



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

January 26, 2018

Mr. Daniel G. Stoddard
Senior Vice President and Chief Nuclear Officer
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060

**SUBJECT: NORTH ANNA POWER STATION UNITS 1 AND 2 – NRC POST-APPROVAL
SITE INSPECTION FOR LICENSE RENEWAL, INSPECTION REPORT
05000338/2017008 AND 05000339/2017008**

Dear Mr. Stoddard:

On December 15, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed a Post-Approval Site Inspection for License Renewal at your North Anna Power Station, Units 1 and 2 in accordance with NRC Inspection Procedure 71003. On December 15, 2017 the NRC inspectors discussed the results of this inspection with Mr. Eric Hendrixson, Director of Engineering, and other members of your staff. The results of this inspection are documented in the enclosed report.

The NRC inspectors did not identify any finding or violation of more than minor significance.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Brian R. Bonser, Chief
Engineering Branch 3
Division of Reactor Safety

Docket Nos.: 50-338 and 50-339
License Nos.: NPF-4 and NPF-7

Enclosure: Inspection Report 05000338/2017008
and 05000339/2017008
w/Attachment: Supplemental Information

cc: Distribution via ListServ

SUBJECT: NORTH ANNA POWER STATION UNITS 1 AND 2 – NRC POST-APPROVAL
 SITE INSPECTION FOR LICENSE RENEWAL, INSPECTION REPORT
 05000338/2017008 AND 05000339/2017008 dated January 26, 2018

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DATE	1/ 24/ 2018	1/ 25/ 2018	1/ 26/ 2018	1/ 25/ 2018	1/ 25/ 2018
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No: 50-338, 50-339

License No: NPF-4 and NPF-7

Report No: 05000338/2017008, 05000339/2017008

Licensee: Virginia Electric and Power Company

Facility: North Anna Power Station, Units 1 and 2

Location Mineral, Virginia 23117

Dates: November 27, 2017 – December 15, 2017

Inspectors: R. Carrion, Senior Reactor Inspector (Lead)
A. Butcavage, Reactor Inspector
B. Collins, Reactor Inspector
P. Cooper, Reactor Inspector
S. Downey, Senior Reactor Inspector
R. Williams, Senior Reactor Inspector
J. Dymek, Reactor Inspector

Approved by: Brian R. Bonser, Chief
Engineering Branch 3
Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000338/2017008 and 05000339/2017008; 11/27/2017 – 12/15/2017; North Anna Power Station, Units 1 and 2; Post-Approval Site Inspection for License Renewal.

This report covers a team inspection conducted by seven regional inspectors in accordance with U.S. Nuclear regulatory Commission (NRC) Inspector Manual Chapter 2515 and Inspection Procedure 71003. The NRC's program for overseeing the safe operations of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

No findings or violations of greater than minor significance were identified.

REPORT DETAILS

4. OTHER ACTIVITIES

4OA5 Other Activities: Post-Approval Site Inspection for License Renewal (Phase 2)

.1 License Conditions and Commitments for License Renewal, Implementation of Aging Management Programs and Time-Limited Aging Analyses

a. Inspection Scope

(1) Implementation of License Conditions and Commitments, including Aging Management Programs

The team reviewed a sample of regulatory commitments, aging management programs (AMPs), and time-limited aging analyses (TLAAs) associated with the renewed operating license for North Anna Power Station, Units 1 and 2, issued on March 20, 2003. This inspection took place prior to the period of extended operation (PEO) for Units 1 and 2, which will begin on April 1, 2018 and August 21, 2020, respectively.

The inspectors reviewed supporting documents including implementing procedures, work orders, inspection reports, engineering evaluations, condition reports (CRs), and completed surveillance records; conducted interviews with licensee staff; and performed visual inspection of structures, systems, and components (SSCs) related to license renewal commitments to verify that the licensee completed the necessary actions to comply with the license conditions stipulated in the renewed facility operating license. The inspectors also verified that the licensee met the commitments associated with the Aging Management Programs (AMPs) described in NUREG-1766, "Safety Evaluation Report Related to the License Renewal of North Anna Power Station, Units 1 and 2, and Surry Power Station Units 1 and 2", issued in December 2002 (ADAMS Accession Number ML030160853). For each selected AMP the inspectors verified that license renewal activities due prior to the period of extended operation were implemented, or were scheduled to be implemented, consistent with the license renewal application (LRA), the NRC safety evaluation report (SER), and the Updated Final Safety Analysis Report (UFSAR) supplement submitted pursuant to 10 CFR 54.21(d). The licensee was tracking the completion of regulatory commitments for license renewal through its corrective action system (CAS).

The inspectors reviewed licensee actions to meet the commitments, AMPs, and TLAAs discussed below. The commitments are described in Appendix D of NUREG 1766. Specific documents reviewed in the course of the inspection are listed in the report attachment.

Commitment 1 - Develop and Implement an Inspection Program for Buried Piping and Valves; and UFSAR Section 18.1.1, Buried Piping and Valve Inspection Activities

The commitment specified that, one-time between years 30-40, the licensee would develop and implement an inspection program for buried piping and valves. The UFSAR states that the Buried Piping and Valve Inspection activities will include a one-time inspection of representative samples of piping and valves for different combinations of buried material and burial condition. Based on the results of the one-time inspections,

follow-up examinations or the need for programmatic corrective actions would be determined.

The inspectors reviewed the program basis documents, administrative procedures, and implementing procedures, to verify that the Buried Piping and Valve Inspection Activities were developed and implemented as described in the license renewal application and the corresponding NRC Safety Evaluation Report (SER). The inspectors also reviewed a sample of work orders and examination results to verify that that the one-time inspections had been completed. In some instances, the results of the licensee's inspections determined that corrective actions and follow-up inspections were needed. The inspectors interviewed licensee personnel and reviewed a sample of condition reports and work orders to verify that the corrective actions were performed in accordance with the applicable regulatory requirements and site procedures.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitment 1 for Units 1 and 2.

Commitment 3 – Add Core Barrel Hold-Down Spring to Augmented Inspection Program and UFSAR Section 18.2.1, Augmented Inspection Activities

The Commitment specified that the reactor core barrel hold-down spring would be added to the licensee's Augmented Inspection Program.

The inspectors reviewed the licensee's Augmented Inspection Program schedule to verify that the reactor core barrel hold-down spring had been added to the program. At the time of this inspection, the initial inspections required to be performed prior to entering the PEO had been completed on Unit 1 and scheduled for spring 2019 for Unit 2. The inspectors reviewed the procedures used to perform these inspections as well as the Unit 1 results to verify that the inspections were performed in accordance with procedures supplied by the work order and evaluated against the industry Materials Reliability Program (MRP), Pressurized Water Reactor Internals Inspections and Evaluation Guidelines, MRP-227-A or appropriate vendor guidance.

The inspectors also reviewed Section 18.2.1 of the current version of the UFSAR Revision 53.01 updated on line 11/15/17, to verify that the commitment was described in accordance with the approach used by the licensee and in accordance with the NRC SER NUREG-1766 requirements.

Based on the review of licensee actions completed on Unit 1 at the time of this inspection and the timeliness of those actions, and planned activities for Unit 2, the inspectors determined that the licensee completed or scheduled the necessary actions to meet Commitment 3.

