

**NORTH ANNA POWER STATION, UNITS 1 AND 2 (NAPS)  
SUBSEQUENT LICENSE RENEWAL APPLICATION (SLRA)  
REQUESTS FOR ADDITIONAL INFORMATION (RAIS)  
SAFETY - SET 2**

**1. SLRA Section 2.3.3.7, Service Water**

Regulatory Basis:

Title 10 of the *Code of Federal Regulations* (10 CFR) 54.4(a) "Scope" reads in part:

(a) Plant systems, structures, and components within the scope of this part are--

(1) Safety-related systems, structures, and components which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49 (b)(1)) to ensure the following functions--

(i) The integrity of the reactor coolant pressure boundary;

(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or

(iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in § 50.34(a)(1), § 50.67(b)(2), or § 100.11 of this chapter, as applicable. ...

In addition, 10 CFR 54.21(a) "Contents of application--technical information" reads in part:

Each application must contain the following information:

(a) An integrated plant assessment (IPA). The IPA must--

(1) For those systems, structures, and components within the scope of this part, as delineated in § 54.4, identify and list those structures and components subject to an aging management review. Structures and components subject to an aging management review shall encompass those structures and components--

(i) That perform an intended function, as described in § 54.4, without moving parts or without a change in configuration or properties. ...

Subsequent License Renewal Application (SLRA) Section 2.1.4.2 "Nonsafety-Related Affecting Safety-Related – 10 CFR 54.4(a)(2)" states in part:

For a nonsafety-related piping system that is directly connected to and provides structural support for a safety-related piping system; the nonsafety-related piping and supports shall be included within the scope of subsequent license renewal up to (1) the analytical boundary defined in the CLB seismic analysis for the safety-related piping or,

(2) if the seismic boundary is not clearly defined in the CLB information, up to and including the point beyond which the failure of the nonsafety-related piping will not render the safety-related portion of the piping system unable to perform its intended function under CLB design conditions. The location of the point beyond which the failure of the nonsafety-related piping will not render the safety-related portion of the piping system unable to perform its intended function under CLB design conditions is identified using the guidance presented in NEI 95-10, Appendix F, Section 4 (as referenced in NEI 17-01).

### **RAI 2.3.3.7-1**

#### Guidance

NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants (SRP-SLR)": Section 2.1.3.1.2 "Nonsafety-Related"

#### Background

Sheet 2 "Subsequent License Renewal Service Water System North Anna Power Station Unit 1" of SLRA Drawing No. 11715-SLRM-078L, Coordinate A-5, displays Level Indicator 2-SW-LI-203. In addition, this drawing displays Calgon Chemical Feeders (Coordinate B-5) and Pump 2-SW-P-22 (Coordinate B-4) all designated as F.4.a "Base Mounted Components" to connote a "structural" function.

#### Issue

The staff notes that neither Table 2.3.3-7 "Service Water" nor Table 3.3.2-7 Auxiliary Systems - Service Water - Aging Management Evaluation contains:

- a) a line item for neither the component type "Level Indicator" or "Sight Glass"
- b) a line item for the Calgon Chemical Feeder with a "Structural Integrity" intended function
- c) a line item for Pump 2-SW-P-22 with a "Structural Integrity" intended function

#### Request

Please identify where the SLRA addresses the aging management review (AMR) for these components as depicted on the subject SLRA Drawing. If not addressed elsewhere, provide a justification for not including these "Component Type" and their associated "Environment" in the aging management program.

## **2. SLRA Section 2.3.3.8, Bearing Cooling**

#### Regulatory Basis:

Paragraph 54.4(a) of 10 CFR "Scope" reads in part:

- (a) Plant systems, structures, and components within the scope of this part are--

(1) Safety-related systems, structures, and components which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49 (b)(1)) to ensure the following functions--

- (i) The integrity of the reactor coolant pressure boundary;
- (ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or
- (iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in § 50.34(a)(1), § 50.67(b)(2), or § 100.11 of this chapter, as applicable. ...

In addition, 10 CFR 54.21(a) "Contents of application--technical information" reads in part:

Each application must contain the following information:

(a) An integrated plant assessment (IPA). The IPA must--

- (1) For those systems, structures, and components within the scope of this part, as delineated in § 54.4, identify and list those structures and components subject to an aging management review. Structures and components subject to an aging management review shall encompass those structures and components--
  - (i) That perform an intended function, as described in § 54.4, without moving parts or without a change in configuration or properties. ...

SLRA Section 2.1.4.2 "Nonsafety-Related Affecting Safety-Related – 10 CFR 54.4(a)(2)" states in part:

For a nonsafety-related piping system that is directly connected to and provides structural support for a safety-related piping system; the nonsafety-related piping and supports shall be included within the scope of subsequent license renewal up to (1) the analytical boundary defined in the CLB seismic analysis for the safety-related piping or, (2) if the seismic boundary is not clearly defined in the CLB information, up to and including the point beyond which the failure of the nonsafety-related piping will not render the safety-related portion of the piping system unable to perform its intended function under CLB design conditions. The location of the point beyond which the failure of the nonsafety-related piping will not render the safety-related portion of the piping system unable to perform its intended function under CLB design conditions is identified using the guidance presented in NEI 95-10, Appendix F, Section 4 (as referenced in NEI 17-01).

### **RAI 2.3.3.8-1**

#### Guidance

SRP-SLR Section 2.1.3.1.2 “Nonsafety-Related”

#### Background

Sheet 1 “Subsequent License Renewal Service Water System North Anna Power Station Unit 1” of SLRA Drawing No. 11715-SLRB-040D Coordinates B-3 and E-7 displays “BC” Safety Related piping and valves within the Safety Related Turbine Building.

