) 71002, "License Renewal Inspection," held the week of May 9, 2011, NRC Inspectors requested that FENOC revise the Fuel Oil Chemistry Program description to state that the program monitors and trends water and particulate contamination concentrations in accordance with the plant's technical specifications, and to include an enhancement to the program to monitor and trend biological activity quarterly. LRA Section A.1.20, "Fuel Oil Chemistry Program," second paragraph, is revised to read as follows:

A.1.20 FUEL OIL CHEMISTRY PROGRAM

The Fuel Oil Chemistry Program manages the presence of contaminants, such as water or microbiological organisms, that could lead to the onset and propagation of loss of material or cracking (of susceptible material) through proper monitoring and control of fuel oil contamination consistent with plant Technical Specifications and ASTM standards D975, D2276, D2709, D4057 and D4176. *Water and particulate contamination concentrations are monitored and trended in accordance with the plant's Technical Specifications. Biological activity is monitored and trended at least quarterly.* The Fuel Oil Chemistry Program is a mitigation program.

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
A.1.22	**Page A-17**	**First paragraph**

In response to RAI B.2.22-7, the first paragraph of LRA Section A.1.22, "Inservice Inspection (ISI) Program - IWE," is revised to read as follows:

A.1.22 INSERVICE INSPECTION (ISI) PROGRAM – IWE

The Inservice Inspection (ISI) Program – IWE establishes responsibilities and requirements for conducting ASME Code, Section XI, Subsection IWE (IWE) inspections as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWE includes examination and testing of accessible surface areas of the steel containment; containment hatches and airlocks; seals, gaskets and moisture barriers; and containment pressure-retaining bolting in accordance with the requirements of IWE. *The program will include examinations to monitor for cracking of containment stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading but have no current licensing basis fatigue analysis.*

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
A.1.25	**Page A-18**	**Entire section**

In response to RAI B.2.25-8 and B.2.39-10, LRA Section A.1.25, "Leak Chase Monitoring Program," is revised to read as follows:

A.1.25 LEAK CHASE MONITORING PROGRAM

The Leak Chase Monitoring Program is a condition monitoring program, consisting of observation and activities to detect leakage from the spent fuel pool, the fuel transfer pit, and the cask pit liners due to age-related degradation.

The Leak Chase Monitoring Program includes periodic monitoring of the spent fuel pool, the fuel transfer pit, and the cask pit liners leak chase system. Periodic monitoring of leakage from the leak chase system permits early determination and localization of leakage. *In conjunction with the PWR Water Chemistry Program, and, for the spent fuel pool, Technical Specifications requirements for monitoring spent fuel pool level, the Leak Chase Monitoring Program is credited for managing the loss of material aging effect in the treated borated water environment for the stainless steel spent fuel pool, the fuel transfer pit, and the cask pit liners. Loss of material due to crevice or pitting corrosion can occur at weld seams. The program detects and monitors leakage prior to loss of intended function. Measurement of leakage from any monitoring line exceeding 15 milliliters per minute will be documented in a condition report for evaluation and potential corrective actions. Evaluation will include consideration of more frequent monitoring.*

The Leak Chase Monitoring Program includes analysis of the leakage from the leak chase system for pH monthly and for iron every six months. The initial acceptance criteria is 7.0 to 8.0 for pH. The results for iron are monitored and trended to insure that there is no indication of corrosion of the reinforcing bars in the walls or floor of the pool and pits. An acceptance criterion for the iron analyses will be developed after three years of measurements. Analyses that exceed the limits will be documented in the Corrective Action Program.

The leak chase system preventive maintenance (PM) activity to inspect and clean the leakage pathways is performed every 18 months based on plant-specific operating experience. Additionally, the program requires inspections once per year of the accessible outside walls and floor (from the ceiling side) of the pool and pits. This inspection will be a documented inspection performed with the specific intent of identifying indications of leakage migrating through the walls. Indication of leakage through the walls will be documented in the Corrective Action Program.

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
A.1.28	**Page A-19**	**Second paragraph, last sentence**

In response to RAI B.2.28-1, the second paragraph of LRA Section A.1.28, "Nickel-Alloy Management Program," is revised to read as follows:

A.1.28 NICKEL-ALLOY MANAGEMENT PROGRAM

The Nickel-Alloy Management Program uses a number of inspection techniques to detect cracking, including volumetric and bare metal visual examinations. The Nickel-Alloy Management Program implements the inspections of components through the Inservice Inspection Program. Component evaluations, examination methods, scheduling, and site documentation comply with 10 CFR 50, the ASME Code, NRC bulletins and generic letters, and staff-approved industry guidelines related to nickel-alloy issues. *Inspection of dissimilar metal butt welds are conducted in accordance with the requirements of ASME Code Case N-770-1, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1," as modified by the Code of Federal Regulations, 10 CFR 50.55a Section (g)(6)(ii)(F).*

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
A.1.41	**Page A-50**	**Entire section**

In response to RAIs B.2.41-1 and B.2.41-3, LRA Section A.1.41, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program," is replaced in its entirety to read as follows:

A.1.41 INSPECTION OF INTERNAL SURFACES IN MISCELLANEOUS PIPING AND DUCTING PROGRAM

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program consists of inspections of the internal surfaces of aluminum, copper alloy (including copper alloy with greater than 15 percent Zn), stainless steel, and steel (including gray cast iron) components exposed to air, condensation, diesel exhaust, lubricating oil or moist air; and, external cooling coil surfaces.

The program manages loss of material and cracking; loss of material due to wear, hardening, and loss of strength of non-metallic, flexible (elastomeric) components; and reduction in heat transfer of cooling coil tubes and fins.

When required by the ASME Code, inspections are conducted in accordance with the applicable code requirements. In the absence of applicable code requirements, visual inspections are performed of metallic and polymeric component surfaces using plant-specific procedures implemented by inspectors qualified through plant-specific programs. The inspections are augmented to include physical manipulation of non-metallic, flexible (elastomeric) components to detect hardening or loss of strength. The sample population for physical manipulation is 10 percent of available surface area, including known suspect locations.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program includes opportunistic inspections, when components are opened for maintenance, repair, or surveillance to ensure that the existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation.

Implementation of this program ensures that the intended functions of susceptible components are maintained during the period of extended operation.

Parameters Monitored or Inspected And Aging Effect for Specific Component			
Aging Effect	***Aging Mechanism***	***Parameter Monitored***	***Inspection Method*** (1)
Loss of Material	*Crevice Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-1 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*Galvanic Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*General Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*MIC*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*Pitting Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-1 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*Erosion*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Reduction of Heat Transfer	*Fouling*	*Tube Fouling*	*Visual (VT-3 or equivalent) or Enhanced VT-1 for CASS*
Cracking	*SCC or Cyclic Loading*	*Surface Condition, Cracks*	*Enhanced Visual (EVT-1 or equivalent) or Surface Examination (magnetic particle, liquid penetrant, or Volumetric (RT or UT)*

(1) *When required by the ASME Code, inspections are conducted in accordance with the applicable code requirements. In the absence of applicable code requirements, visual inspections are performed of metallic and polymeric component surfaces using plant-specific procedures implemented by inspectors qualified through plant-specific programs.*

At least one inspection of each material and environment combination is conducted within the ten-year period prior to entering the period of extended operation.

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
A.2.5.1	**Pages A-44 & A-45**	**Entire section**

In response to RAI 4.6-1, LRA Section A.2.5.1, "Containment Vessel," is revised to read as follows:

A.2.5.1 Containment Vessel

The containment vessel is a Class B vessel as defined in the ASME Section III, Paragraph N-132, 1968 Edition through Summer Addenda 1969. The containment vessel meets the requirements for Paragraph N-415.1 of ASME Section III, thereby justifying the exclusion of cyclic or fatigue analyses in the design of the containment vessel~~*, as discussed in USAR Section 3.8.2.1.5. The containment vessel has been analyzed for 400 pressure cycles (from -25 psi to 120 psi) and 400 temperature cycles (from 30°F to 120°F). The containment vessel has not seen any pressure cycles in the defined range (through 2009)*~~. *The 60-year projected cycles for plant heatup and cooldown are 128 (shown in Table 4.3-1) and are less than the specified 400 pressure cycles and 400 temperature cycles. Therefore, t*he values of 400 pressure cycles and 400 temperature cycles used to exclude fatigue analyses will not be exceeded for 60 years of operation.