Commitment 4 - Expand Scope of the Civil Engineering Structural Inspection to Cover License Renewal Requirements; Commitment 5 - Revise Plant Documents to Use Inspection Opportunities When Inaccessible Areas Become Accessible During Work Activities; Commitment 16 – Incorporate Ground Water Monitoring into the Civil Engineering Structural Monitoring Program. Consider Groundwater Chemistry in Engineering Evaluations of Deficiencies; Commitment 17 - Incorporate Management of Concrete Aging into the Civil Structural Monitoring Program and the Infrequently

Accessed Area Inspection Program; **Commitment 28** - Revise Procedures for Groundwater Testing to Account for Possible Seasonal Variations; and **UFSAR Section 18.2.6**, Civil Engineering Structural Inspection Program

UFSAR section 18.2.6 stated that the Civil Engineering Structural Inspection Program would use the provisions of the Maintenance Rule Program to provide reasonable assurance for the continuing capability of civil engineering structures to fulfill their intended functions. In addition, this program had five license renewal commitments. Commitment 4 required that the licensee expand the scope of Civil Engineering Structural Inspection to cover License Renewal requirements; Commitment 5 required the licensee to revise plant documents to use inspection opportunities when inaccessible areas become accessible during work activities; Commitment 16 required the licensee to incorporate groundwater monitoring and to consider groundwater chemistry in engineering evaluations of deficiencies; Commitment 17 required the licensee to incorporate the management of concrete aging; and Commitment 28 required the licensee to revise procedures for groundwater testing to account for possible seasonal variations.

The inspectors reviewed program basis documents, administrative and implementing procedures, correspondence between the licensee and NRC, UFSAR changes, corrective actions, and work orders to verify that the program was developed and executed with the criteria described in the LRA, and the corresponding NRC SER. The inspectors interviewed licensee personnel to discuss the implementation of the AMP and associated commitments.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitments 4, 5, 16, 17, and 28 for Units 1 and 2.

Commitment 6 – Incorporate NFPA-25, Section 2-3.1.1, for sprinklers and **UFSAR Section 18.2.7**, Fire Protection Program

This Commitment specified that the National Fire Protection Association (NFPA) standard NFPA-25, section 2-3.1.1, for sprinklers would be incorporated into the fire protection program at North Anna. That action would require the replacement or testing of a representative sample of sprinkler heads that have been in service for 50 years. Provisions to replace sprinklers or testing of a representative sample have been incorporated into the Fire Protection Program. CM-AA-FPA-100, "Fire Protection/Appendix R (Fire Safe Shutdown) Program," Revision 11, includes requirements within the fire protection program to ensure that the license renewal commitment is adequately implemented. ETE-NA-2016-0024, Revision 1, has been developed and describes the actions to be taken to implement the commitment. This work was being implemented by Project Number 708N99, which has been approved to implement the sprinkler replacements and testing. Work Orders (WOs) have been initiated to replace sprinklers on in-scope systems prior to 50 years of service. Where testing is used, recurring tasks (preventative maintenance) have been developed to ensure that a sample is tested prior to 50 years of service, and retested on a 10-year frequency.

Based upon review of the licensee aging management program for sprinkler heads installed in fire protection suppression systems approaching 50 years of service,

licensee actions that had been completed at the time of the inspection, and administrative controls in place to track additional pending actions, the inspectors concluded that Commitment 6 was being tracked acceptably and there was reasonable assurance that the actions would be accomplished in the specified time.

Commitment 7 - Develop Inspection Criteria for Non-ASME Supports and Doors;
Commitment 8 - Develop Procedural Guidance for Inspection Criteria That Puts Focus on Aging Effects; and UFSAR Section 18.2.9, General Condition Monitoring Activities

UFSAR section 18.2.9 stated that the General Condition Monitoring Activities are performed for the assessment and management of aging for components that are located in normally accessible areas. The results of this monitoring are the basis for initiating required corrective action in a timely manner. This monitoring is based on the observations that are made during focused inspections that are performed on a periodic basis. In addition, this program has two license renewal commitments. Commitment 7 required the licensee to develop inspection criteria for non-ASME supports and doors and Commitment 8 required the licensee to develop procedural guidance for inspection criteria that puts focus on aging effects.

The inspectors reviewed program basis documents, administrative and implementing procedures, correspondence between the licensee and NRC, UFSAR changes, and work orders to verify that the program was developed and executed with the criteria described in the LRA, and the corresponding NRC SER.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitments 7 and 8 for Units 1 and 2.

Commitment 9 - Develop and Implement Inspection Program for Infrequently Accessed Areas and UFSAR Section 18.1.2, Infrequently Accessed Area Inspection Activities

UFSAR section 18.1.2 stated that the purpose of the Infrequently Accessed Area Inspection Activities is to provide reasonable assurance that equipment and components within the scope of License Renewal, which are not readily accessible, will continue to fulfill their intended functions during the period of extended operation. Infrequently accessed areas determined to be within the scope of license renewal and the focus of a one-time inspection within these areas include;

- Reactor containment - Sump areas, cabling and supports
- Reactor containment keyway - Leakage, structural support provided by the neutron shield tank
- Subsurface drains - Access shaft and component supports
- Cover for Containment dome plug - Structural condition
- Volume control tank cubicle - Structure, supports, and equipment
- Emergency diesel generator (EDG) exhaust bunkers - Structural condition
- Cable spreading rooms, Cable tunnels, Upper areas of emergency switchgear rooms - Cable raceways and supports
- New fuel storage area - Supports and structure affecting spent fuel pool cooling
- Auxiliary Building filter and ion exchanger cubicles - Structure, supports, and equipment
- Tunnel from Turbine Building to Auxiliary Building - Structure, supports, and piping

- Service water (SW) expansion joint vault - Supports and piping
- SW tie-in vault - Supports and piping
- Auxiliary SW valve pit - Supports and piping
- Turbine building SW valve pit - Structures, supports and piping
- SW valve house lower level - Supports, piping, and equipment
- SW pump house lower level - Supports, piping, and equipment
- Spray array structure in SW reservoir - Underwater supports
- Auxiliary SW expansion joint vault - Supports and piping

- Charging pump pipe chase - Structure, supports and piping
- Auxiliary feedwater piping tunnel - Structure, supports and piping

This program satisfies license renewal Commitment 9, which required that the licensee develop and implement an inspection program for infrequently accessed areas. Implementation of the developed inspection program was to be performed one time between years 30 and 40 of the current operating license. The results of the inspections from the developed program were to be evaluated and form the basis for performing additional inspections, if needed.

The inspectors reviewed program basis documents, administrative and implementing procedures, correspondence between the licensee and NRC, UFSAR changes, and work orders to verify that the one-time inspections were developed and executed with the criteria described in the LRA, and the corresponding NRC SER. The inspectors interviewed licensee personnel to discuss the implementation of the activities and associated commitments.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitment 9 for Units 1 and 2.

Commitment 10 - Develop and Implement Inspection Program for Tanks and UFSAR Section 18.1.3, Tank Inspection Activities

This commitment specified that, one-time between years 30-40, the licensee would develop and implement an inspection program for tanks. The UFSAR states that the purpose of the tank inspection activities is to perform inspections of above ground and underground tanks to provide reasonable assurance that the tanks will perform their intended function through the period of extended operation. The aging effect of concern for tanks is loss of material. The program would involve one-time inspections of a representative sample of the tanks that require aging management. Based on the results of the one-time inspections, follow-up examinations would be determined.