#### Issue

The staff notes that there are no “structural” identifiers on the drawing to ensure that the structural integrity of the NSR piping “anchors” are managed for aging effects consistent with the SLRA Section 2.1.4.2 excerpt cited above during the period of extended operations. In particular, the subject SLRA drawing does not display seismically qualified equivalent supports for the two interfaces of these (a)(1)/(a)(2) system piping components.

#### Request

Please provide a justification for not including a seismically qualified equivalent anchor for the interfaces of these (a)(1)/(a)(2) system piping components.

### **3. SLRA Section 2.3.3.14, Instrument Air System**

#### Regulatory Basis:

Paragraph 54.4(a) of 10 CFR “Scope” reads in part:

- (a) Plant systems, structures, and components within the scope of this part are--
  - (1) Safety-related systems, structures, and components which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49 (b)(1)) to ensure the following functions--
    - (i) The integrity of the reactor coolant pressure boundary;
    - (ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or
    - (iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in § 50.34(a)(1), § 50.67(b)(2), or § 100.11 of this chapter, as applicable. ...

In addition, 10 CFR 54.21(a) "Contents of application--technical information" reads in part:

Each application must contain the following information:

(a) An integrated plant assessment (IPA). The IPA must--

(1) For those systems, structures, and components within the scope of this part, as delineated in § 54.4, identify and list those structures and components subject to an aging management review. Structures and components subject to an aging management review shall encompass those structures and components--

(i) That perform an intended function, as described in § 54.4, without moving parts or without a change in configuration or properties. ...

SLRA Section 2.1.4.2 "Nonsafety-Related Affecting Safety-Related – 10 CFR 54.4(a)(2)" states in part:

For a nonsafety-related piping system that is directly connected to and provides structural support for a safety-related piping system; the nonsafety-related piping and supports shall be included within the scope of subsequent license renewal up to (1) the analytical boundary defined in the CLB seismic analysis for the safety-related piping or, (2) if the seismic boundary is not clearly defined in the CLB information, up to and including the point beyond which the failure of the nonsafety-related piping will not render the safety-related portion of the piping system unable to perform its intended function under CLB design conditions. The location of the point beyond which the failure of the nonsafety-related piping will not render the safety-related portion of the piping system unable to perform its intended function under CLB design conditions is identified using the guidance presented in NEI 95-10, Appendix F, Section 4 (as referenced in NEI 17-01).

### **RAI 2.3.3.14-1**

#### Guidance

SRP-SLR Section 2.1.3.1.2 "Nonsafety-Related"

#### Background

Sheet 2 "Subsequent License Renewal Instrument Air System North Anna Power Station Unit 2" of SLRA Drawing No. 12050-SLRM-082C Coordinates F-7 and F-8 displays 3" NSR piping on either side of the Containment Penetration 112 as not being structurally supported.

#### Issue

The staff notes that there are no "structural" identifiers on the drawing to ensure that the structural integrity of the NSR piping "anchors" are managed for aging effects consistent with the SLRA Section 2.1.4.2 excerpt cited above during the period of extended operations. In particular, the subject SLRA drawing does not display seismically qualified equivalent supports for the two interfaces of these (a)(1)/(a)(2) system piping components.

### Request

Please provide a justification for not including a seismically qualified equivalent anchor for the interfaces of these (a)(1)/(a)(2) system piping components.

#### **4. SLRA Section 2.3.3.15 Service Air**

##### Regulatory Basis:

Paragraph 54.4(a) of 10 CFR "Scope" reads in part:

(a) Plant systems, structures, and components within the scope of this part are--

(1) Safety-related systems, structures, and components which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49 (b)(1)) to ensure the following functions--

(i) The integrity of the reactor coolant pressure boundary;

(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or

(iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in § 50.34(a)(1), § 50.67(b)(2), or § 100.11 of this chapter, as applicable. ...

In addition, 10 CFR 54.21(a) "Contents of application--technical information" reads in part:

Each application must contain the following information:

(a) An integrated plant assessment (IPA). The IPA must--

(1) For those systems, structures, and components within the scope of this part, as delineated in § 54.4, identify and list those structures and components subject to an aging management review. Structures and components subject to an aging management review shall encompass those structures and components--

(i) That perform an intended function, as described in § 54.4, without moving parts or without a change in configuration or properties. ...

SLRA Section 2.1.4.2 "Nonsafety-Related Affecting Safety-Related – 10 CFR 54.4(a)(2)" states in part:

For a nonsafety-related piping system that is directly connected to and provides structural support for a safety-related piping system; the nonsafety-related piping and supports shall be included within the scope of subsequent license renewal up to (1) the analytical boundary defined in the CLB seismic analysis for the safety-related piping or, (2) if the seismic boundary is not clearly defined in the CLB information, up to and including the point beyond which the failure of the nonsafety-related piping will not

render the safety-related portion of the piping system unable to perform its intended function under CLB design conditions. The location of the point beyond which the failure of the nonsafety-related piping will not render the safety-related portion of the piping system unable to perform its intended function under CLB design conditions is identified using the guidance presented in NEI 95-10, Appendix F, Section 4 (as referenced in NEI 17-01).

### **RAI 2.3.3.15-1**

#### Guidance

SRP-SLR Section 2.1.3.1.2 "Nonsafety-Related"

#### Background

*Unit 1* - Sheet 1 "Subsequent License Renewal Service Air System North Anna Power Station Unit 1" of SLRA Drawing No. 11715-SLRM-082F displays at Coordinate C-7, a 2" NSR line inside containment connected to SR piping at Containment Penetration 42.

*Unit 2* - Sheet 2 "Subsequent License Renewal Service Air System North Anna Power Station Unit 2" of SLRA Drawing No. 12050-SLRM-082F displays at Coordinate D-6, a 2" NSR line inside containment connected to SR piping at Containment Penetration 42.