The TLAA associated with exclusion of the containment vessel from fatigue analyses per ASME Section III, Paragraph N-415.1 remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
A.2.7.5	**Page A-50**	**New Section**
A.2.8	**Page A-52**	**New Reference**
Appendix A Table of Contents	**Page A-5**	**New entry**

The NRC initiated a telephone conference call with FENOC on July 15, 2011, to discuss the FENOC response to RAI 4.1-2 (ML11172A389). The NRC does not agree that the cycle-dependent fatigue flaw growth analysis is not a time-limited aging analysis. FENOC provides this supplemental response to RAI 4.6-1 to add a new LRA Section A.2.7.5, "ASME Code Case N-481 Evaluation." LRA Section A.2.8 is revised to include a new reference to support new Section A.2.7.5. The LRA Appendix A Table of Contents, not presented below, is revised to include new Section A.2.7.5. New LRA Section A.2.7.5 and the new reference in LRA Section A.2.8 read as follows:

A.2.7.5 ASME Code Case N-481 Evaluation

The reactor coolant pumps (RCPs) are the only ASME Code Class 1 pumps installed at Davis-Besse. The pump casings are constructed of cast austenitic stainless steel. The applicable ASME Code for the current Third Ten-Year Inspection Interval for Davis-Besse is ASME Section XI, 1995 Edition, through the 1996 Addenda, as modified by 10 CFR 50.55a or relief granted in accordance with 10 CFR 50.55a. Examination Category B-L-1 of this Code year requires volumetric examination on pump casing welds. ASME Code Case N-481, "Alternative Examination Requirements for Cast Austenitic Pump Casings," provides an alternative to the volumetric examination requirement. This code case allows the replacement of volumetric examinations of primary loop pump casings with fracture mechanics-based integrity evaluation (Item (d) of the code case) supplemented by specific visual examinations. Davis-Besse has invoked the use of Code Case N-481 in place of the volumetric examination requirements of Code Category B-L-1. The NRC has accepted Code Case N-481 for use in inservice inspection programs.

Code Case N-481 requires an evaluation to demonstrate the safety and serviceability of the pump casings. The evaluation for the Davis-Besse RCPs required by Code Case N-481 is documented in Structural Integrity Associates (SIA) report SIR-99-040 [Reference A.2-18]. This evaluation assumed a quarter thickness flaw, with length six times its depth, and showed that the flaw will remain stable considering the stresses and material properties of the pump casing. To determine stability of the postulated flaw, a fracture mechanics

evaluation was performed that included a fatigue crack growth analysis to demonstrate that a small initial assumed flaw (10 percent through-wall), corresponding to the acceptance standards of ASME Code, Section XI, Subarticle IWB-3500, would not grow to quarter thickness during plant life. There are two potential time-dependencies in the Code Case N-481 evaluation.

1. *The fracture toughness of the cast austenitic stainless steel is not time dependent as the analysis used a lower bound fracture toughness of 139 ksi√in that bounds the saturated fracture toughness of the Davis-Besse material.*

2. *The fatigue crack growth analysis is based on design cycles for a 40 year plant life and therefore, is a TLAA requiring analysis and disposition for license renewal.*

The fatigue crack growth analysis assumed an initial flaw size corresponding to the acceptance standards of ASME Code Section XI and considered all the significant plant transients. This analysis examined the design cycles and determined there were 240 cycles that were significant to flaw growth in the RCPs. Then 2000 cycles were conservatively analyzed, and flaw growth (initial 10 percent assumed through-wall had grown only to 15 percent through-wall) remained well below the quarter thickness postulated flaw. The analyzed cycles of 2000 bound the 60-year projected cycles shown in LRA Table 4.3-1 and therefore, the fatigue crack growth TLAA associated with the ASME Code Case N-481 evaluation will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.2.8 REFERENCES

A.2-18 Structural Integrity Associates Report SIR-99-040, "ASME Code Case N-481, Evaluation of Davis-Besse Reactor Coolant Pumps" Rev. 1, September 2000 (ADAMS Accession No. ML011200090)

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
Table A-1	**Page A-69**	**Commitment 8**

In response to RAI 3.3.2.2.5-2, LRA Table A-1, "Davis-Besse License Renewal Commitments," license renewal future Commitment 8 is revised to capture revised program enhancements. Additionally, NRC Region III License Renewal 71002 Inspection Open Item OIN-352 changes are included in this revision to enhance the program to include inspection parameters and record retention requirements. LRA Table A-1, Commitment 8, is revised to read as follows:

Table A-1

Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
8	Enhance the External Surfaces Monitoring Program to: • Add systems which credit the program for license renewal but do not have Maintenance Rule intended functions to the scope of the program. • Perform opportunistic inspections of surfaces that are inaccessible or not readily visible during normal plant operations or refueling outages, such as surfaces that are insulated. *Surfaces that are accessible will be inspected at a frequency not to exceed one refueling cycle.* • *Perform, in conjunction with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program, inspection and surveillance of elastomers and polymers exposed to air-indoor uncontrolled or air-outdoor environments, but not replaced on a set frequency or interval (i.e., are long-lived), for evidence of*	Prior to April 22, 2017	LRA and FENOC Letters L-11-153*,* ~~and~~ L-11-166 *and L-11-238*	A.1.15 B.2.15 Responses to NRC RAIs 3.3.2.2.5-1 and B.2.2-2 from NRC Letter dated April 20, 2011, ~~and~~ NRC RAI 3.3.2-2 from NRC Letter

Table A-1 Davis-Besse License Renewal Commitments				
Item Number	**Commitment**	**Implementation Schedule**	**Source**	**Related LRA Section No./ Comments**
	cracking and change in material properties (hardening and loss of strength) and loss of material due to wear. Specify acceptance criteria of no unacceptable visual indications of cracks or discoloration that would lead to loss of function prior to the next inspection, and of no hardening as evidenced by a loss of suppleness during manipulation. • Perform inspection of the control room emergency ventilation system air-cooled condensing unit cooling coil tubes and fins and the station blackout diesel generator radiator tubes and fins for visible evidence of external surface conditions that could result in a reduction in heat transfer. Specify acceptance criteria of no unacceptable visual indications of fouling (build up of dirt or other foreign material) that would lead to loss of function prior to the next scheduled inspection. • Manage cracking of copper alloys with greater than 15 percent zinc and stainless steel components exposed to an outdoor air environment through plant system inspections and walkdowns for evidence of leakage. Specify acceptance criteria of no unacceptable visual indications of cracks that would lead to loss of function prior to the next scheduled inspection. • *Include inspection parameters and acceptance criteria for polymers, elastomers and metallic components as applicable in system inspection and walkdown documentation. Retain system inspection and walkdown documentation in plant records.*			dated May 2, 2011, *RAI 3.3.2.2.5-2 from NRC Letter dated July 12, 2011, and NRC OIN-352 from NRC Region III 71002 Inspection*

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
Table A-1	**Page A-69**	**Commitment 26**

The NRC initiated a telephone conference call with FENOC on July 27, 2011, to discuss the FENOC response to RAI 2.1-3 (ML11126A016). The NRC staff stated that the current FENOC response does not meet the NRC's expectations and is not consistent with other applications. FENOC provides this supplemental response to RAI 2.1-3 to replace LRA Table A-1, "Davis-Besse License Renewal Commitments," license renewal future Commitment 26, in its entirety, to read as follows:

Table A-1

Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
26	*Ensure that abandoned equipment is identified, and either isolated and drained or included within the scope of license renewal and subject to aging management review.*	*Prior to December 31, 2012*	*FENOC Letter L-11-238*	*Supplemental response to NRC RAI 2.1-3 from NRC Letter dated March 30, 2011*

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
Table A-1	**Page A-55**	**Commitment 28**

During the NRC Region III Inspection Procedure (IP) 71002, "License Renewal Inspection," held the week of May 9, 2011, NRC Inspectors requested that FENOC revise the Fuel Oil Chemistry Program description to state that the program monitors and trends water and particulate contamination concentrations in accordance with the plant's technical specifications, and to include an enhancement to the program to monitor and trend biological activity quarterly. LRA Table A-1, "Davis-Besse License Renewal Commitments," license renewal future Commitment 28, is revised to read as follows:

Table A-1

Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
28	Enhance the Fuel Oil Chemistry Program to: • Require that internal surfaces of emergency diesel generator fuel oil storage tanks and day tanks, diesel oil storage tank, diesel fire pump day tank, and station blackout diesel generator day tank are periodically drained (at least once every 10 years) for cleaning and are visually inspected to detect potential degradation. If degradation is identified in a diesel fuel tank by visual inspections, a volumetric inspection is performed. • *Require that biological activity be monitored and trended at least quarterly.*	Prior to April 22, 2017	LRA FENOC Letter L-11-134 *and* *L-11-238*	A.1.20 B.2.20 Response to NRC RAI B.2.20-1 and B.2.20-2 from NRC Letter dated April 5, 2011, *and* *NRC OIN-368*