The inspectors reviewed the program basis documents, administrative procedures, and implementing procedures, to verify that the tank inspection activities were developed and implemented as described in the license renewal application and the corresponding NRC SER. The inspectors also reviewed a sample of work orders and examination results to verify that that the one-time inspections had been completed. In some instances, the results of the licensee's inspections determined that follow-up inspections were needed. The inspectors performed a walkdown of several tanks and interviewed licensee personnel to discuss the results of the one-time inspections and the proposed

follow-up inspections. The inspectors also reviewed a sample of future work orders to verify that the future tank inspections were entered into and tracked by the licensee's work control process.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitment 10 for Units 1 and 2.

Commitment 11 - Follow Industry Activities Related to Failure Mechanisms for Small Bore Piping; Evaluate Changes to Inspection Activities Based on Industry Recommendations; and UFSAR Section 18.2.11, Inservice Inspection (ISI) Program - Component and Component Support Inspections

This commitment specifies that the licensee would, as an ongoing activity, follow industry activities related to failure mechanisms for small bore piping and evaluate changes to inspection activities based on industry recommendations. The UFSAR states that Component and Component Support Inspections are performed in accordance with the requirements of Subsections IWB, IWC, and IWF of ASME XI, Rules for Inservice Inspection of Nuclear Power Plant Components. In addition, the inspectors noted that a risk-informed inservice inspection program is in place at the NAPS.

The inspectors reviewed the risk-informed inservice inspection program, administrative and implementing procedures, and program health reports to verify that the inspection program was implemented in accordance with the licensing basis and the ASME Code. The inspectors interviewed licensee staff to discuss recent industry activities related to failure mechanisms for small bore piping and the licensee's process for updating its inspection program based on industry recommendations. The inspectors also reviewed the current plan and schedule for small bore piping inspections to verify that recent industry guidance related to thermal fatigue failures in small bore piping had been implemented.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitment 11 for Units 1 and 2.

Commitment 12 - Follow Industry Activities Related to Core Support Lugs. Evaluate Need to Enhance Inspection Activities Based on Industry Recommendations; and UFSAR Section 18.2.13, ISI Program - Reactor Vessel

This Commitment specified that the licensee would follow industry activities related to Core Support Lugs and evaluate the need to enhance inspection activities based on Industry recommendations. Existing ASME BPVC Section XI, Table IWB-2500-1, requires core support structures to be inspected during each ten-year Inspection Interval. The inspectors reviewed the licensee's actions to verify that it followed industry activities regarding core support lugs and evaluated the need to enhance inspections based on industry recommendations.

The inspectors interviewed the responsible engineers on site to discuss the approach used by the licensee to address industry experience with core barrel lower radial

supports, including Westinghouse Technical Bulletin TB-14-5, Reactor Internals Lower radial Support Clevis Insert Cap Screw Degradation. The inspectors verified that North Anna had included Attachment #50 to its Augmented Inspection Program, which requires a VT-1 inspection of the reactor vessel radial supports, and noted that the examination is required as part of an NRC commitment for license renewal.

This inspection activity is currently scheduled for Unit 1 during the spring 2018 refueling outage. Unit 2 is scheduled to follow at a later date because Unit 2 has a later entry date into the PEO.

The inspectors also reviewed the NAPS UFSAR Section 18.2.13, Revision 53.01, dated 11/15/17, to verify that the UFSAR had been updated to reflect the current status of Commitment 12 as follows, "A commitment was made for Dominion to evaluate industry recommendations and enhance inspections of core support lugs as appropriate (Item 12, Table 18-1). Requests for information from EPRI and from the Nuclear Energy Institute (NEI) indicate that no updated guidance is being developed by the industry for the inspection of core support lugs. The continued use of visual inspections in accordance with ASME Section XI is proper. Examinations of the core support lugs continue to be performed for NAPS Units 1 and 2 during the 10-year reactor vessel inservice inspections."

Based on the review of licensee actions completed at the time of this inspection and noting that elective augmented VT-1 examinations have been scheduled for the core support lugs, the inspectors determined that the licensee has completed or scheduled the necessary actions to meet Commitment 12 for Units 1 and 2.

Commitment 13 – Inspect Representative Sections of Polar Crane Box Girders, and UFSAR Section 18.2.10, Inspection Activities - Load Handling Cranes and Devices

This commitment stated that the licensee would perform a one-time internal inspection of representative sections of the box girders for the polar cranes between year 30 and the end of the original operating license. This inspection was intended to identify the presence of any anomalous indications that could be signs of degradation. Any such indications would be addressed through the licensee's CAS.

The inspectors verified that program documents were administratively updated to reflect their applicability to the license renewal program. Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitment 13 for Units 1 and 2.

Commitment 14 – Follow Industry Activities Related to Reactor Vessel Internals Issues Such as Void Swelling, Thermal and Neutron Embrittlement. Evaluate Industry Recommendations. Inspect Accordingly. And FSAR Section 18.2.15, Reactor Vessel Internals Inspection

Per NUREG-1766, the licensee committed to follow industry activities related to reactor vessel internals issues such as void swelling, thermal and neutron embrittlement, etc., and perform a one-time focused inspection of the reactor vessel internals on the most susceptible single unit between North Anna and Surry for license renewal between years 30 and 40 of operation. The results of the one-time inspection were evaluated to

determine if additional inspections were required. The most susceptible single unit was determined to be Surry Unit 1, with the exception of the control rod guide cards. It was determined that Surry Unit 2 contained the more susceptible control rod guide cards. Following the approval of License Renewal for Surry and North Anna (NUREG-1766), MRP-227-A, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines," introduced additional inspection requirements for reactor vessel internals susceptible to aging effects. An aging management program for reactor vessel internals has been developed in accordance with MRP-227-A and is documented in ETE-NA-2015-0033, Reactor Vessel Internals – License Renewal Aging Management Program (LR-2752). Both Surry Units 1 and 2 have completed inspections under MRP-227 guidance, thereby satisfying the commitment to perform a one-time inspection on the most susceptible unit. Dominion planned to implement reactor vessel internals inspections on North Anna Units 1 and 2 under the guidance of MRP-227-A. Phase 1 of the RVI inspections was completed on Unit 1 during the fall 2016 refueling outage (R25). Inspection results were evaluated and summarized in ETE-NA-2016-0078. Additional Unit 1 inspections are scheduled for the spring 2018 RFO by Work Order #59103137462. Unit 2 inspections are scheduled to start during the spring 2019 RFO. Note that Dominion committed to the internal reactor vessel inspections at the NAPS in accordance with MRP-227-A following the August 2011 earthquake, per Confirmatory Action Letter (CAL) of November 11, 2011. This commitment is being tracked by LA3004279 and is considered an independent commitment by the licensee.

The inspectors reviewed samples of the program basis documents, administrative and implementing procedures, license renewal drawings, and ISI program schedules to verify that the Reactor Vessel Internals Programs were developed as described in the license renewal application, the corresponding NRC SER, and the additional commitment of the CAL of November 11, 2011, MRP-227 Inspection Plan. The inspectors interviewed licensee personnel to discuss the current status of North Anna Unit 1 and Unit 2 reactor internals inspection plans within the scope of the program. Samples of Unit 1 completed inspection activities were reviewed and compared to MRP-227-A inspection guidelines. The inspectors reviewed a sample of non-destructive examination results for Unit 1 to verify that the examination results were in accordance with the program implementing procedures, MRP-227-A, and more recent industry operating experience, where appropriate. Unit 2 ISI schedules were reviewed with the ISI program owner to verify that Unit 2 inspection schedules have been established for the Unit 2 reactor vessel internals inspections based on the MRP-227-A Guidelines.