#### Issue

The staff notes that there are no "structural" identifiers on the drawing to ensure that the structural integrity of the NSR piping "anchors" inside Containment are managed for aging effects consistent with the SLRA Section 2.1.4.2 excerpt cited above during the period of extended operations. In particular, the subject SLRA drawing does not display seismically qualified equivalent supports for the two interfaces of these (a)(1)/(a)(2) system piping components.

#### Request

Please provide a justification for not including a seismically qualified equivalent anchor for the interfaces of these (a)(1)/(a)(2) system piping components.

### **5. SLRA Section 2.3.3.38, System Radiation Monitoring**

#### Regulatory Basis:

Paragraph 54.4(a) of 10 CFR "Scope" reads in part:

(a) Plant systems, structures, and components within the scope of this part are--

(1) Safety-related systems, structures, and components which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49 (b)(1)) to ensure the following functions--

(i) The integrity of the reactor coolant pressure boundary;

(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or

(iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in § 50.34(a)(1), § 50.67(b)(2), or § 100.11 of this chapter, as applicable. ...

In addition, 10 CFR 54.21(a) "Contents of application--technical information" reads in part:

Each application must contain the following information:

(a) An integrated plant assessment (IPA). The IPA must--

(1) For those systems, structures, and components within the scope of this part, as delineated in § 54.4, identify and list those structures and components subject to an aging management review. Structures and components subject to an aging management review shall encompass those structures and components--

(i) That perform an intended function, as described in § 54.4, without moving parts or without a change in configuration or properties. ...

SLRA Section 2.1.4.2 "Nonsafety-Related Affecting Safety-Related – 10 CFR 54.4(a)(2)" states in part:

For a nonsafety-related piping system that is directly connected to and provides structural support for a safety-related piping system; the nonsafety-related piping and supports shall be included within the scope of subsequent license renewal up to (1) the analytical boundary defined in the CLB seismic analysis for the safety-related piping or, (2) if the seismic boundary is not clearly defined in the CLB information, up to and including the point beyond which the failure of the nonsafety-related piping will not render the safety-related portion of the piping system unable to perform its intended function under CLB design conditions. The location of the point beyond which the failure of the nonsafety-related piping will not render the safety-related portion of the piping system unable to perform its intended function under CLB design conditions is identified using the guidance presented in NEI 95-10, Appendix F, Section 4 (as referenced in NEI 17-01).

### **RAI 2.3.3.38-1**

#### Guidance

SRP-SLR: Section 2.1.3.1.2 "Nonsafety-Related"

#### Background

*Unit 1* - Sheet 3 "Subsequent License Renewal Radiation Monitoring System North Anna Power Station Unit 1" of SLRA Drawing No. 11715-SLRM-082N displays:



- a) At Coordinate C-4, a 1" NSR line inside Containment "Open to Reactor Containment" connected to the SR piping at Containment Penetration 43; and
- b) At Coordinate D-4, a 1" NSR line inside Containment from "Vent Duct Piping" connected to SR piping at Containment Penetration 44.

*Unit 2 - Sheet 2 "Subsequent License Renewal Instrument Air System North Anna Power Station Unit 2" of SLRA Drawing No. 12050-SLRM-082B displays:*

- a) At Coordinate C-8, a 1" NSR line inside Containment "Open to Reactor Containment" connected to SR piping at Containment Penetration 43; and
- b) At Coordinate D-8, a 1" line inside Containment from "Vent Duct Piping" connected to SR piping at Containment Penetration 44.

### Issue

The staff notes that there are no "structural" identifiers on the drawing to ensure that the structural integrity of the NSR piping "anchors" inside Containment are managed for aging effects consistent with the SLRA Section 2.1.4.2 excerpt cited above during the period of extended operations. In particular, the subject SLRA drawing does not display seismically qualified equivalent supports for the two interfaces of these (a)(1)/(a)(2) system piping components.

### Request

Please provide a justification for not including a seismically qualified equivalent anchor for the interfaces of these (a)(1)/(a)(2) system piping components.

## **6. SLRA AMP B2.1.7, Pressurized Water Reactor (PWR) Reactor Vessel Internals**

### Background and Regulatory Basis

Paragraph 54.21(a)(3) of 10 CFR states "[f]or each structure and component identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis (CLB) for the period of extended operation."

The applicant developed its AMR results for the PWR vessel internal (PWRVI) components based on the guidance in the NUREG-2191, Revision 0, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," and SRP-SLR reports, as supplemented by SLR-ISG-2021-01-PWRVI (ADAMS Accession No. [ML20217L203](#)). The NRC staff is reviewing the applicant's AMR results, as documented in SLRA Table 3.1.1 (Table 1), SLRA Table 3.1.2-2 (Table 2), and associated AMR further evaluations (FEs) in SLRA Sections 3.1.2.2.9 and 3.1.2.2.10, Subitem 2 (control rod drive penetration nozzle thermal sleeves), and revised per SLRA Supplement 2 dated March 17, 2021 (ADAMS Accession No. [ML21076B025](#)).

In order to have reasonable assurance that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, the staff is reviewing the applicant's use of the SRP-SLR and GALL-SLR report recommendations (including deviations from these documents) for the plant-specific AMR

results. The staff's review of the AMR results for PWRVI components addresses their consistency with the inspection and evaluation (I&E) guidelines in the PWRVI AMP described in SLRA Section B2.1.7; the SLRA AMP is based on the generic I&E guidelines in MRP-227, Revision 1-A (ADAMS Accession No. ML20175A112), as supplemented by the results of the applicant's MRP-227, Rev. 1-A Gap Analysis.

**RAI B2.1.7-1 - Preventative Measures for Pitting and Crevice Corrosion (eRAI Letter #182, Question #277)**

Issue

SLRA Table 1, Item 3.1.1-087 states in the "Discussion" column that that this item is "not applicable" since "loss of material for reactor vessel internal components exposed to reactor coolant and neutron flux is addressed by rows 3.1.1-028, 3.1.1-054, 3.1.1-059a, 3.1.1-059b, and 3.1.1-059c." This SLRA Table 1 item also states that the associated GALL-SLR Table IV.B2 items "are not used" in the SLRA Table 2 AMR results for the PWRVI components.