Table A-1 Davis-Besse License Renewal Commitments				
Item Number	**Commitment**	**Implementation Schedule**	**Source**	**Related LRA Section No./ Comments**
				from NRC Region III 71002 Inspection

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
Table A-1	**Page A-69**	**Commitment 30**

License renewal future Commitment 30 regarding Leak Chase Monitoring Program enhancement is revised based on the responses to RAI B.2.25-7 and B.2.39-10, and LRA Table A-1, "Davis-Besse License Renewal Commitments," Commitment 30, now reads as follows:

Table A-1

Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
30	Enhance the Leak Chase Monitoring Program to: • Include acceptance criteria such that measurement of leakage from any monitoring line exceeding 15 milliliters per minute will be documented in the Corrective Action Program for evaluation and potential corrective actions. *Evaluation will include consideration of more frequent monitoring.* • *Analyze collected leak chase drainage for pH monthly and for iron every six months. The initial acceptance criteria will be 7.0 to 8.0 for pH. The results for iron will be monitored and trended to insure that there is no indication of corrosion of the reinforcing bars in the walls or floor of the pool and pits. An acceptance criterion for the iron analyses will be developed after three years of measurements. Analyses that exceed the limits will be documented in the Corrective Action Program.* • *Perform the leak chase inspection and cleaning recurring preventive maintenance (PM) activity every 18 months.*	Prior to April 22, 2017	FENOC Letter L-11-153 *and* *L-11-238*	Response to NRC RAI B.2.25-5 from NRC Letter dated April 5, 2011 *and* *RAIs B.2.25 and B.2.39-10 from NRC Letter dated July 21, 2011*

Table A-1 Davis-Besse License Renewal Commitments				
Item Number	**Commitment**	**Implementation Schedule**	**Source**	**Related LRA Section No./ Comments**
	• *Inspect once per year for leakage migrating through the accessible outside walls and floor (from the ceiling side) of the pool and pits. Document the inspection results and retain in plant records. Indication of leakage through the walls will be documented in the Corrective Action Program.*			

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
Table A-1	**Page A-69**	**Commitment 37**

License renewal future Commitment 37 regarding core bores for spent fuel pool leakage through concrete is revised based on the response to RAI B.2.39-10, and LRA Table A-1, "Davis-Besse License Renewal Commitments," Commitment 37, now reads as follows:

Table A-1

Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
37	Perform and evaluate core bores of the ECCS Pump Room No. 1 wall and the Room 109 ceiling. • *The core bores will be deep enough to expose reinforcing bar in the wall and ceiling. The core samples from the core bores will be examined for signs of corrosion or chemical effects of boric acid on the concrete or reinforcing bars. The examination will include a petrographic examination. The reinforcing steel that will be exposed for a visual inspection will have corrosion products collected for testing. Degradation identified from the samples will be entered into the FENOC Corrective Action Program. The core bores will be performed in areas where leakage has been observed in the past.* • *The first set of core bores will be performed prior to the end of 2014 (Phase 1).*	~~Prior to April 22, 2017~~ *Phase 1 prior to December 31, 2014* *Phase 2 prior to December 31, 2020*	FENOC Letters L-11-153 *and* *L-11-238*	Response to NRC RAI B.2.39-2 from NRC Letter dated April 5, 2011, *and* *RAI B.2.39-10 from NRC Letter dated July 21, 2011*

Table A-1

Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
	• *The second set of core bores will be performed prior to the end of 2020 (Phase 2).* • *Further core bores will be conducted, if warranted, based on the evaluation of the results of the inspection and testing of the core bores or if SFP leakage through the wall or ceiling recurs after the second set of core bores is performed. If spent fuel pool leakage through another wall or ceiling is identified, then core bores will be performed in a manner similar to that stated for the ECCS Pump Room No. 1 wall and the Room 109 ceiling.*			

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
Table A-1	**Page A-69**	**Commitment 38**

License renewal future Commitment 38 regarding concrete cracking on the underside of the spent fuel pool is revised based on the response to RAI B.2.39-10, and LRA Table A-1, "Davis-Besse License Renewal Commitments," Commitment 38, now reads as follows:

Table A-1

Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
38	*Evaluate the concrete cracking observed on the underside of the spent fuel pool for necessary repairs. ~~If necessary, based on the evaluation, repair the crack prior to entering the period of extended operation.~~* *Note: A core bore of the Room 109 ceiling will be performed by the end of 2014 (see license renewal commitment 37). Degradation identified from the samples will be entered into the FENOC Corrective Action Program. The condition of the concrete and the reinforcing steel will be evaluated at that time to assist in determining what repairs, if any, need to be made to the underside of the spent fuel pool concrete. The criterion for determining the need to repair the cracking will be the continued capability of the structures to perform their intended functions during the period of extended operation.*	Prior to April 22, 2017	FENOC Letter L-11-153 *and* *L-11-238*	Response to NRC RAI B.2.39-2 from NRC Letter dated April 5, 2011, *and* *RAI B.2.39-10 from NRC Letter dated July 21, 2011*

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
Table A-1	**Page A-69**	**New Commitment (Item No. 47)**

A new license renewal future commitment is added based on the response to RAI B.2.22-7 regarding examination of Containment penetrations, and LRA Table A-1, "Davis-Besse License Renewal Commitments," is revised to read as follows:

Table A-1

Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
47	Enhance the Inservice Inspection (ISI) Program - IWE to: • Include examinations to monitor for cracking of stainless steel Containment penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading but have no current licensing basis fatigue analysis.	Prior to April 22, 2017	LRA and FENOC Letter L-11-238	A.1.22 B.2.22 Response to NRC RAI B.2.22-7 from NRC Letter dated July 21, 2011

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
Table A-1	**Page A-69**	**New Commitment (Item No. 48)**

A new license renewal future commitment is added based on the response to RAI B.2.40-2 regarding the Intake Canal embankment, and LRA Table A-1, "Davis-Besse License Renewal Commitments," is revised to read as follows:

Table A-1

Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
48	*Complete an investigation and needed repairs or modification of the degraded portion of the safety-related Intake Canal embankment.*	*Prior to April 22, 2017*	*FENOC Letter L-11-238*	*Response to NRC RAI B.2.40-2 from NRC Letter dated July 21, 2011*

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
Table A-1	**Page A-69**	**New Commitment (Item No. 49)**

A new license renewal future commitment is added based on the response to RAI B.2.28-1 regarding an enhancement to the Nickel-Alloy Management Program, and LRA Table A-1, "Davis-Besse License Renewal Commitments," is revised to read as follows:

Table A-1

Davis-Besse License Renewal Commitments

Item Number	Commitment	Implementation Schedule	Source	Related LRA Section No./ Comments
49	*Enhance the Nickel-Alloy Management Program to:* • *Provide for inspection of dissimilar metal butt welds in accordance with the requirements of ASME Code Case N-770-1, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1," as modified by the Code of Federal Regulations, 10 CFR 50.55a(g)(6)(ii)(F).*	*Prior to April 22, 2017*	*FENOC Letter L-11-238*	*A.1.28* *B.2.28* *Response to NRC RAI B.2.28-1 from NRC Letter dated July 27, 2011*

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
Table B-2	**Pages B-18 & B-21**	**3 Rows (as listed)**

In response to RAI B.2.22-7, the "Inservice Inspection (ISI) Program - IWE" row of Table B-2, "Consistency of Davis-Besse Aging Management Programs with NUREG-1801," now shows that enhancement is required, and is revised to read as follows:

Program Name	New / Existing	Consistent with NUREG-1801	Consistent with NUREG-1801 with Exceptions	Plant-Specific	Enhancement Required
Inservice Inspection (ISI) Program - IWE Section B.2.22	Existing	Yes	--	--	_Yes_

In response to RAI B.2.25-8, the "Leak Chase Monitoring Program" row of Table B-2 now shows that enhancement is required, and is revised to read as follows:

Leak Chase Monitoring Program Section B.2.25	Existing	--	--	Yes	_Yes_

In response to RAI B.2.28-1, the "Nickel-Alloy Management Program" row of Table B-2 now shows that enhancement is required, and is revised to read as follows:

Nickel-Alloy Management Program Section B.2.28	Existing	--	--	Yes	_Yes_

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
B.2.8	**Page B-44**	**Program Description subsection, second paragraph**

In response to RAI 3.3.1.49-1, the second paragraph of LRA Section B.2.8, "Closed Cooling Water Chemistry Program," the "Program Description" subsection, previously revised in FENOC Letter dated May 24, 2011 (ML11151A090), is revised to read as follows:

B.2.8 CLOSED COOLING WATER CHEMISTRY PROGRAM

Program Description

Also, the Closed Cooling Water Chemistry Program includes corrosion rate measurement at selected locations in the closed cooling water systems. In addition, periodic inspections of opportunity will be conducted when components are opened for maintenance, repair, or surveillance, to ensure that the existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation. A representative sample of piping and components will be inspected on a 10-year interval, with the first inspection taking place prior to entering the period of extended operation. *Systems within the scope of this program are monitored for the presence of microbiological activity in accordance with the EPRI Closed-Cycle Cooling Water guidelines.*

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
B.2.9	**Page B-47 thru B-49**	**Program Description – new sentence; Parameters Monitored or Inspected and Detection of Aging Effects – new paragraphs**

In response to RAI 3.3.2.2.5-2, the "Program Description," "Parameters Monitored or Inspected," and "Detection of Aging Effects" subsections of LRA Section B.2.9, "Collection, Drainage, and Treatment Components Inspection Program," are revised to include a new sentence and now read as follows:

B.2.9 COLLECTION, DRAINAGE, AND TREATMENT COMPONENTS INSPECTION PROGRAM

Program Description

The Collection, Drainage, and Treatment Components Inspection Program is a new plant-specific program for Davis-Besse that will consist of visual and volumetric inspections. This program will be implemented via periodic inspections of a representative sample. These inspections will ensure that the existing environmental conditions in collection, drainage, and treatment service are not causing material degradation that could result in a loss of component intended function during the period of extended operation. Visual inspections will be conducted using visual (VT-1 or equivalent) inspection methods, capable of detecting loss of material, cracking, or reduction in heat transfer. This program will also include volumetric inspections of inaccessible surfaces (e.g., tank bottoms sitting on concrete). *The aging effects for elastomers, exposed to raw water, will be monitored through a combination of visual inspection and manual or physical manipulation (at least 10 percent of available surface) of the material.* Inspections will be performed by qualified personnel following procedures consistent with the pertinent ASME code of record and 10 CFR 50, Appendix B. The Collection, Drainage, and Treatment Components Inspection Program is a condition monitoring program.

Aging Management Program Elements

- Parameters Monitored or Inspected

  The aging effects for elastomers, exposed to raw water, will be monitored through a combination of visual inspection and manual or physical manipulation (at least 10 percent of available surface) of the material.

- Detection of Aging Effects

  The aging effects for elastomers, exposed to raw water, will be monitored through a combination of visual inspection and manual or physical manipulation (at least 10 percent of available surface) of the material.

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
B.2.15	**Page B-72 & B-73**	**Program Description and Enhancements subsections**

In response to RAI 3.3.2.2.5-2, LRA Section B.2.15, "External Surfaces Monitoring Program," is revised to include physical manipulation of elastomers. Additionally, changes requested in NRC Region III License Renewal 71002 Inspection Open Item OIN-352 are included in this revision to enhance the program to include inspection parameters and record retention requirements. LRA Section B.2.15, subsections "Program Description" and "Enhancements," are replaced in their entirety to read as follows:

B.2.15 EXTERNAL SURFACES MONITORING PROGRAM

Program Description

The External Surfaces Monitoring Program manages the aging of external surfaces, and internal surfaces in cases where environment is the same, of mechanical components within the scope of license renewal.

The External Surfaces Monitoring Program is a condition monitoring program that consists of periodic visual inspections and surveillance activities of component external surfaces to manage cracking and loss of material. The program includes components located in plant systems within the scope of license renewal that are constructed of aluminum, copper alloy (copper, brass, bronze, and copper-nickel), stainless steel (including CASS), and steel (carbon and low-alloy steel and cast iron) materials. Cracking and loss of material from the external surfaces of these metals will be evidenced by surface irregularities, leakage, or localized discoloration and be detectable prior to loss of intended function. Surfaces that are inaccessible or not readily visible during either normal plant operations or refueling outages, such as surfaces that are insulated, will be inspected opportunistically during the period of extended operation. Surfaces that are accessible will be inspected at a frequency not to exceed one refueling cycle. System inspection and walkdown documentation will include inspection parameters and acceptance criteria for polymers, elastomers and metallic components as applicable. This documentation will be retained in plant records.

The External Surfaces Monitoring Program, supplemented by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program, will perform inspection and surveillance of elastomers and polymers that are exposed to air-indoor uncontrolled and air-outdoor environments, but are not replaced on a set frequency or interval (i.e., are long-lived), for evidence of cracking, change in material properties (hardening and loss of strength), and loss of material due to

wear. The aging effects for elastomers will be monitored through a combination of visual inspection and manual or physical manipulation (at least 10 percent of available surface) of the material. Acceptance criteria for these components will consist of no unacceptable visual indications of cracks or discoloration that would lead to loss of function prior to the next scheduled inspection hardening as evidenced by a loss of suppleness during manipulation.

The External Surfaces Monitoring Program will perform inspection and surveillance of the CREVS air-cooled condensing unit cooling coil tubes and fins and the SBODG radiator tubes and fins for visible evidence of external surface conditions that could result in a reduction in heat transfer. Acceptance criteria for these components will consist of no unacceptable visual indications of fouling (build up of dirt or other foreign material) that would lead to loss of function prior to the next scheduled inspection.

The External Surfaces Monitoring Program will also manage cracking of copper alloys with greater than 15 percent zinc and stainless steel components exposed to an outdoor air environment through plant system inspections and walkdowns for evidence of leakage. Acceptance criteria for surfaces consists of no unacceptable visual indications of cracks that would lead to loss of function prior to the next scheduled inspection.

Enhancements

The following enhancements will be implemented in the identified program elements prior to the period of extended operation.

- ***Scope of Program***
  Systems that credit the External Surfaces Monitoring Program for license renewal but which do not have Maintenance Rule intended functions will be added to the scope of the program.

- ***Detection of Aging Effects***
  Surfaces that are inaccessible or not readily visible during either normal plant operations or refueling outages, such as surfaces that are insulated, will be inspected opportunistically during the period of extended operation. Surfaces that are accessible will be inspected at a frequency not to exceed one refueling cycle.

- ***Scope of Program, Parameters Monitored/Inspected, Detection of Aging Effects, Acceptance Criteria***

  The External Surfaces Monitoring Program, supplemented by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program, will perform inspection and surveillance of elastomers and polymers exposed to air-indoor uncontrolled or air-outdoor environments, but not replaced on a set frequency or interval (i.e., are long-lived), for evidence of cracking, change in material properties (hardening and loss of strength), and loss of material due to wear. The aging effects for elastomers will be monitored through a combination of visual inspection and manual or physical manipulation (at least 10 percent of available surface) of the material. Acceptance criteria for these components will consist of no unacceptable visual indications of cracks or discoloration that would lead to loss of function prior to the next scheduled inspection and of no hardening as evidenced by a loss of suppleness during manipulation.

  The External Surfaces Monitoring Program will perform inspection and surveillance of the CREVS air-cooled condensing unit cooling coil tubes and fins and the SBODG radiator tubes and fins for visible evidence of external surface conditions that could result in a reduction in heat transfer. Acceptance criteria for these components will consist of no unacceptable visual indications of fouling (build up of dirt or other foreign material) that would lead to loss of function prior to the next scheduled inspection.

  The External Surfaces Monitoring Program will also manage cracking of copper alloys with greater than 15 percent zinc and stainless steel components exposed to an outdoor air environment through plant system inspections and walkdowns for evidence of leakage. Acceptance criteria for surfaces consists of no unacceptable visual indications of cracks that would lead to loss of function prior to the next scheduled inspection.

- ***Parameters Monitored/Inspected, Acceptance Criteria***

  System inspection and walkdown documentation will include inspection parameters and acceptance criteria for polymers, elastomers and metallic components as applicable. This documentation will be retained in plant records.

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
B.2.20	**Pages B-87 and B-88**	**Program Description – first paragraph, and Enhancements – Monitoring and Trending**

During the NRC Region III Inspection Procedure (IP) 71002, "License Renewal Inspection," held the week of May 9, 2011, NRC Inspectors requested that FENOC revise the Fuel Oil Chemistry Program description to state that the program monitors and trends water and particulate contamination concentrations in accordance with the plant's technical specifications, and to include an enhancement to the program to monitor and trend biological activity quarterly. LRA Section B.2.20, "Fuel Oil Chemistry Program," subsections "Program Description" and "Enhancements," are revised to read as follows:

B.2.20 FUEL OIL CHEMISTRY PROGRAM

Program Description

The Fuel Oil Chemistry Program monitors and maintains fuel oil quality in order to mitigate damage due to loss of material, as well as due to cracking of susceptible materials, for the storage tanks and associated piping and components containing fuel oil that are within the scope of license renewal. The program includes verifying the quality of new fuel oil, periodic sampling of stored diesel fuel oil, and periodic cleaning and inspection of the emergency diesel generator fuel oil storage tanks and day tanks, diesel oil storage tank, diesel fire pump day tank, and station blackout diesel generator day tank. The Fuel Oil Chemistry Program manages the presence of contaminants, such as water or microbiological organisms, that could lead to the onset and propagation of loss of material or cracking (of susceptible material) through proper monitoring and control of fuel oil contamination consistent with plant Technical Specifications and ASTM standards D975, D2276, D2709, D4057 and D4176. *Water and particulate contamination concentrations are monitored and trended in accordance with the plant's Technical Specifications. Biological activity will be monitored and trended at least quarterly.* Exposure to these contaminants are minimized by a) verifying the quality of new fuel oil before it enters the storage tanks, b) periodic sampling of tank contents to ensure the fuel oil is free of water and particulates, and c) periodic cleaning and inspection of tanks containing fuel oil. Fuel oil tanks will be periodically drained (at least once every 10 years) for cleaning and will be visually inspected to detect potential degradation. If degradation is identified in a diesel fuel tank by visual inspections, a volumetric

inspection will be performed. The Fuel Oil Chemistry Program is a mitigation program.