The inspectors also discussed the licensee's continuing participation in industry activities associated with the Electric Power Research Institute (EPRI) MRP, Pressurized Water Reactor Owners Group (PWROG) materials sub-committee and Nuclear Energy Institute (NEI) Ad-Hoc committees with the North Anna program owners. The licensee provided examples of Unit 1 completed inspection activities which demonstrate Dominion's participation in industry activities. The samples which demonstrate continued participation in industry activities related to North Anna Unit 1 included, but are not limited to, operating experience included for the baffle former bolt inspections, control rod guide tube assembly guide card inspections, and lower internals hold down spring inspection and evaluations. These samples are also part of the MRP-227-A Reactor Internals Inspection Guidelines listed in the documents reviewed section.

UFSAR Section 18.2.15, Reactor Vessel Internals Inspection, states that visual inservice inspections are implemented in accordance with Category B-N-3 (Removable Core

Support Structures) of ASME Section XI, Subsection IWB, to determine the possible occurrence of age-related degradation. These inspections are performed at ten-year intervals in accordance with the inspection plans submitted to the NRC. The scope of components that comprise the reactor internals includes the upper and lower core internals assemblies. This includes core support and hold-down spring components as well as the baffle/former bolting and barrel/former bolting.

Visual inspections are utilized to detect loss of material and cracking as well as gross indications of loss of pre-load and/or reduced fracture toughness. The acceptance standards for the visual examinations are summarized in ASME Subsection IWB-3520.2, Visual Examination, VT-3. These inspections are directed to be performed with the internals assemblies removed from the reactor vessel.

Acceptance standards for Reactor Vessel Internals Inspection activities are identified in ASME Section XI, Subsection IWB. Table IWB 2500-1 identifies references to the acceptance standards listed in Paragraph IWB 3500. Anomalous indications that are revealed to be beyond the criteria in the acceptance standards by the ISIs may require additional inspections. Evidence of any component degradation requires an engineering evaluation for determination of corrective action. Occurrence of significant degradation that is adverse to quality is entered into the CAS. Corrective action provides reasonable assurance that conditions adverse to quality are promptly corrected.

Discussion with responsible program owners provided reasonable assurance that Dominion has and will continue to remain active in industry groups, including the EPRI-sponsored Material Reliability Project Industry Task Group, to stay aware of any new industry recommendations regarding such aging management issues as neutron embrittlement, void swelling, and the synergistic effect of thermal and neutron embrittlement of internals sub-components.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitment 14 for Units 1 and 2.

Commitment 15 - Implement Changes Into Procedures to Assure Consistent Inspection of Components for Aging Effects During Work Activities; Commitment 18 - Incorporate Management of Elastomers into the Work Control Activities; Commitment 21 - Inspectors Credited in the Work Control Process will be QMT or VT Qualified; Commitment 22 - Perform Audit of Work Control Inspections to Ensure Representation by All In-Scope License Renewal Systems and to Determine Need for Supplemental Inspections; Commitment 29 - Inspect Similar Material/Environment Components, Both Within the System and Outside the System, If Aging Identified in a Location Within the System Cannot be Explained by Environmental/Operational Conditions at that Specific Location; and UFSAR Section 18.2.19, Work Control Process

The UFSAR section 18.2.19 description of this program stated that the Work Control Process was an existing program that integrated and coordinated the combined efforts of Maintenance, Engineering, Operations, and other support organizations to manage maintenance and testing activities. The Work Control Process was a computerized work system used to identify, plan, track, status, and record history on plant equipment. This AMP was used to manage the aging effects of change in material properties, separation and cracking/delamination, cracking, loss of material, and heat transfer degradation.

The Work Control Process AMP had five commitments associated with it to be completed prior entering the PEO including: (1) to implement changes to procedures to assure consistent inspection of components for aging effects during work activities, (2) to incorporate the management of elastomers into the work control activities, (3) to ensure that inspectors credited in the Work Control Process were VT qualified, (4) to perform audits of work control inspections to ensure representation by all in-scope license renewal systems and to determine need for supplemental inspections (audits to be performed prior to and every ten years after the PEO), and (5) to inspect similar material/environment components, both within the system and outside the system if aging was identified in a location within a system that could not be explained by environmental/operational conditions at that specific location.

This AMP was used to ensure that opportunistic inspection of plant components and adjacent piping was performed during both preventative and corrective maintenance activities. The scope of this program included visual examination of the internal and external surfaces of mechanical components and adjacent piping, performance testing of mechanical components and heat exchangers, and routine maintenance sampling of motor lubricating oil and engine coolant.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitments 15, 18, 21, 22, and 29, and adequate implementation of the UFSAR Section 18.2.19 AMP for Units 1 and 2.

Commitment 19 – Develop and Implement Inspection Program for Non-EQ Cables and UFSAR Section 18.1.4, Non-EQ Cable Monitoring

This commitment specifies that, one time between years 30-40, the licensee would develop and implement an inspection program for non-EQ cables. The program would involve one-time inspections of a representative sample of the non-EQ cables that require aging management and additional inspections every 10 years thereafter. The UFSAR states that the purpose of the non-EQ Cable Monitoring activities will be to perform inspections on a limited, but representative, number of accessible cable jackets and connector coverings that are utilized in non-EQ applications. Visual inspection of the representative samples of non-EQ power, instrumentation, and control cable jackets and connector coverings will detect the presence of cracking, discoloration, or bulging which could indicate aging effects requiring management.

The inspectors reviewed the program basis documents, administrative procedures, and implementing procedures to verify that the non-EQ monitoring activities associated with the commitment were developed and implemented as described in the license renewal application and the corresponding NRC Safety Evaluation Report. The inspectors also interviewed the licensee's staff to determine the actions taken to satisfy the commitment. The non-EQ cables within the scope of Commitment #19 are divided into the following three categories:

- Type E1 – Electrical Cables and Connections not Subject to 10 CFR 50.49 Environmental Qualifications Requirements
- Type E2 – Electrical Cables not Subject to Environmental Qualification Requirements used in Instrumentation Circuits

- Type E3 – Inaccessible Medium Voltage Cables not Subject to 10 CFR 50.49 Environmental Qualification Requirements

To satisfy the commitment for Type E1 and Type E3 cables, the licensee performed one-time inspections and created preventative maintenance task orders to ensure that the cables are inspected at least once every ten years throughout the period of extended operation. The inspectors reviewed a sample of work orders to verify that the one-time inspections had been completed. The inspectors also reviewed the preventative maintenance tasks and verified that they appropriately addressed the commitment. To satisfy the commitment for type E2 cables, the licensee has taken credit for routine calibration testing to identify the potential existence of aging degradation throughout the period of extended operation. The inspectors reviewed the applicable testing procedures and a sample of work orders to verify that the licensee's actions appropriately satisfied the commitment.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitment 19 for Units 1 and 2.

Commitment 20 – Follow Industry Activities Related to Alloy 82/182 Weld Material. Implement Activities Based on Industry Recommendations, as Appropriate; and UFSAR Section 18.3.5.3 - Leak-Before-Break

This commitment stated that the licensee would follow industry activities related to alloy 82/182 weld material, and that they would implement activities based on industry recommendations, as appropriate. The UFSAR description of this commitment stated that the licensee used the guidance of EPRI MRP-126, "Materials Reliability Program: Generic Guidance for Alloy 600 Management," as the basis for their approach to leak-before-break. The licensee utilized a TLAA-type analysis to evaluate the thermal aging effect associated with leak-before-break, and determined that the change in material property through the PEO was insignificant.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitment 20 for Units 1 and 2.