SRP-SLR Table 3.1-1, Item ID 087 credits the Water Chemistry AMP to mitigate loss of material due to pitting and crevice corrosion for PWRVI components. Use of the Water Chemistry AMP for mitigating loss of material due to pitting and crevice corrosion is also included in Element 2 of GALL-SLR AMP XI.M16A. SLRA Section B2.1.7 states that the PWRVI AMP is consistent with this GALL-SLR AMP element. SLRA Table 1, Items 3.1.1-028, 3.1.1-054, 3.1.1-059a, 3.1.1-059b, and 3.1.1-059c address the need for I&E to detect loss of material due to wear. The staff notes that loss of material due to pitting and crevice corrosion is a different aging effect and mechanism than loss of material due to wear since pitting and crevice corrosion are highly localized aging effects that may not be readily detected by VT-3 visual exam. As such, the SRP-SLR and GALL-SLR reports recommend the use of the Water Chemistry AMP for monitoring and control of PWR water chemistry in order mitigate pitting and crevice corrosion.

Request

Address whether a revision to SLRA Table 1, Item 3.1.1-087 and an addition to SLRA Table 2 AMR results are needed to address the management of loss of material due to pitting and crevice corrosion in PWRVI components.

**7. SLRA AMP B2.1.8, Flow-Accelerated Corrosion**

Regulatory Basis

Title 10 of the Code of Federal Regulations (10 CFR) 54.21(a)(3) requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function or functions will be maintained consistent with the current licensing basis for the period of extended operation. In addition, 10 CFR 54.37(a) requires that information necessary to document compliance with the license renewal rule be retained in an auditable and retrievable form. One of the findings that the staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken (with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21), such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. In order to complete its review and enable formulation of a finding for

10 CFR 54.29(a), the staff requires additional information regarding the matters described below.

**RAI B2.1.8-1 (eRAI Letter #169, eRAI Number #263)**

Background

Dominion Energy's SLRA Section B2.1.8, "Flow Accelerated Corrosion," notes that it is an existing aging management program (AMP) that relies on implementation of the Electric Power Research Institute (EPRI) Guidelines in Nuclear Safety Analysis Center (NSAC) 202L, "Recommendations for an Effective Flow Accelerated Corrosion Program." The SLRA also notes that, following an enhancement associated with infrequently used lines, it will be consistent with GALL-SLR Report, "AMP XI.M17, "Flow Accelerated Corrosion."

The guidance in NSAC 202L specifies that the selection of an outage inspection sample includes multiple sources, including reviews of plant experience over the past operating cycle and reviews of industry operating experience. NSAC 202L includes consideration of additional inspection locations based on plant experience using information received from related plant organizations such as system engineering, maintenance, and operations. NSAC-202L also discusses program documentation that includes a report for each outage, identifying (among other things) the basis for the sample selection, such as operating experience.

In its evaluation of the Flow Accelerated Corrosion program, Dominion Energy lists Procedure ER-AA-FAC-102, "Flow-Accelerated Corrosion (FAC) Inspection and Evaluation Activities," as one of several implementing procedures. Procedure ER-AA-FAC-102, Section 3.10.2 includes a requirement for issuing a post-outage summary report and notes that it is a quality assurance record. Dominion Energy provided several post-outage summary reports on its ePortal as developmental references for the Flow Accelerated Corrosion program's operating experience.

The NRC staff reviewed the post-outage summary reports for 2016 through 2019 and noted that each report discussed the methodology for development of the outage inspection sample. Each report cited inputs from several items, including the Operational Experience Review required by procedure ER-AA-FAC-1003, "Flow-Accelerated Corrosion (FAC) Operational Experience Reviews." Procedure ER-AA-FAC-1003 notes that operational review personnel interviews and the operating experience reviews are to be incorporated into the outage summary report. In addition, this procedure states that the Dominion flow-accelerated corrosion operating experience database is to be maintained up-to-date to reflect reviews of pertinent industry events.

Issue

Based on the staff's reviews of the post-outage summary reports, it appears that the operational review personnel interviews and operating experience reviews, as prescribed by Dominion Energy procedure ER-AA-FAC-1003, are not being performed. This issue appears to have been acknowledged in the post-outage reports from 2016 and 2017 through reference to PA 3042187, which discusses procedure updates to address the issue. However, Procedure ER-AA-FAC-1003, Revision 6, which addressed items tracked by PA 3042187, did not include any changes associated with conducting operational interviews or operating experience reviews.

In addition, the operating experience review documentation included in the post-outage summary reports does not show that industry operating experience had been reviewed as part of the outage inspection sample selection. There is no mention of the event at Davis-Besse (LER 346/2015-002) as having been considered. The staff notes that PA 3004801 included consideration of the Davis-Besse event; however, the post-outage summary reports do not reflect that the operating experience had been considered as part of the outage inspection sample. The staff also notes that the 2015 Davis-Besse event report, which was caused by inaccurate FAC modeling parameters, included a discussion about a missed opportunity from a previous event that had also been caused by incorrect modeling parameters.

During the audit, Dominion Energy personnel indicated that the flow accelerated corrosion database, as prescribed in Procedure ER-AA-FAC-1003, had been replaced by quarterly fleet FAC conference calls with site program owners. Dominion Energy personnel further indicated that any applicable plant operating experience reports are reviewed during these quarterly conference calls and captured in meeting minutes through individual PAs. Dominion Energy stated that these meeting minutes/PAs to provide the documentation of the operating experience reviews and take the place of the database discussed in Procedure ER-AA-FAC-1003. Meeting minutes and associated PAs from several recent conference calls were subsequently posted to the ePortal.