Enhancements

The following enhancements will be implemented in the identified program elements prior to the period of extended operation.

- ***Monitoring and Trending***

  Require that biological activity be monitored and trended at least quarterly.

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
B.2.22	**Page B-96**	**Program Description subsection, first paragraph; and, Enhancements subsection**

In response to RAI B.2.22-7, the first paragraph of LRA Section B.2.22, "Inservice Inspection (ISI) Program - IWE," "Program Description," is revised, and a new enhancement is added to the program, as follows:

B.2.22 INSERVICE INSPECTION (ISI) PROGRAM – IWE

Program Description

The Inservice Inspection (ISI) Program – IWE establishes responsibilities and requirements for conducting ASME Code Section XI, Subsection IWE inspections as required by 10 CFR 50.55a. The Inservice Inspection (ISI) Program – IWE includes examination and/or testing of accessible surface areas of the steel containment vessel; containment hatches and airlocks; seals, gaskets and moisture barriers; and containment pressure-retaining bolting. These examinations are in accordance with the requirements of the ASME Code, Section XI, 1995 Edition through the 1996 Addenda. *The program will include examinations to monitor for cracking of Containment stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading but have no current licensing basis fatigue analysis.*

Enhancements

~~None.~~

The following enhancement will be implemented in the identified program element prior to the period of extended operation.

- ***Parameters Monitored or Inspected***

  The Inservice Inspection (ISI) Program – IWE will include examinations to monitor for cracking of Containment stainless steel penetration sleeves, dissimilar metal welds, bellows, and steel components that are subject to cyclic loading but have no current licensing basis fatigue analysis.

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
B.2.25	**Pages B-104 thru B-107**	**Program Description; Parameters Monitored or Inspected; Detection of Aging Effects; Acceptance Criteria; and, Enhancements**

In response to RAI B.2.25-8 and B.2.39-10, the "Program Description," "Acceptance Criteria," and "Enhancements" subsections of LRA Section B.2.25, "Leak Chase Monitoring Program," subsection, are revised as follows:

B.2.25 LEAK CHASE MONITORING PROGRAM

Program Description

The Leak Chase Monitoring Program is an existing condition monitoring program, consisting of observation and activities to detect leakage from the spent fuel pool, the fuel transfer pit, and the cask pit liners due to age-related degradation.

The Leak Chase Monitoring Program includes periodic monitoring of the spent fuel pool, the fuel transfer pit, and the cask pit liners leak chase system. Periodic monitoring of leakage from the leak chase system permits early determination and localization of leakage. *In conjunction with the PWR Water Chemistry Program, and, for the spent fuel pool, Technical Specifications requirements for monitoring spent fuel pool level, the Leak Chase Monitoring Program is credited for managing the loss of material aging effect in the treated borated water environment for the stainless steel spent fuel pool, the fuel transfer pit, and the cask pit liners. Loss of material due to crevice or pitting corrosion can occur at weld seams. The program detects and monitors leakage prior to loss of intended function. Measurement of leakage from any monitoring line exceeding 15 milliliters per minute will be documented in a condition report for evaluation and potential corrective actions. Evaluation will include consideration of more frequent monitoring.*

The Leak Chase Monitoring Program will include analysis of the leakage from the leak chase system for pH monthly and for iron every six months. The initial acceptance criteria will be 7.0 to 8.0 for pH. The results for iron will be monitored and trended to insure that there is no indication of corrosion of the reinforcing bars in the walls or floor of the pool and pits. An acceptance criterion for the iron analyses will be developed after three years of measurements. Analyses that exceed the limits will be documented in the Corrective Action Program.

The leak chase system recurring preventive maintenance (PM) activity to inspect and clean the leakage pathways will be performed every 18 months based on

plant-specific operating experience. Additionally, the program will require inspections once per year of the accessible outside walls and floor (from the ceiling side) of the pool and pits. This inspection will be a documented inspection performed with the specific intent of identifying indications of leakage migrating through the walls. Indication of leakage through the walls will be documented in the Corrective Action Program.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Parameters Monitored or Inspected

  The spent fuel pool, the fuel transfer pit, and the cask pit liner leak detection drain valves are periodically opened, any leakage is collected, and the amounts are recorded. In addition, leak rates for zone valves are calculated by the volumetric method and recorded. *The Leak Chase Monitoring Program includes analysis of the leakage from the leak chase system for pH monthly and for iron every six months. The results for iron will be monitored and trended to insure that there is no indication of corrosion of the reinforcing bars in the walls or floor of the pool and pits. Additionally, the program requires inspections once per year of the accessible outside walls and floor (from the ceiling side) of the pool and pits, with the specific intent of identifying indications of leakage migrating through the walls.*

- Detection of Aging Effects

  The Leak Chase Monitoring Program includes activities to cycle open and close the spent fuel pool, the fuel transfer pit, and the cask pit liner drain valves on a monthly basis [References LC.3a Section 4.1 and LC.4a]. Each valve on the drain line capable of being cycled is opened to allow any water that accumulated in the lines to drain into an open funnel. After a prescribed wait time, leakage is collected. The amount collected and the calculated leak rate are recorded for each of the 21 drain zones. If leakage collected from any zone drain valve is greater than 10 ml, then the sample is appropriately labeled and transported to a laboratory for boron analysis. Collected leakage information and boron analysis results are recorded in the work order system. *The Leak Chase Monitoring Program includes analysis of the leakage from the leak chase system for pH monthly and for iron every six months.* Monitoring of leakage from the leak chase system permits early determination and localization of any leakage.

  The leak chase system preventive maintenance (PM) activity to inspect and clean the leakage pathways is performed every 18 months based on plant-

specific operating experience. Additionally, the program requires inspections once per year of the accessible outside walls and floor (from the ceiling side) of the pool and pits. This inspection will be performed with the specific intent of identifying indications of leakage migrating through the walls. The inspection results will be documented and retained in plant records.

- Acceptance Criteria

  Measurement of leakage from any monitoring line exceeding 15 ml/min will be documented in the Corrective Action Program for evaluation and potential corrective actions. Evaluation will include consideration of more frequent monitoring. Adverse trends (continued increases of leak rates on a particular zone valve) are *also* documented in the Corrective Action Program.

Enhancements

The following enhancements will be implemented in the identified program elements prior to the period of extended operation.

- ***Parameters Monitored or Inspected, Detection of Aging Effects and Acceptance Criteria***

  Analyze collected leak chase drainage for pH monthly and for iron every six months. The initial acceptance criteria will be 7.0 to 8.0 for pH. The results for iron will be monitored and trended to insure that there is no indication of corrosion of the reinforcing bars in the walls or floor of the pool and pits. An acceptance criterion for the iron analyses will be developed after three years of measurements. Analyses that exceed the limits will be documented in the Corrective Action Program.

  Inspect once per year for leakage migrating through the accessible outside walls and floor (from the ceiling side) of the pool and pits. The acceptance criterion is no visible leakage. Document the inspection results and retain in plant records. Indication of leakage through the walls will be documented in the Corrective Action Program.

- ***Detection of Aging Effects***

  Perform the leak chase inspection and cleaning recurring preventive maintenance (PM) activity every 18 months.

- **Acceptance Criteria**

  Include acceptance criteria such that measurement of leakage from any monitoring line exceeding 15 ml/min will be documented in the Corrective Action Program for evaluation and potential corrective actions. *Evaluation will include consideration of more frequent monitoring.*

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
B.2.28	**Pages B-113 thru B-115**	**Program Description – new third paragraph; Detection of Aging Effects – new fourth paragraph; Monitoring and Trending – new third paragraph; and, Enhancements – new enhancement**

In response to RAI B.2.28-1, the "Program Description," "Detection of Aging Effects," "Monitoring and Trending," and "Enhancements" subsections of LRA Section B.2.28, "Nickel-Alloy Management Program," are revised as follows:

B.2.28 NICKEL-ALLOY MANAGEMENT PROGRAM

Program Description

In addition, inspection of dissimilar metal butt welds will be conducted in accordance with the requirements of ASME Code Case N-770-1, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1," as modified by the Code of Federal Regulations, 10 CFR 50.55a Section (g)(6)(ii)(F).