Commitment 23 – Measure the Sludge Buildup in the Service Water Reservoir at North Anna Power Station; and UFSAR Section 18.2.17, Service Water System Inspections

This commitment specifies that the licensee will measure the sludge buildup in the service water reservoir one-time between years 35 and 40 of operation. The service water reservoir was originally designed to provide service water for the operation of a potential four units with a total maximum calculated rating of 11,354 MWt. The storage capacity of the reservoir is approximately 22.5 million gallons. This capacity is reduced as organic decay products, atmospheric dust, and other particles accumulate in the bottom of the service water reservoir. A sludge depth of up to four feet can be tolerated without impacting the thermal performance or 30-day cooling water inventory of the service water reservoir. The sludge depth is monitored every 5 years. (Note that following the first twenty years of operation, only one foot of sludge buildup occurred in the service water reservoir and since implementing a continuous blowdown in 2001, the sludge depth has remained below six inches.) The licensee last executed O-PT-75.22,

Engineering Periodic Test, Service Water System Reservoir Sludge Depth Measurement, Revision 7, in December 2016 and credits that surveillance to satisfy Commitment 23.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitment 23 for Units 1 and 2.

Commitment 24 – Provide Inspection Details for PZR Surge Line Inspections to the NRC for Review and Approval; Commitment 25 - Provide Inspection Details for Safety Injection (SI) and Charging Line Inspections to the NRC for Review and Approval; and UFSAR Section 18.3.2.4, Environmentally-Assisted Fatigue

The UFSAR section 18.3.2.4 description of this TLAA stated that analyses of thermal fatigue of mechanical components had previously been performed. The UFSAR separated these into four methodologies: ASME Boiler and Pressure Vessel Code, Section III, Class 1; Reactor Vessel Underclad Cracking; ANSI B31.1 Piping; and Environmentally-Assisted Fatigue. Each methodology addressed thermal fatigue for components which would be appropriate for that categorization. Generally, each methodology provided an analysis method using requirements applicable to the type of component within the categorization, e.g., for ASME Section III, Class 1, the fatigue analysis was performed in accordance with the requirements found in that category.

Commitments 24 and 25 stated that, specifically for the Environmentally-Assisted Fatigue method, the licensee would provide the inspection details for the pressurizer surge line inspections (Commitment 24), safety injection and charging line inspections (Commitment 25) to the NRC for review and approval.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitments 24 and 25 for Units 1 and 2.

Commitment 26 – Address NRC Staff Final Guidance Regarding Fuse Holders When Issued and UFSAR Section 18.1.4, Non-EQ Cable Monitoring

This commitment specifies that the licensee will address NRC staff final guidance regarding fuse holders when issued, or prior to the PEO, whichever is later. The NRC guidance related to fuse holders was issued in Revision 1 to NUREG-1801, Generic Aging Lessons Learned (GALL) Report. The UFSAR states that the licensee's review of the NRC guidance and the station's electrical equipment configurations did not identify any fuse holders requiring aging management.

The inspectors reviewed the licensee's engineering evaluations to determine how the fuse holders of interest were identified and how it was determined that they did not require aging management. The inspectors also interviewed the licensee's staff to discuss the results of the engineering evaluations and plant walkdowns.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated completion of Commitment 26 for Units 1 and 2.

Commitment Item 30 – Supplement the NFPA Pressure and Flow Rate Testing Credited in Each LRA as Part of the Fire Protection Program Activity with the Work Control Process Activity in Order to Manage Aging Effects for the Fire Protection System Piping and UFSAR Section 18.2.7, Fire Protection Program

In response to NRC Request for Additional Information (RAI) B2.2.7-2, a commitment was made to supplement the pressure and flow rate testing presently performed by surveillance procedures with additional measures that will be included in the work controls process. These measures will allow NAPS to better manage the aging effects of fire protection piping. The work controls process, as described in section B2.2.19 of the LRA, provides numerous opportunities to perform an internal inspection of fire protection piping when opened for maintenance. This will be performed prior to the PEO. Fire protection location numbers within the Plant Asset Management System (PAMS) have been designated as license renewal components included within the work control process activity. As a result, the automated license renewal as-found inspection sheets are included within work orders associated with the fire protection components. These inspection sheets are required to be filled out to document the “as-found” conditions relevant to license renewal for the inside surfaces of pressure retaining mechanical components, such as piping components, valve bodies, tanks, pump casings, heating ventilation and air conditioning (HVAC) ducting, and damper housings, when they are made available for inspections. These inspections are performed by maintenance personnel who are VT-qualified and trained as members of a quality maintenance team (QMT). Findings of sedimentation or internal degradation are referred to engineering personnel for further evaluation. Occurrence of significant degradation that is adverse to quality is entered into the CAS. Corrective actions provide reasonable assurance that the conditions adverse to quality are promptly corrected. The inspectors reviewed WOs, CRs, and interviewed personnel associated with the maintenance of water-based fire suppression systems. The inspectors concluded that ongoing pressure and flow-rate testing, supplemented by visual inspections that are incorporated into the work control process, will provide adequate continuous indication of the internal condition of piping and valves.

Based on the review of the licensee aging management program for water-based fire protection suppression systems, the inspectors determined that the licensee completed the necessary actions to meet Commitment 30 for Units 1 and 2.

UFSAR Section 18.2.2, Battery Rack Inspections

UFSAR section 18.2.2 stated that the purpose of the Battery Rack Inspections is to provide reasonable assurance of the integrity of the supports for various station batteries. Loss of material due to corrosion is the aging effect. Periodic checks of the rack integrity are performed, coincident with periodic battery inspections, to determine the physical condition of the battery support racks.

The inspectors reviewed program basis documents, administrative and implementing procedures, correspondence between the licensee and NRC, corrective actions, and work orders to verify that the program was developed and executed with the criteria described in the LRA, and the corresponding NRC SER.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated adequate implementation of this AMP for Units 1 and 2.

UFSAR Section 18.2.4, Chemistry Control Program for Primary Systems

The UFSAR section 18.2.4 description of this program stated that the Chemistry Control Program for Primary Systems AMP was an existing program that provided reasonable assurance that water quality was compatible with the materials of construction in the plant systems and equipment in order to minimize the loss of material and cracking. This AMP was an aging effects mitigation activity which did not directly detect aging effects. The scope of this program included monitoring fluid with the following systems and components: the primary grade water tank, the primary systems, the component cooling system, the spent fuel pit, the refueling water storage tank, the boric acid storage tank, the accumulator tank, the chemical addition tank, boron injection tank, and the casing cooling tank. The main activities of this AMP included controlling various primary water chemistry parameters (such as lithium, hydrogen, chloride, fluoride, and sulfate concentrations) within established bands and trending and evaluating gaseous fission products in the coolant to aid in early detection of fuel failures.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated adequate implementation of this AMP for Units 1 and 2.

UFSAR Section 18.2.5, Chemistry Control Program for Secondary Systems

The UFSAR section 18.2.5 description of this program stated that the Chemistry Control Program for Secondary Systems AMP was an existing program that provided reasonable assurance that water quality was compatible with the materials of construction in the plant systems and equipment in order to minimize the loss of material and cracking. This AMP was an aging effects mitigation activity which did not directly detect aging effects. The main activities of this AMP included monitoring/controlling various secondary water chemistry parameters in the following systems or components: condensate storage tank, condensate, condensate polishing, feedwater, steam generator, main steam, steam generator wet layup, diesel generator cooling, station makeup water, and air conditioning.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated adequate implementation of this AMP for Units 1 and 2.