The NRC staff reviewed the meeting minutes and associated PAs to determine if effective operating experience were being performed and documented as delineated in NSAC-202L. Based on the available documentation, the staff is unable to determine if effective operating experience reviews were being performed for the development of the outage inspection sample. Also, based on the available documentation, both the current operating experience reviews and the maintenance of the flow-accelerated corrosion operating experience database appear to be inconsistent with Procedure ER-AA-FAC-1003. Finally, based on available documentation, it is not clear whether industry operating experience (such as Davis-Besse and IN 2019-08) has been effectively considered as part of the process for adjusting the Flow-Accelerated Corrosion program.

### Request

With respect to the flow-accelerated corrosion program, provide information for the following:

- 1) As discussed during the audit breakout session, the post-outage summary reports do not appear to include documentation of the evaluation for the Davis-Besse event in LER 346/2015-002. Provide the bases to show that the existing documentation of these reviews are sufficient to demonstrate that effective industry operating experience reviews are being performed and, if applicable, describe changes operating experience review procedure to ensure such evaluation are completed and documented in the future.
- 2) As discussed during the audit breakout session, there was a recently identified FAC modeling error that was documented in PA 8264343, which was associated with a model discrepancy identified in 2018. Discuss the effectiveness of the operating experience reviews performed for NRC Information Notice 2019-02, associated with FAC modeling issues. Specifically address whether FAC model validation activities have been performed or will be performed prior to the subsequent period of extended operation. Alternatively, provide a discussion about that justifies the accuracy of the current FAC models.

- 3) Discuss whether operational review personnel interviews and maintenance of the FAC operating experience database are being performed as provided in procedure ER-AA-FAC-1003. And, if appropriate, discuss any modifications to the procedure to demonstrate that effective operating experience reviews are being performed.

#### **RAI B2.1.8-2 (eRAI Letter #193, Question #302)**

##### Background

Dominion Energy's SLRA Section B2.1.8, "Flow-Accelerated Corrosion," notes that it is an existing condition monitoring aging management program (AMP) that also manages wall thinning due to erosion mechanisms. The SLRA also notes that the erosion activity implements the recommendations of the Electric Power Research Institute (EPRI) 3002005530, "Recommendations for an Effective Program Against Erosive Attack." The SLRA states that the basis for erosion monitoring is an Erosion Susceptibility Evaluation (ESE) that identifies components requiring inspection due to various erosion mechanisms, including liquid droplet impingement, and considers various inputs including operating experience. The NRC staff notes that EPRI 3002005530 includes guidance that low operating time should be the only basis for system exclusion if the operating service is severe.

Condition reports (CR) 117085, CR1033983, and CR1099475 discuss leakage downstream of component 2-BD-HCV-200B and note that the leak is not considered flow-accelerated corrosion, but rather a water impingement issue. (The NRC staff notes that this component is part of the low capacity blowdown subsystem designated as BD03.) Document ETE-CME-2020-0005, "Erosion Susceptibility Evaluation – North Anna, Unit 2," notes that subsystem BD03 is not susceptible to erosion because it is kept in standby with an estimated usage of less than 2 percent of the operating time. Document ETE-CME-2020-0013, "Engineering Evaluation for North Anna Systems Excluded from the Erosion Program Due to Low Operating Time," notes that its purpose is to evaluate subsystems excluded from the erosion portion of the program due to low operating time in order to confirm that components will qualify for the exclusion into the subsequent period of extended operation. The NRC staff notes that subsystem BD03 for the low capacity blowdown subsystem is not discussed in ETE-CME-2020-0013, even though it had been excluded due to infrequent operation.

##### Issue

Although the SLRA states that the erosion susceptibility evaluation considers operating experience, the reviews of plant-specific operating experience reports (e.g., CR 117085, CR 1033983, and CR 1099475) do not appear to have been appropriately considered in the erosion susceptibility evaluation, ETE-CME-2020-0005. In addition, the evaluation performed in ETE-CME-2020-0013, confirming that components will continue to qualify for exclusion from the erosion program based on infrequent operating time, did not appear to be comprehensive because it did not consider subsystem BD03 for the low capacity blowdown subsystem, which had been excluded based on infrequent operating time. In that regard, the erosion susceptibility evaluation did not discuss whether severe service had been considered as part of the evaluation to confirm that components can be excluded from the erosion portion of the program based on infrequent operating time.

## Request

In light of the apparent inconsistencies between plant-specific operating experience for the low capacity blowdown subsystem (BD03) documented in CR117085, CR1033983, and CR1099475 and the evaluations for erosion susceptibility and exclusion criteria confirmation in ETE-2020-0005 and ETE-2020-0013, provide information relative to the reviews of operating experience that will be performed to ensure that the erosion portion of the Flow-Accelerated Corrosion program effectively considers program adjustments based on operating experience. Include information regarding severe service considerations for components that would otherwise be excluded from the erosion portion of the program based on infrequent operating time.

## **8. SLRA AMP B2.1.16, Fire Water System**

### Regulatory Basis

Section 54.21(a)(3) of Title 10 of the Code of Federal Regulations (10 CFR) requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. One of the findings that the U.S. Nuclear Regulatory Commission (NRC) staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to the managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. In order to complete its review and enable making a finding under 10 CFR 54.29(a), the staff requires additional information in regard to the matters described below.