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Detection of Aging Effects

  In addition, inspection of dissimilar metal butt welds will be conducted in accordance with the requirements of ASME Code Case N-770-1, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1," as modified by the Code of Federal Regulations, 10 CFR 50.55a Section (g)(6)(ii)(F).

- Monitoring and Trending

  In addition, MRP-139 will be replaced by incorporating the requirements of ASME Code Case N-770 as modified by the Code of Federal Regulations, 10 CFR 50.55a Section (g)(6)(ii)(F).

Enhancements

~~None.~~

The following enhancement will be implemented in the identified program elements prior to the period of extended operation.

- ***Detection of Aging Effects, Monitoring and Trending***

  Provide for inspection of dissimilar metal butt welds in accordance with the requirements of ASME Code Case N-770-1, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1," as modified by the Code of Federal Regulations, 10 CFR 50.55a Section (g)(6)(ii)(F).

Affected LRA Section	**LRA Page No.**	**Affected Paragraph and Sentence**
B.2.30	**Page B-123**	**Aging Management Program Element: "Detection of Aging Effects"**

The NRC initiated a telephone conference call with FENOC on July 27, 2011, to discuss FENOC's response to RAI 3.3.2.2.4.3-1 and corresponding LRA Section B.2.30 amendment (ML11159A132). The NRC requests that FENOC identify the type of visual examination that will be used to inspect for cracking as part of the One-Time Inspection Program. FENOC provides this supplemental response to RAI 3.3.2.2.4.3-1 to revise LRA Section B.2.30, "One-Time Inspection," Aging Management Program Element "Detection of Aging Effects," to include a table identifying the types of inspections that are planned to be performed, as follows:

B.2.30 ONE-TIME INSPECTION

Aging Management Program Elements

- Detection of Aging Effects

Parameters Monitored or Inspected And Aging Effect for Specific Component			
Aging Effect	***Aging Mechanism***	***Parameter Monitored***	***Inspection Method*** (1)
Loss of Material	*Crevice Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-1 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*Galvanic Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*General Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*MIC*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*Pitting Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-1 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*Erosion*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*

Parameters Monitored or Inspected And Aging Effect for Specific Component, cont.			
Aging Effect	***Aging Mechanism***	***Parameter Monitored***	***Inspection Method*** [(1)]
Reduction of Heat Transfer	*Fouling*	*Tube Fouling*	*Visual (VT-3 or equivalent) or Enhanced VT-1 for CASS*
Cracking	*SCC or Cyclic Loading*	*Surface Condition, Cracks*	*Enhanced Visual (EVT-1 or equivalent) or Surface Examination (magnetic particle, liquid penetrant, or Volumetric (RT or UT)*

[(1)] *Examinations of code components will follow procedures consistent with the requirements of the ASME Code and 10 CFR 50 Appendix B. Non-code examinations will be performed in accordance with site procedures.*

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
B.2.41	**Page B-166**	**Program Description – entire section; Scope – third paragraph; Parameters Monitored or Inspected – new table; and, Detection of Aging Effects – second paragraph**

In response to RAIs B.2.41-1 and B.2.41-3, LRA Section B.2.41, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program," subsections "Program Description," "Scope," "Parameters Monitored or Inspected," and "Detection of Aging Effects," are revised as follows:

B.2.41 INSPECTION OF INTERNAL SURFACES IN MISCELLANEOUS PIPING AND DUCTING PROGRAM

Program Description

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program is a new plant-specific program for Davis-Besse. The program will consist of inspections of the internal surfaces of aluminum, copper alloy (including copper alloy > 15% Zn), stainless steel, and steel (including gray cast iron) components exposed to air, condensation, diesel exhaust, lubricating oil or moist air; and external cooling coil surfaces. ~~*The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program will also consist of accessible inspections of the internal surfaces of non-metallic, flexible (elastomeric) components that are not included in other aging management programs and the external surfaces of non-metallic, flexible (elastomeric) components as a supplement to the External Surfaces Monitoring Program.*~~

The program will manage loss of material and cracking; ~~*of susceptible stainless steel components,*~~ *loss of material due to wear, hardening and loss of strength of non-metallic, flexible (elastomeric) components; and reduction in heat transfer of cooling coil tubes and fins.*

When required by the ASME Code, inspections are conducted in accordance with the applicable code requirements. In the absence of applicable code requirements, visual inspections are performed of metallic and polymeric component surfaces using plant-specific procedures implemented by inspectors qualified through plant-specific programs. The inspections will be augmented to include physical manipulation of non-metallic, flexible (elastomeric) components

to detect hardening or loss of strength. The sample population for physical manipulation will be 10 percent of available surface area, including known suspect locations.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program will include opportunistic inspections, when components are opened for maintenance, repair, or surveillance to ensure that the existing environmental conditions are not causing material degradation that could result in a loss of component intended function during the period of extended operation.

Implementation of this program will ensure that the intended functions of susceptible components are maintained during the period of extended operation.

Parameters Monitored or Inspected And Aging Effect for Specific Component			
Aging Effect	***Aging Mechanism***	***Parameter Monitored***	***Inspection Method [(1)]***
Loss of Material	*Crevice Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-1 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*Galvanic Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*General Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*MIC*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*Pitting Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-1 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*Erosion*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Reduction of Heat Transfer	*Fouling*	*Tube Fouling*	*Visual (VT-3 or equivalent) or Enhanced VT-1 for CASS*
Cracking	*SCC or Cyclic Loading*	*Surface Condition, Cracks*	*Enhanced Visual (EVT-1 or equivalent) or Surface Examination (magnetic particle, liquid penetrant, or Volumetric (RT or UT)*

(1) When required by the ASME Code, inspections are conducted in accordance with the applicable code requirements. In the absence of applicable code requirements, visual inspections are performed of metallic and polymeric component surfaces using plant-specific procedures implemented by inspectors qualified through plant-specific programs.

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program is a new condition-monitoring program. At least one inspection of each material and environment combination will be conducted within the 10-year period prior to entering the period of extended operation.

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope

The program will include visual and physical (manipulation or prodding) examination of subject non-metallic, flexible (elastomeric) components in various environments for evidence of hardening or loss of strength due to thermal exposure, ultraviolet exposure, or ionizing radiation ~~as a supplement to the External Surfaces Monitoring Program~~.

- Parameters Monitored or Inspected

Parameters Monitored or Inspected And Aging Effect for Specific Component			
Aging Effect	***Aging Mechanism***	***Parameter Monitored***	***Inspection Method [(1)]***
Loss of Material	*Crevice Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-1 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*Galvanic Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*General Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*MIC*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*Pitting Corrosion*	*Surface Condition, Wall Thickness*	*Visual (VT-1 or equivalent) and/or Volumetric (RT or UT)*
Loss of Material	*Erosion*	*Surface Condition, Wall Thickness*	*Visual (VT-3 or equivalent) and/or Volumetric (RT or UT)*
Reduction of Heat Transfer	*Fouling*	*Tube Fouling*	*Visual (VT-3 or equivalent) or Enhanced VT-1 for CASS*
Cracking	*SCC or Cyclic Loading*	*Surface Condition, Cracks*	*Enhanced Visual (EVT-1 or equivalent) or Surface Examination (magnetic particle, liquid penetrant, or Volumetric (RT or UT)*

(1) When required by the ASME Code, inspections are conducted in accordance with the applicable code requirements. In the absence of applicable code requirements, visual inspections are performed of metallic and polymeric component surfaces using plant-specific procedures implemented by inspectors qualified through plant-specific programs.

- Detection of Aging Effects

  When required by the ASME Code, inspections are conducted in accordance with the applicable code requirements. In the absence of applicable code requirements, visual inspections are performed of metallic and polymeric component surfaces using plant specific procedures implemented by inspectors qualified through plant-specific programs.