UFSAR Section 18.2.8, Fuel Oil Chemistry

The UFSAR section 18.2.8 description of this program stated that the Fuel Oil Chemistry AMP was an existing program that managed the loss of material by requiring that fuel oil quality was compatible with the materials of construction in plant systems and equipment. This program minimized the existence of contaminants such as water, sediment, and bacteria which could degrade fuel oil quality and damage the fuel oil system and interfere with the operation of safety-related equipment. These actions ensured that diesel fuel oil was within specifications required for proper operation of the station's diesel engines, in order to prevent unanticipated equipment failure due to fuel

oil-related issues. The Fuel Oil Chemistry AMP was an aging effects mitigation activity which did not directly detect aging effects. The program scope included the following tanks: the above-ground fuel oil storage tank, the underground emergency diesel generator fuel oil tanks, the diesel generator day tanks, the fire pump fuel oil tank security diesel generator fuel oil tank, and the station alternate alternating current (AAC) diesel fuel oil tank. Major activities for this AMP included receipt sampling and testing of new fuel oil, developing chemistry laboratory procedures for on-site analysis, and developing chemistry surveillance procedures or periodic tests for the documentation of analysis results. This program also provided for the routine sampling and testing of fuel oil storage tanks and for the trending of parameters associated with fuel quality to identify adverse fuel oil conditions before they impact equipment operability.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated adequate implementation of this AMP for Units 1 and 2.

UFSAR Section 18.2.12, ISI Program – Containment Inspection

The UFSAR description of this AMP stated that the ISI Program - Containment Inspection for concrete containments and containment steel liners implements the requirements in 10 CFR 50.55a and Subsections IWE and IWL of ASME Section XI. Loss of material is the aging effect for the containment steel liner. Surface degradation and wall thinning are checked by visual and volumetric examinations. The frequency and scope of examination requirements are specified in 10 CFR 50.55a and Subsection IWE. Loss of material, cracking and change in material properties are the aging effects for the containment concrete and are checked by visual examinations. The frequency and scope of examination requirements are specified in 10 CFR 50.55a and Subsections IWL.

The inspectors reviewed program basis documents, administrative and implementing procedures, correspondence between the licensee and NRC, corrective actions, and work orders to verify that the program was developed and executed with the criteria described in the LRA, and the corresponding NRC SER. The inspectors interviewed licensee personnel to discuss the implementation of the AMP and associated commitments.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated adequate implementation of this AMP for Units 1 and 2.

UFSAR Section 18.2.14, Reactor Vessel Integrity Management and UFSAR Section 18.3.1, Reactor Vessel Neutron Embrittlement

UFSAR section 18.2.14 states that the scope of Reactor Vessel Integrity Management Activities is focused on ensuring adequate fracture toughness of the reactor vessel beltline and weld materials. The Reactor Vessel Integrity Management Activities include the following program aspects: irradiated sample surveillance; vessel fast neutron fluence calculations; measurements and calculations of nil-ductility transition temperature (RT_{NDT}) for vessel beltline materials; measurements and calculation of Charpy Upper Shelf Energy (USE); calculation of reactor coolant system pressure/temperature (P-T) operating limits, and Low Temperature Overpressure

Protection System (LTOPS) setpoints; and pressurized thermal shock (PTS) screening calculations. UFSAR Section 18.3.1 specifies that the analyses to address USE, PTS, and P-T operating limits would be addressed through a TLAAs approach.

The inspectors reviewed the program basis documents and administrative and implementing procedures to verify that the program was implemented in accordance with the licensing basis. The inspectors interviewed licensee personnel to discuss the aspects of the Reactor Vessel Integrity Management Program and to verify that the various calculation methodologies had not changed since the approval of the LRA.

For the TLAAs, the inspectors reviewed the licensing basis and TLAAs implementing documents to verify that the TLAAs were developed as described in the license renewal application and the corresponding NRC SER.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated adequate implementation of this AMP and the referenced TLAAs for Units 1 and 2.

UFSAR Section 18.2.18, Steam Generator Inspections

The UFSAR section 18.2.18 description of this AMP stated that steam generator inspections would be performed in accordance with Technical Specifications and ISI requirements of ASME Code Section XI, and that the plans for these inspections would be based upon the guidelines established by NEI 97-06 and the EPRI steam generator inspection guidelines. It also stated that examination of steam generator sub-components other than tubes are performed as required by the governing edition and addenda of ASME Section XI, as imposed by 10 CFR 50.55a, and that acceptance standards for steam generator inspections would be those provided in ASME Section XI, Subsections IWB-3500 and IWC-3500. Any occurrence of significant degradation would be entered into the CAS and corrected through that process.

Based on the review of licensee actions completed at the time of this inspection and the timeliness of those actions, the inspectors determined that the licensee demonstrated adequate implementation of this AMP for Units 1 and 2. However, the inspectors made one observation associated with the implementation of this program, which is discussed in further detail in section 4OA5.1.b(1) of this report.

UFSAR Section 18.3.3, Environmental Qualification of Electric Equipment and UFSAR Section 18.4.1, Environmental Qualification Program

The description of this AMP in UFSAR Sections 18.3.3 and 18.4.1 stated that the Environmental Qualification (EQ) Program activities were established to be compliant with the requirements of 10 CFR 50.49, and that they would be continued through the PEO. The UFSAR description stated that the component types were broken down into six categories and stated that, based on the definitions of 10 CFR 54, certain EQ calculations were considered to be TLAAs. Specifically, Environmental Qualification of Electric Equipment was addressed in this manner, but the UFSAR description of that TLAAs stated that ultimately EQ of electrical equipment would be managed within the EQ Program.

The inspectors reviewed the TLAA implementing documents to verify that the TLAA was developed as described in the LRA and the corresponding NRC SER and determined that the licensee demonstrated adequate implementation of this TLAA for Units 1 and 2.

UFSAR Section 18.3.4, Containment Liner Plate

The UFSAR section 18.3.4 description stated that the containment liner plate was identified and evaluated to meet 10 CFR 54.21(c) for a time-limited aging analysis. The accumulated fatigue effects of applicable liner loading conditions were evaluated in accordance with Paragraph N-415 of the ASME Boiler and Pressure Vessel Code, Section III, 1968. The number of design cycles was conservatively increased to 1500 cycles of operating pressure variations, 6000 cycles of operating temperature variation, and 30 design earthquake cycles by using a multiplication factor of 1.5, to account for the period of extended operation.

The licensee conducted a review of the identified calculations and determined that the increase in the number of cycles due to the period of extended operation is acceptable. As a result, the licensee considered the status for the administrative action items associated with the development of this TLAA to be completed for Units 1 and 2.

UFSAR Section 18.3.5.1, Crane Load Cycle Limit

The UFSAR section 18.3.5.1 description of this TLAA stated that NUREG-0612 required that the design of heavy load overhead handling systems meet the intent of Crane Manufacturers Association of America Specification #70, and identified the cranes in the scope of license renewal and NUREG-0612. Utilizing these guidelines, the licensee evaluated the crane cycle load limit and determined that the in-scope cranes would not reach this limit during the PEO.

The inspectors reviewed the TLAA implementing documents to verify that the TLAA was developed as described in the LRA and the corresponding NRC SER and determined that the licensee demonstrated adequate implementation of this TLAA for Units 1 and 2.