### **RAI B2.1.16-1 (Exception for Fire Pump Suction Screen Inspections) (eRAI Letter #190, eRAI Number #295)**

#### Background

Table XI.M27-1, "Fire Water System Inspection and Testing Recommendations," of NUREG-2191, Volume 2, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17187A204), recommends that the inspection and testing of fire pump suction screens follow Section 8.3.3.7, "Suction Screens," of National Fire Protection Association (NFPA) 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems." Note 10 to Table XI.M27-1 of NUREG-2191, Volume 2, states, "...testing and inspections can be conducted on a refueling outage interval if plant-specific OE [operating experience] has shown no loss of intended function of the in-scope SSC [structures, systems, and components] due to aging effects being managed for the specific component (e.g., loss of material, flow blockage due to fouling)." Section 8.3.3.7 of NFPA 25 requires the suction screens be "inspected and cleared of any debris or obstructions" following the "waterflow portions of the annual test or fire protection system activations."

Table 3.3.2-42, "Auxiliary Systems – Fire Protection – Aging Management Evaluation," of the SLRA cites Item VII.G.AP-197, Standard Review Plan (SRP) Item 3.3.1-064 of NUREG-2191, Volume 1, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR)

Report" (ADAMS Accession No. ML17187A031), which addresses loss of material and flow blockage of steel and copper alloy exposed to raw water, treated water, and raw water (potable) as applicable aging effects to be managed using Aging Management Program (AMP) XI.M27, "Fire Water System."

SLRA Section B2.1.16, "Fire Water System," includes an exception to Element 4, "Detection of Aging Effects." Instead of the fire pump suction screens being inspected for applicable aging effects on a refueling outage interval based on operating experience, Section B2.1.16 of the SLRA states:

The circulating water [CW] and service water [SW] traveling screens will be monitored for a change in differential pressure (dp) since the water flow to the fire protection pumps travels through the respective circulating or service water traveling screens prior to the fire pump suction strainers. The dp across the circulating water and service water traveling screens are monitored once per shift by Operations personnel and the dp is recorded in the logs and trended for a change (10.0 inches and 3.5 inches maximum, respectively) as an indication of potential flow blockage. The circulating water and service water screen wash operation are automatically initiated on increasing differential pressure. A main control room alarm indicates high differential pressure and requires operator corrective actions."

SLRA Section B2.1.16 states that the CW and SW traveling screens have a 3/8-inch opening size, whereas the fire pump suction strainers have a larger 1/2-inch opening size. The justification for this exception concludes by stating, "Monitoring and trending of the circulating water and service water traveling screens dp will ensure clearing of any debris or obstructions from the fire protection suction is performed as a result of pump activations."

SLRA Sections 2.4.1.18, "Intake Structure," and 2.4.1.30, "Service Water Pump House," state, "The traveling screens are active components and do not require aging management." Therefore, the SLRA does not cite programs to manage applicable aging effects (i.e., loss of material and flow blockage) for the traveling screens.

During the audit of AMP XI.M27, the NRC staff reviewed documents, including condition reports and work orders, related to degradation of the SW traveling screens. Specifically one SW traveling screen was replaced and the screen trays and screen chains will be replaced for the remaining SW traveling screens. During the audit, the licensee stated that there has been no degradation history of the CW traveling screens.

#### Issue

Although SLRA Section B2.1.16 credits the CW and SW traveling screens for limiting the debris size that the fire pump suction screens might see, aging effects are not being managed for either set of traveling screens. Because age-related degradation (e.g., loss of material) of the traveling screens could allow larger size debris to pass through and potentially buildup on the fire pump suction screens, it is not clear how monitoring differential pressure across the traveling screens is sufficient to justify this exemption. High differential pressure across the traveling screens would tend to show that they are functioning properly (by filtering out the appropriate size debris), while a low differential pressure could be an indication that either the debris loading is low or that the traveling screens are degraded and allowing larger size debris to pass through.

In addition, although the inspections prescribed by Section 8.3.3.7 of NFPA 25 are for clearing the fire pump suction screens of any debris or obstructions, these periodic inspections could reasonably be expected to identify loss of material leading to a loss of intended function of the suction screens. The exception justification in SLRA Section B2.1.16, for not performing these outage-interval inspections, does not clearly say how loss of material of the fire pump suction screens will be managed and on what frequency.

### Request

1. Given that low differential pressure across the traveling screens could either indicate a lack of debris is on the screens or that the screens are degraded and allowing larger debris to pass through them, provide additional information showing that differential pressure monitoring can reasonably "ensure clearing of any debris or obstructions from the fire protection suction is performed as a result of pump activations." Specifically provide information with appropriate acceptance criteria for how decreasing or increasing differential pressure across the traveling screens will prompt the inspections directed by NFPA 25 for inspecting and clearing any debris or obstructions from the fire pump suction screens. Alternatively, provide justification of appropriate changes to the SLRA for managing the applicable aging effects for the CW and SW traveling screens, such that there is reasonable assurance the debris allowed to pass through them will be limited to less than ½-inch size of the fire pump suction screen.
2. Because the periodic inspections of the fire pump suction screens (as directed by NFPA 25) will not be performed, provide information regarding the activities (e.g., type, frequency) to manage loss of material for the fire pump suction screens.

### **RAI B2.1.16-2 (Internal Pipe Blockage and External Pipe Corrosion) (eRAI Letter #190, eRAI Number #296)**

#### Background

SLRA Section B2.1.16 includes operational experience related to identification of debris on the internal surfaces of fire water system piping in 2012. In addition, thinning with excessive rust was observed on the external surface of the same portion of fire water system piping.

During the audit of this program, the NRC staff reviewed documents, including condition reports and work orders, related to this operational experience. Based on the audit, there is a portion of piping that contains debris on the internal surfaces that still needs to be replaced. Based on the audit, this work has been scheduled; however, it has not yet been completed. Audit documents stated that the pressure maintenance devices are performing satisfactorily. The resolution of the external corrosion was that all of the piping was going to be replaced, so no additional corrective action was needed.

SLRA Section B2.1.16 also discusses an effectiveness review of the existing program using the performance criteria identified in Nuclear Energy Institute (NEI) 14-12, "Aging Management Program Effectiveness." The "acceptance criteria" program element in NEI 14-12 includes anticipating rates of change and margin to loss of function, and the "corrective action" program element includes predicting the extent of degradation to effect timely preventive actions.