Affected LRA Section	LRA Page No.	Affected Paragraph and Sentence
B.2.42	Page B-166	Entire Section

The NRC initiated a telephone conference call with FENOC on July 27, 2011, to discuss the FENOC response to RAI XI.S8-1 (ML11172A389). The NRC staff asked for clarification as to why ASTM D5163 specifies a year-of-issue designator in part of the submittal but is not consistent throughout the response. FENOC provides this supplemental response to RAI XI.S8-1 to add year-of-issue designators to the ASTM standards cited in the program. LRA Section B.2.42, "Nuclear Safety-Related Coatings Program," is revised accordingly (six locations), and now reads as follows:

B.2.42 NUCLEAR SAFETY-RELATED COATINGS PROGRAM

Program Description

The Nuclear Safety-Related Protective Coatings Program is an existing plant-specific condition monitoring program that monitors the performance of Service Level 1 coatings inside containment (e.g., coated structures and components such as steel containment vessel, structural steel, supports, penetrations, and concrete walls and floors) through periodic coating examinations, condition assessments and remedial actions, including repair or testing. The Nuclear Safety-Related Protective Coatings Program defines roles, responsibilities, controls and deliverables for monitoring the condition of coatings in containment. Service Level 1 coatings are subject to the guidance of ASTM International (ASTM) D5163-91, "Standard Guide for Establishing Procedures to Monitor the Performance of Safety Related Coatings in an Operating Nuclear Power Plant," and American National Standards Institute (ANSI) Standard N101.4 (1972), "Quality Assurance for Protective Coatings Applied to Nuclear Facilities." The program follows the guidance of EPRI 1003102, "Guidelines on Nuclear Safety Related Coatings," Revision 1. This program also ensures that the Design Basis Accident (DBA) analysis limits with regard to debris loading from failed coatings will not be exceeded for the Emergency Core Cooling Systems (ECCS) suction strainers. On July 14, 1998 the NRC published Generic Letter 98-04, "Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System After a Loss-of-Coolant Accident because of Construction and Protective Coating Deficiencies and Foreign Material in Containment." The program is implemented as described in the FirstEnergy Nuclear Operating Company (FENOC) response to NRC Generic Letter 98-04, accepted by the NRC. The Nuclear Safety-Related Protective Coatings Program provides reasonable assurance that potentially detrimental aging effects will be adequately detected and mitigated such that Service Level 1 protective coatings are

maintained consistent with the current licensing basis for the period of extended operation.

NUREG-1801 Consistency

The Nuclear Safety-Related Protective Coatings Program is an existing plant specific program for Davis-Besse. While NUREG-1801 includes a Protective Coating Monitoring and Maintenance Program (XI.S8), the Nuclear Safety-Related Protective Coatings Program is considered plant-specific, and is evaluated against the ten elements described in Appendix A.1, Section A.1.2.3 of NUREG-1800, the Standard Review Plan for License Renewal (SRP-LR).

Aging Management Program Elements

The results of an evaluation of each program element are provided below.

- Scope

  The Nuclear Safety-Related Protective Coatings Program monitors the performance of Service Level 1 coatings inside containment through periodic coating examinations, condition assessments and remedial actions, including repair or testing. The Nuclear Safety-Related Protective Coatings Program ensures that the Design Basis Accident (DBA) analysis limits with regard to coatings will not be exceeded for the ECCS suction strainers per the response to NRC Generic Letter 98-04. The program consists of periodic visual inspections of the Service Level 1 coatings, looking for any visible defects, such as blistering, cracking, flaking, peeling, delamination, rusting and physical damage. *The program was established in accordance with the guidance provided in ASTM D5163-91, "Standard Guide for Establishing Procedures to Monitor the Performance of Safety Related Coatings in an Operating Nuclear Power Plant."*

  The qualification testing of Service Level 1 coatings used for new applications or used as maintenance coatings for repair and replacement activities inside containment is addressed in the FENOC revised response to NRC Generic Letter 98-04 for Davis-Besse. The testing meets the applicable requirements contained in Regulatory Guide (RG) 1.54 Rev. 0, "Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants." Although Davis-Besse was not committed to ANSI N101.2, "Protective Coatings (Paints) for Light Water Nuclear Reactor Containment Facilities," protective coatings have been evaluated to meet the coatings qualification test criteria per ANSI N101.2.

- Preventive Actions

Protective coatings are not credited for aging management at Davis-Besse. The Nuclear Safety-Related Protective Coatings Program is a condition monitoring program that does not include preventive actions. No actions are taken as part of the Nuclear Safety-Related Protective Coatings Program to prevent aging effects or mitigate age-related degradation.

- Parameters Monitored or Inspected

The Nuclear Safety-Related Protective Coatings Program monitors Service Level 1 coatings in accordance with ASTM D5163-91, "Standard Guide for Establishing Procedures to Monitor the Performance of Safety Related Coatings in an Operating Nuclear Power Plant," ASTM D 714-02, "Standard Test method for Evaluating Degree of Blistering of Paints," and SSPC VIS-2, "Standard Method of Evaluating Degree of Rusting on Painted Surfaces."

Parameters monitored or inspected by the Nuclear Safety-Related Protective Coatings Program include any visible defects, such as blistering, cracking, flaking, peeling, delamination, rusting and physical damage.

The Nuclear Safety-Related Protective Coatings Program procedure will be revised to clarify that visible defects "rusting and physical damage" are inspection attributes following the guidance of ASTM D5163-08, subparagraph 10.2. The Coating Condition Assessment Inspection Form will be revised to list the same set of degradation parameters for inspection as the governing procedure.

- Detection of Aging Effects

A visual containment inspection is performed for evidence of degraded qualified coatings and identification of unqualified coatings applied to structures and components during each refueling outage in accordance with the guidance in ASTM D5163-91, "Standard Guide for Establishing Procedures to Monitor the Performance of Safety Related Coatings in an Operating Nuclear Power Plant." The containment inspection includes a visual coating inspection of the accessible areas that are listed in the approved procedure along with location plan maps. Unless conditions warrant a closer review, inspectors are not required to examine portions of the area, structures or components that are inaccessible due to insulation, scaffold or permanent plant SSCs. Conditions that warrant a closer review are evidence of a coating failure where the area of concern is hidden from view by the obstruction. For areas of the Containment Vessel which have visual evidence (identifiable boundary) of repair or touch-up; its location (azimuth and elevation), approximate surface area and average dry film thickness are

documented on the Coating Condition Assessment Inspection Form. Instruments and equipment used for inspection; such as flashlight, acuity card, inspection mirror, camera, telescope, video equipment, magnifying glass, measuring tape, dry film thickness gage, spring micrometer, etc. meet the guidelines of ASTM D5163-08, subparagraph 10.5.

Coating inspections are performed by coatings inspectors qualified per the requirements of Regulatory Guide 1.58, "Qualification of Nuclear Power Plant Inspection, Examination and Testing Personnel," and ANSI N45.2.6, "Qualification of Inspection, Examination, and Testing Personnel for Nuclear Power Plants". The nuclear safety-related coatings program owner and coating surveillance personnel meet the requirements of EPRI 1003102 Revision 1, "Guidelines on Nuclear Safety Related Coatings."

The Nuclear Safety-Related Protective Coatings Program procedure will be revised to specify the qualifications for inspection personnel, the inspection coordinator and the inspection results evaluator following the guidance of ASTM D5163-08, paragraph 9.

- Monitoring and Trending

  The Nuclear Safety-Related Protective Coatings Program incorporates guidance from ASTM D5163-91, "Standard Guide for Establishing Procedures to Monitor the Performance of Safety Related Coatings in an Operating Nuclear Power Plant." The Nuclear Safety-Related Coatings Program owner develops and manages the Nuclear Safety-Related Protective Coatings Program. The Nuclear Safety-Related Coatings Program owner also maintains the Non-DBA Qualified Protective Coatings Inventory. Inspection results are reviewed and identified degradations are evaluated in accordance with the FENOC Corrective Action Program. Degraded coating that is left in place in an area is documented on the Coating Condition Assessment Inspection form and evaluated by the program owner.

  The Nuclear Safety-Related Protective Coatings Program procedure will be revised to include prioritization of repair areas as either needing repair during the same outage or as postponed to future outages, but under surveillance in the interim period, following the guidance of ASTM D5163-08, subparagraph 11.1.2.

- Acceptance Criteria

  The Nuclear Safety-Related Protective Coatings Program characterizes, documents, and tests defective or deficient coatings in accordance with ASTM D5163-91, "Standard Guide for Establishing Procedures to Monitor the Performance of Safety Related Coatings in an Operating Nuclear Power

Plant." As applicable, coated surfaces are characterized as exhibiting blisters, cracking, flaking, peeling, delamination, abrasion, and holidays. Coating tests are employed for areas where the qualification is in question, representative dry film thickness is obtained for each area on a structure or component which has coating degradation. Evidence of corrosion is further categorized per the guidance of a standard method for evaluating degree of rusting on painted surfaces.