UFSAR Section 18.3.5.4, Spent Fuel Pool Liner

The UFSAR section 18.3.5.4 description stated that the Spent Fuel Pool Liner was identified and evaluated to meet 10 CFR 54.21(c) for a time-limited aging analysis. The normal thermal cycles occur at each refueling, resulting in 80 cycles for both units in 60 years. The total number of thermal cycles is expected to be 90, which includes normal, upset, emergency, and faulted conditions. The calculations show that the allowable thermal cycles for spent fuel pool liner for the most severe thermal condition, which includes a loss of cooling, is 100.

The licensee conducted a review of the identified calculations and determined that the increase in the number of cycles due to the period of extended operation is acceptable. As a result, the licensee considered the status for the administrative action items associated with the development of this TLAA to be as completed for Units 1 and 2.

UFSAR Section 18.3.5.5, Piping Subsurface Indications

UFSAR section 18.3.5.5 identifies calculations to address piping subsurface indications detected by inspections performed in accordance with ASME Section XI as a TLAA. ASME Section XI provides the acceptance criteria for various flaw orientations, locations, and sizes and the licensee's calculations determined the number of thermal cycles required for flaws to reach an unacceptable size. The licensee concluded that the number of cycles experienced by piping will not exceed these values for sixty years of operation.

The inspectors reviewed the TLAA implementing documents to verify that the TLAA was developed as described in the LRA and the corresponding NRC SER and determined that the licensee demonstrated adequate implementation of this TLAA for Units 1 and 2.

UFSAR Section 18.3.5.6, Reactor Coolant Pump and ASME Code Case N-481

UFSAR section 18.3.5.6 identifies an analysis performed to determine the integrity of reactor coolant pump casings in accordance with ASME Code Case N-481 requirements as a TLAA. Code Case N-481 allows the licensee to replace volumetric examinations of primary loop pump casings with visual examinations provided that analysis is performed to demonstrate the safety and serviceability of the pump casing.

The inspectors reviewed the TLAA implementing documents to verify that the TLAA was developed as described in the LRA and the corresponding NRC SER and determined that the licensee demonstrated adequate implementation of this TLAA for Units 1 and 2.

UFSAR Section 18.4.2, Transient Cycle Counting

The UFSAR section 18.4.2 description of this TLAA activity stated that [ASME] Class 1 reactor coolant system components were designed to withstand a number of design transients without experiencing fatigue failures during their operating life, and that the purpose of the Transient Cycle Counting was to record the number of normal, upset, and test events that the station experiences during operation. Design transients would be counted and upon approaching a limit, an engineering analysis would determine the design margin remaining to confirm that the allowable factor had not been exceeded, and the component would be repaired or replaced as warranted.

The inspectors reviewed the TLAA implementing documents to verify that the TLAA was developed as described in the LRA and the corresponding NRC SER and determined that the licensee demonstrated adequate implementation of this TLAA for Units 1 and 2.

b. Findings and Observations

No findings were identified.

On the basis of the sample selected for review, the team determined that the licensee had completed, or was on track to complete, the necessary tasks to meet the license renewal commitments, license conditions, and regulatory requirements associated with the issuance of the renewed operating license at the NAPS Units 1 and 2. The inspectors noted that due to the span between the start of the PEO dates for Units 1 and 2, some activities for Unit 2 had yet to be fully implemented at the time of this

inspection; however, they were being actively tracked in the licensee's corrective action system. Based on the review of program documents and activities completed at the time of this inspection, the team determined that the licensee had established the required AMPs and TLAAAs to manage the aging effects of in-scope structures, systems, and components through the period of extended operation of the two units.

The inspectors identified one observation that, if identified in the PEO, would be characterized as a performance deficiency and processed in accordance with NRC Inspection Manual Chapter 0612, "Power Reactor Inspection Reports." The observation is presented in (1) below and is subject to a follow-up inspection in accordance with NRC inspection procedure IP 71003 to provide reasonable assurance that the license renewal commitments are met.

- (1) Observation: Steam Generator Inspections (UFSAR Section 18.2.18)
LRA Table 3.1.5-1 identified that Steam Generator Primary Manway Cover Bolting (carbon steel, air environment) was subject to the loss of pre-load aging mechanism, and the licensee assigned the Steam Generator Inspection Program to manage the mechanism. UFSAR Section 18.2.18, Steam Generator Inspections, stated, "Examination of steam generator sub-components other than tubes are performed as required by the governing edition and addenda of ASME Section XI, as imposed by 10 CFR 50.55a." In the case of the primary manway cover bolting, the ASME Section XI requirement is Table IWB-2500-1, Examination Category B-G-2, Item B7.30, Steam Generators (Bolts, Studs, Nuts). The requirement states that a VT-1 inspection must be performed when the bolting is removed for other reasons (Note 2 of the Table states, "For components other than piping, examination of bolting is required only when the component is examined under Examination Category B-B, B-L-2, or B-M-2. Examination of bolted connection is required only once during the interval"). The inspectors identified that the licensee's methodology for these inspections would accomplish the inspection required by ASME Code, but would not adequately manage the loss of pre-load mechanism through the PEO. The licensee captured this observation as CR1085789.

.2 Newly Identified SSCs

a. Inspection Scope

After the renewed license is issued, the FSAR update required by 10 CFR 50.71(e) must include any SSCs newly identified that would have been subject to an aging management review or time-limited analysis in accordance with 10 CFR 54.21. The UFSAR update must describe how the effects of aging are managed such that the intended function(s) in 10 CFR 54.4(b) will be effectively maintained during the period of extended operation.

The inspectors discussed the evaluation of newly identified structures, systems, or components (SSCs) with the licensee's staff to verify compliance with the provisions of 10 CFR 54.37(b). The inspectors reviewed a sample of licensee procedures to verify that adequate guidance was provided to ensure that SSCs within the scope of 10 CFR 54.37(b) were identified, evaluated, and reported. The licensee indicated that one component (Missile Door 1-BLD-DR-T54-6) had been identified that should have been within the scope of its license renewal program due to discovering components in the plant that were not accurately reflected in the database used to originally generate the

application for a renewed license. In addition, the inspectors reviewed a sample of modifications implemented since the LRA was submitted to the NRC until the date the renewed operating license was issued to identify any potential new SSCs that should have been subject to aging management review at the time the NRC was reviewing the LRA.

b. Findings and Observations

No findings were identified.

The inspectors determined that the licensee took appropriate actions to assure that newly identified structures, systems, and components were properly identified and evaluated for management of aging effects.

.3 Description of AMPs in the UFSAR Supplement

a. Inspection Scope

As part of the review of AMPs approved by the NRC in the SER, the inspectors reviewed their UFSAR descriptions to confirm that the implemented programs were consistent with the SER. The inspectors reviewed changes made to the programs and activities in the UFSAR supplement from the date the renewed license was issued to the next scheduled UFSAR update to verify that changes were evaluated against the criteria in 10 CFR 50.59.

b. Findings and Observations

The inspectors found that the aforementioned supplement was included in the UFSAR as required and changes to the programs and activities were evaluated in accordance with 10 CFR 50.59. With the exception of one example described in section 4OA5.1.b(1) of this inspection report, the inspectors did not identify inconsistencies between the AMPs approved in the SER and the UFSAR supplement.

.4 License Renewal Commitment Changes

a. Inspection Scope

As part of the review of the commitments identified in Appendix D of the SER, the inspectors reviewed license renewal commitment change documents to verify the licensee followed the guidance in NEI 99-04, "Guidelines for Managing NRC Commitment Changes," for any change to the commitments, including their elimination. The inspectors verified that the licensee properly evaluated, reported, and approved where necessary, changes to license renewal commitments listed in the UFSAR in accordance with 10 CFR 50.59.