### Issue

The SLRA does not address the portion of pipe with debris on the internal surface that still needs to be replaced or the degree of external corrosion. The NRC staff did not find information related to the determination that the pressure maintenance devices continue to meet their intended functions since discovery in 2012.

Documents reviewed as part of the audit of the Fire Water System program did not appear to address the guidance in NEI 14-12 regarding consideration of rates of change and margin to loss of function or prediction of the degradation extent to effect timely preventive actions.

### Request

1. Given that the pipe with debris on the internal surfaces was discovered in 2012, please discuss what procedures are in place for periodic evaluation of determinations that intended functions continue to be met.
2. Discuss whether there are procedures in place for periodic evaluation relative to external corrosion that is performed if a corrective action is not completed in a "reasonable" timeframe (i.e., consideration of rates of change and margin to loss of function).

### **RAI B2.1.16-3 (Main Drain Testing) (eRAI Letter #190, eRAI Number #297)**

### Background

Table XI.M27-1 of NUREG-2191, Volume 2, recommends that main drain tests follow Section 13.2.5, "Main Drain Test," of NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems." Note 10 to Table XI.M27-1 of NUREG-2191, Volume 2, states, "...testing and inspections can be conducted on a refueling outage interval if plant-specific OE [operating experience] has shown no loss of intended function of the in-scope SSC [structures, systems, and components] due to aging effects being managed for the specific component (e.g., loss of material, flow blockage due to fouling)." Section 13.2.5 of NFPA 25 requires "main drain tests to be conducted annually at each water-based fire protection system riser to determine whether there has been a change in the condition of the water supply piping and control valves." It also states, "When there is a 10 percent reduction in full flow pressure when compared to the original acceptance test or previously performed tests, the cause of the reduction shall be identified and corrected if necessary."

SLRA Section B2.1.16 includes proposed enhancements related to main drain testing to be consistent with NFPA 25. Acceptance criteria will be based upon monitoring flowing pressures from test to test to determine if there is a 10 percent reduction in full flow pressure. During the audit of AMP XI.M27 the licensee stated that main drain testing had been discontinued.

### Issue

It is unclear whether the 10 percent pressure reduction criteria for the test-to-test pressure monitoring will be compared to the original acceptance test (or comparable test results) as provided in NFPA 25. The NRC staff notes that if the test-to-test pressure monitoring only uses the immediately prior test result, significant degradation of the fire water system supply over several years would not be identified while still being less than a 10 percent reduction from the

previous test. In addition, the staff did not identify any information related to the basis for the current discontinuation of main drain testing. It is unclear whether comparable bases will be used to determine impacts on the fire water system's ability to perform its function during the subsequent period of extended operation.

#### Request

1. Clarify whether the test-to-test pressure monitoring associated with the periodic main drain testing will be compared to the original acceptance test (or comparable test result) or will only use the immediately prior test results. If the original acceptance test (or comparable test result) will not be used, provide the bases to show that degradation of the fire water system supply will be adequately managed.
2. Discuss the basis for discontinuing main drain testing, including how the condition of the water supply piping and control valve are determined in absence of the main drain testing. Also discuss whether comparable bases will be used during the subsequent period of extended operation.

#### **RAI B2.1.16-4 (Cracking of Copper Alloy (>15% Zn)) (eRAI Letter #190, eRAI Number #300)**

#### Background

Item VII.G.A-405a, SRP Item 3.3.1-132 in NUREG-2191, Volume 1 addresses cracking due to stress corrosion cracking (SCC) for copper alloy (>15% Zn or >8% Al) piping, piping components exposed to air, condensation to be managed by AMP XI.M36, "External Surfaces Monitoring of Mechanical Components." Also, Item VII.C1.A-473, SRP Item 3.3.1-160 in NUREG-2191, Volume 1 addresses cracking due to SCC for copper alloy (>15% Zn or >8% Al) piping components exposed to closed-cycle cooling water, raw water, waste water to be managed by several programs including AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components."

SLRA Table 3.3.2-42 states that cracking for copper alloy (>15% Zn) piping, piping components exposed internally to air – indoor uncontrolled and valve bodies exposed to raw water will be managed by the Fire Water System program. The corresponding AMR items (3.3.1-132 and 3.3.1-160) cite Standard Note E (consistent with GALL-SLR but different program credited) for the use of the Fire Water System program in lieu of the External Surfaces Monitoring of Mechanical Components program, and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, respectively.

AMP XI.M36 notes that periodic visual or surface examinations are conducted if this program is being used to manage cracking in stainless steel or aluminum components and notes that visual inspections may be conducted where it has been analytically demonstrated that surface cracks can be detected by leakage prior to a crack challenging the intended function of the component. Similarly, AMP XI.M38 notes that periodic surface examinations are conducted for managing cracking in stainless steel and aluminum components and states, "Visual inspections for leakage or surface cracks are an acceptable alternative to conducting surface examinations to detect cracking if it has been determined that cracks will be detected prior to challenging the structural integrity or intended function of the component."

### Issue

AMP XI.M27 does not provide additional guidance for managing cracking, whereas XI.M36 and XI.M38 do provide additional guidance for managing cracking. SLRA Section B2.1.16 does not describe how the Fire Water System program inspections and testing performed in accordance with NFPA 25 will manage cracking of copper alloy (>15% Zn) for piping, piping components exposed internally to air – indoor uncontrolled and for valve bodies exposed internally to raw water.

### Request

Describe how the Fire Water System program will manage cracking of copper alloy (>15% Zn) piping, piping components exposed internally to air – indoor uncontrolled and valve bodies exposed internally to raw water. Specifically discuss whether surface examinations will be performed or whether analyses will be performed to demonstrate that surface cracks can be detected by leakage prior to a crack challenging the intended function of the component, such that visual inspections would suffice. Alternatively, propose the use of a different aging management program that already includes comparable guidance.