The Coating Surveillance Personnel inspect the containment according to the following degradation definitions:

- Abrasion – The wearing away of coating material in small shreds as a result of friction.
- Blistering - The formation of bubbles in a cured, or nearly cured, coating film after exposure, generally in an aqueous environment.
- Cracking - The formation of breaks in a coating film that extend through to the underlying surface.
- Delamination - A separation of one coat from another coat within a coating system; or from the substrate.
- Flaking - The detachment of small pieces of the coating film.
- Holiday - Pinhole, skip, discontinuity, or void in a coating film that exposes the substrate.
- Peeling - The separation of one or more coats or layers of a coating system from the substrate.

Acceptable coatings are free of delamination, blistering, peeling, flaking, cracking and other defects. Coatings not found to be acceptable are documented using the FENOC Corrective Action Program. The protective coating condition assessment and associated Coating Condition Assessment Inspection forms are approved and signed by the Protective Coatings Program Owner or their Designee.

The Nuclear Safety-Related Protective Coatings Program procedure will be revised to improve reporting requirements by following the guidance of ASTM D5163-08, paragraph 11, including a summary report of findings and recommendations for future surveillance or repair, and prioritization of repairs.

- Corrective Actions

  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Confirmation Process

  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Administrative Controls

  This element is common to Davis-Besse programs and activities that are credited with aging management during the period of extended operation and is discussed in Section B.1.3.

- Operating Experience

  A review of operating experience indicates that the Nuclear Safety-Related Protective Coatings Program has been effective in monitoring coatings inside containment by identifying degraded conditions, performing evaluations and performing corrective actions ensuring that the DBA analysis limits for debris loading will not be exceeded for the ECCS suction strainers.

  Industry operating experience is documented in NRC Regulatory Guide 1.54 and several NRC Generic Communications including Information Notice 97-13, Generic Letter 98-04, Bulletin 2003-01 and Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors."

  The industry experience cited in these publications deals principally with debris that could block emergency recirculation during a design basis accident.

  In 2003 Davis-Besse provided a revised response to NRC Generic Letter 98-04. During the Cycle 13 refueling outage, FENOC identified via the Corrective Action Program that significant amounts of unqualified coating materials were applied to components inside the containment vessel. FENOC informed the NRC by letter dated September 15, 2003 that incomplete or inaccurate information was provided in the original 1998 Davis-Besse response to Generic Letter 98-04. This issue led to reporting that the containment emergency sump could be significantly challenged by the quantity of failed coating material and other debris present in the Containment

after a postulated Loss of Coolant Accident (LOCA) under Davis-Besse Licensee Event Report (LER) 2002-005. Corrective actions taken for this event were:

- The old Containment Emergency Sump Strainer was removed and a new strainer with greater surface area was installed.
- Unqualified coatings have been removed from major equipment in Containment and replaced with qualified coatings.
- A Nuclear Safety-Related Coatings Program has been developed for coating material controls and application to structures and components located within the Containment.
- Where possible, fibrous insulation was removed from Containment. The fibrous insulation and unqualified coatings left in the Containment have been identified and evaluated (in conjunction with other potential debris) for effect on the Emergency Core Cooling System and Containment Spray System. Controls have been established for potential debris sources to ensure requirements are met.
- Evaluations were performed in conjunction with the modifications implemented on the containment emergency sump, which examined the Low Pressure Injection System, the High Pressure Injection System, the Containment Spray System, and the Boron Precipitation Control System.
- Modifications were implemented for the High Pressure Injection System Pumps.

In 2004, the NRC concluded that information regarding the reason for the violation based on the FENOC November 11, 1998 response to Generic Letter 98-04, the corrective actions taken, plans to correct the violation and prevent recurrence, and the date when full compliance was achieved, were adequately addressed on the Davis-Besse docket in NRC Inspection Report 50-346/03-19, LERs 2003-002 and 2002-005, and FENOC letters dated February 27, 2004 (ML040620456), November 26, 2003 (ML033370836), and October 24, 2003 (ML040890175). In summary, Davis-Besse had met the requirements of NRC Generic Letter 98-04 and had committed to maintain the Nuclear Safety-Related Protective Coatings Program for coating material controls and coating application to structures and components located within the Containment.

In 2006, the Nuclear Safety-Related Protective Coatings Program documented inspection findings in the Corrective Action Program for the Cycle 14 refueling outage. Inspection findings were:

- Epoxy topcoat cracking and peeling areas observed on several embedded plates on east and north surfaces of the east Once-Through Steam Generator (OTSG) enclosure (D-ring) walls. Approximately 50 square feet of coating material was cracked or peeling. The coating was applied during initial plant construction.
- Upper edge of the west D-ring at edge for the missile shield support shelf had approximately one square foot of peeled coating. The baseplate for a pipe whip restraint located on the east D-ring had approximately two square feet of peeled material.
- Approximately one square foot of degraded material was observed on an embedded plate (approximate elevation 625'-0") for west staircase restraint and on two pipe restraint baseplates at an elevation of approximately 650'-0".

Corrective actions taken were to add the quantity of failed protective coating material to the Non-DBA Qualified Coating Inventory and to plan removal and rework of the failed coating material.

In 2008, NRC Integrated Inspection Report 05000346/2008-03 described the implementation of the Davis-Besse actions documented in the February 28, 2008, response to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized Water Reactors." The Davis-Besse resolution of Generic Letter 2004-02 included the installation of a significantly larger strainer within containment. The debris source term was also significantly reduced through removal of nearly all fibrous insulation and completely stripping and recoating the containment dome. Detailed analyses that used bounding limits for debris generation, transport and head loss effect were performed using the NEI 04-07, "Pressurized Water Reactor Sump Performance Evaluation Methodology," and associated NRC Safety Evaluation Report (SER) methods, with permitted deviations. The NRC inspectors reviewed the engineering change packages (ECPs) associated with modifications installed, procedure changes and programmatic controls implemented, and changes for the Updated Safety Analysis Report (USAR) in response to Generic Letter 2004-02. No findings of significance were identified.

In 2008, the Nuclear Safety-Related Protective Coatings Program documented inspection findings in the Corrective Action Program for the

Cycle 15 refueling outage. General coating conditions in Containment remained acceptable. Inspection findings were:

- Blistering of containment dome coating material in two locations. The degraded material was quantified and added to the Non-DBA Qualified Protective Coatings Inventory.

- Peeling of containment vessel top coat material behind the polar crane access ladder between elevations 714' to 722'. The degraded coating material was removed.

- Rusting of containment penetrations P3, P4, P5, P6, P7, P9, P10 and P11 was identified and evaluated.

- Peeling of epoxy top coat on bottom of northeast, upper OTSG 1-1 support.

- Flaking paint on a hot leg platform brace adjacent to the OTSG was quantified and added to the Non-DBA Qualified Protective Coatings Inventory.

- Peeled top coat material was found on a lower snubber mounting for OTSG 1-2.

Several areas of degradation which were noted during this outage had previously been identified and are to be reworked. The degraded material in these areas has been included in the Non-DBA Qualified Protective Coatings Inventory.

In 2011, the Nuclear Safety-Related Protective Coatings Program documented inspection findings in the Corrective Action Program for the Cycle 16 refueling outage. General coating conditions in Containment remained good. Inspection findings were:

- Blistering of containment vessel coating material in two locations adjacent to the polar crane access ladder at approximately the 660' elevation. The degraded material has been removed.

- Peeling coating material on structural steel for the elevation 610'-0" hot leg platform. The degraded material has been removed.

- Rusting of containment penetrations identified and previously evaluated. Rework of these penetrations is currently planned to be performed per work order during the Cycle 18 refueling outage scheduled for spring 2014.

- Peeling of epoxy top coat on bottom of northeast, upper OTSG 1-1 support. The degraded material was quantified and added to the Non-DBA Qualified Protective Coatings Inventory.
- Flaking paint on hot leg platform brace adjacent to the OTSG. The degraded material was quantified and added to the Non-DBA Qualified Protective Coatings Inventory.
- Peeled top coat material was found on a lower snubber mounting for OTSG 1-2. The degrade material was quantified and added to the Non-DBA Qualified Protective Coatings Inventory.

Several areas of degradation which were noted during this outage had been identified previously and are currently planned to be reworked during the Cycle 18 refueling outage. The degraded material in those areas has been included in the Non-DBA Qualified Protective Coatings Inventory.

Enhancements:

None.

Conclusion

The Nuclear Safety-Related Protective Coatings Program is an existing program that has been demonstrated to be capable of monitoring the performance of coatings inside containment. Proper maintenance of protective coatings has ensured that the quantities of unqualified and degraded qualified coatings inside containment are maintained below the acceptance limits. The continued implementation of the Nuclear Safety-Related Protective Coatings Program provides reasonable assurance that the effects of aging will be managed such that the Service Level 1 protective coatings and other coatings in containment are maintained consistent with the current licensing basis for the period of extended operation.