## **9. SLRA AMP B2.1.17, Atmospheric Metallic Tanks**

### **RAI B2.1.17-1 (eRAI Letter #187, eRAI Number #291)**

#### Regulatory Basis

Title 10 of the Code of Federal Regulations (10 CFR) 54.21(a)(3) requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. In addition, 10 CFR 54.37(a) requires that information necessary to document compliance with the license renewal rule be retained in an auditable and retrievable form. One of the findings that the staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken (with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21), such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. In order to complete its review and enable formulation of a finding for 10 CFR 54.29(a), the staff requires additional information regarding the matters described below.

#### Background

Section 54.21(d) of 10 CFR requires each license renewal application to include a final safety analysis report (FSAR) supplement, containing a summary description of the programs and activities for managing the effects of aging. In its discussions about FSAR supplements, the Standard Review Plan for Subsequent License Renewal (NUREG-2192) notes that the description should be sufficiently comprehensive such that later changes to the program can be controlled by 10 CFR 50.59. NUREG-2192 also notes that Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report (NUREG-2191), Table XI-01 provides examples of the type of information to be included. GALL-SLR Report Table XI-01, "FSAR Supplement Summaries for GALL-SLR Report Chapter XI Aging Management Programs [AMP]," provides a description of the "Outdoor and Large Atmospheric Metallic Storage Tanks"

program (AMP XI.M29), stating that loss of material is managed by conducting periodic internal and external visual examinations.

As amended by Dominion letter dated February 4, 2021 (ADAMS Accession No. ML21035A303), the corresponding AMP in SLRA, Section B2.1.17, notes that the emergency condensate storage tanks (ECSTs) are surrounded by 2-foot thick concrete missile shields. Consequently, SLRA Section B2.1.17 includes exceptions from the GALL-SLR Report AMP XI.M29 for the ECSTs, because the missile shields prevent any visual inspections of the external surfaces of the tanks, and because there is no caulking or sealant at the base of the tank between the concrete-tank interface. Although Section B2.1.17 states that the concrete missile shield and a 2-inch layer of expansion joint filler foam minimize water and moisture from penetrating to the inaccessible exterior tank surfaces, the associated operating experience discussion notes that rain water leakage between the concrete missile shield and the outer surfaces of the ECSTs has been a chronic problem. Recent tank wall thickness measurements taken from the tank's inside surface have revealed loss of material on the external surface of the Unit 2 ECST, prompting periodic wall thickness measurements by the program.

SLRA Section A1.17, "Outdoor and Large Atmospheric Metallic Storage Tanks," as amended by Dominion letter dated February 4, 2021, contains the FSAR supplement for the corresponding AMP. SLRA Section A1.17 does not describe the periodic inspections or preventive maintenance activities that will be performed on Unit 1 and Unit 2 ECSTs resulting from past chronic rain water leakage and the inability to visually inspect the external surfaces of the tanks.

#### Issue

In order to ensure that changes to the program, which could decrease the overall effectiveness of the program to manage the effects of aging, will receive appropriate review by a licensee, the FSAR supplement should be sufficiently comprehensive. The FSAR supplement for the Outdoor and Large Atmospheric Metallic Storage Tanks program appears to lack a sufficient description of the activities for managing the effects of aging for the ECSTs to provide appropriate administrative and regulatory controls for the program. The current program includes one-time and periodic wall thickness inspections of the ECSTs that are not described in the FSAR supplement. In addition, periodic inspections of the preventive measures to mitigate corrosion by minimizing water and moisture from penetrating to the inaccessible external surfaces of the ECSTs are not described in the FSAR supplement. The staff cannot complete its review of the FSAR supplement without additional information either a) explaining how the current description of the program and aging management activities will provide appropriate administrative and regulatory controls for the program, or b) providing a more detailed description of the program and aging management activities.

#### Request

Regarding SLRA Section A1.17, provide additional information that either: a) explains how the current description of the program and aging management activities in the FSAR supplement will provide appropriate administrative and regulatory controls for changes to the program, or b) modifies the FSAR supplement to include a more detailed description of the program and aging management activities.

### **10. SLRA AMP B2.1.35, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants**

## Regulatory Basis

Section 54.21(a)(3) of 10 CFR requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation.

### **RAI B2.1.35-1**

## Background

SLRA Section B2.1.35, in item 8 of the Operating Experience Summary, states that structures within the settlement monitoring program, including the Service Water Reservoir, the Service Water Pump House, and the Service Water Valve House, are monitored every 184 days, as specified in the Technical Requirements Manual (TRM), Section 3.7.7.

By letter dated March 10, 2021 (ADAMS Accession No. ML21XXX), the applicant noted that the inspection frequency for settlement was changed from 184 days to 12 months.

During the audit, the staff reviewed document ETE-CCE-2020-0001, Revision 0, "Station and Service Water Reservoir Technical Requirements Manual (TRM) Settlement Data Trends," which notes that settlements do not typically challenge the current TRM action limits for settlement, with the exception of the Service Water Valve House which is close to the TRM action limit. The staff also reviewed document ETE-NA-2020-0015, Revision 0, "Reduction in Site Settlement Survey Frequency," which documents the history of settlement at NAPS and discusses extending the frequency of settlement monitoring from six months to twelve months.

## Issue

No technical justification was provided for how the extended settlement inspection interval will continue to provide adequate aging management of settlement for structures within the scope of subsequent license renewal.

## Request

Explain how the longer interval will continue to provide adequate aging management of settlement for structures within the scope of subsequent license renewal, especially structures which may be close to the settlement action limits identified in the TRM (i.e., data trends indicate limits would be reached within one or two inspection intervals).