The team also reviewed the licensee's procedures for commitment revision to obtain reasonable assurance that future changes to regulatory commitments would follow the guidance in NEI 99-04, and would properly evaluate, report, and approve changes to license renewal commitments listed in the UFSAR in accordance with 10 CFR 50.59.

b. Findings and Observations

No findings were identified.

4OA6 Meetings, Including Exit

On December 15, 2017, the inspectors presented the inspection results to Mr. Eric Hendrixson, Director of Engineering North Anna Power Station, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary. Proprietary material received during the inspection was returned to the licensee.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

M. Bourdeau, Consulting Engineer for License Renewal

E. Hendrixson, Director, Site Engineering

M. Whalen, Technical Specialist III, Licensing

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened/Closed

None

Discussed

None

LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety, but rather, that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance or endorsement of the document or any part of it.

Commitment 1 - Develop and Implement an Inspection Program for Buried Piping and Valves and UFSAR Section 18.1.1, Buried Piping and Valve Inspection Activities

CM-AA-CTG-10, Coatings Program, Revision 4
CM-AA-CTG-102, Coating Service Level III and Immersion Service Application Revision 4
ER-AA-BPM-10, Underground Piping and Tank Integrity Program Description, Revision 8
ER-AA-BPM-101, Underground Piping and Tank Integrity Program, Revision 11
ET-CEP-04-0019, Assessment of External Condition of Buried Piping at Surry and North Anna, Revision 0
ETE-NA-2012-0064, Life Cycle Management Plan – Underground Piping and Tank Integrity Program, Revision 4
ETE-NA-2014-0068, Assessment for Addition of Cathodic Protection to Existing Buried Pipe and Tanks at North Anna Power Station, Revision 0
ETE-NA-2016-0090, Summary of Buried Piping Inspections for North Anna License Renewal Commitment, Revision 1
ETE-NA-2017-0004, Engineering Review of Susceptible Buried Piping for North Anna Unit 1 and North Anna Unit 2, Revision 0
RP-AA-502, Groundwater Protection Program, Revision 5
WO 59049830202
WO 59052375202
WO 59102420578
WO 59102431506
WO 59102577832

Commitment 3 – Add Core Barrel Hold-Down Spring to Augmented Inspection Program and UFSAR Section 18.2.1, Augmented Inspection Activities

03-9259966, AREVA Field Procedure for Performing Hold Down Spring Measurements, Revision 001
59102978077, Dominion Work Order Unit-1, MRP-227A Inspection, Directed by NDE, Performed by AREVA, License Renewal Examination of Reactor Vessel Components, Revision 0
CR Process-2016-6194, AREVA CR, Error on QCIR T5.29-9192168-000, Hold Down Spring Calibration Blocks, 9/23/16
Dominion Generation North Anna Unit 1, 4th Interval Augmented Examination Schedule, Revision 4
Dominion Generation North Anna Unit 2, 4th Interval augmented Examination Schedule, Revision 2
ETE-NA-2016-0078, North Anna Unit-1, MRP-227-A Reactor Vessel Internals Inspection Engineering Evaluation, 6/10/16
ETE-2017-CEP-1009, Augmented Inspection Activities Surry and North Anna Power Stations, Attachment 1, (LR-1731/LR-2731) Revision 0
ER-NA-AUG-101, North Anna Augmented Inspection Program Attachment 48, Revision 7

Commitment 4 - Expand Scope of the Civil Engineering Structural Inspection to Cover License Renewal Requirements; Commitment 5 - Revise Plant Documents to Use Inspection Opportunities When Inaccessible Areas Become Accessible During Work Activities; Commitment 16 – Incorporate Ground Water Monitoring into the Civil Engineering Structural Monitoring Program. Consider Groundwater Chemistry in Engineering Evaluations of Deficiencies; Commitment 17 - Incorporate Management of Concrete Aging into the Civil Structural Monitoring Program and the Infrequently Accessed Area Inspection Program; Commitment 28 - Revise Procedures for Groundwater Testing to Account for Possible Seasonal Variations; and UFSAR Section 18.2.6, Civil Engineering Structural Inspection Program

0-PT-112.1, Ground Water Testing, Revision 2

CR411632, Block Wall Spalls and Deterioration during Maintenance Rule Inspection, 1/26/11

CR412525, Moderate Concrete spalls/separation found during MR Inspection, 2/3/11

CR448560, Wall crack identified in Unit 1 MDAFW pump house, 10/19/2011

ER-AA-AMP-101, Implementation of Activities Performed by License Renewal Aging Management Coordinators, Revision 8

ER-NA-INS-104, Monitoring of Structures North Anna Power Station, Revision 4

ET-N-07-0120, Monitoring of Structures – Report of 5 Year Periodic Inspections, Revision 0

ETE-CEP-2017-1005, License Renewal Aging Management Activities - Civil Engineering Structural Inspection, Revision 0

ETE-NA-2015-0020, Condition Assessment of Plant Structures (Third Five-Year Inspection Interval, Revision 0

ETE-NA-2016-0080, License Renewal Commitments #9 and #17, 9/12/17

FN-2004-048, UFSAR Change Request, 2/8/05

FN-2006-033, UFSAR Change Request, 01/09/2007

NAPS-UCR-2017-018, UFSAR Chapter 18 Changes, 10/3/17

WM-AA-100, Work Management, Rev. 29

WO59102258327, North face Block Wall spalls and deterioration found during Mrule Inspection, 7/26/2011

WO59102262132, Moderate Concrete spalls/separation found during Mrule inspection, 2/14/17

WO59102877285, Ground Water Test, 10/27/15

WO59102901804, Ground Water Test, 2/14/16

WO59102920242, Ground Water Test, 5/23/16

WO59102959202, Ground Water Test, 8/11/16

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Commitment 7 - Develop Inspection Criteria for Non-ASME Supports and Doors;
Commitment 8 - Develop Procedural Guidance for Inspection Criteria That Puts Focus on Aging Effects; and UFSAR Section 18.2.9, General Condition Monitoring Activities

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 0-PT-105.1.1, Fire Door Inspection – Turbine Building, Control Room and Office Area, Revision 10
 0-PT-105.1.2, Fire Door Inspection – Service Building, Revision 11
 0-PT-105.1.3, Fire Door Inspection – Auxiliary Building, Revision 8
 1-PT-161, License Renewal General Condition Monitoring Review – Unit 1 Containment, Revision 1
 1-PT-162, License Renewal General Condition Monitoring Review – Unit 1 Areas Outside of Containment, Revision 1
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Commitment 9 - Develop and Implement Inspection Program for Infrequently Accessed Areas and UFSAR Section 18.1.2, Infrequently Accessed Area Inspection Activities

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 WO59102857896, 1H EDG Exhaust Bunker, 4/24/15
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 WO59102857902, 2H EDG Exhaust Bunker, 4/24/15
 WO59102857911, 2J EDG Exhaust Bunker, 4/24/15
 WO59102858679, Unit 1 Cable Spreading Rooms, Cable Tunnels, and Emergency Switchgear Rooms, 12/8/15
 WO59102858699, Unit 2 Cable Spreading Rooms, Cable Tunnels, and Emergency Switchgear Rooms, 1/19/16
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 WO59102875720, Unit 2 'A' Containment Mat Sump, 9/2/15
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 WO59102878056, TB SW Valve Pit and Tunnel, 11/25/15
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Commitment 10 - Develop and Implement Inspection Program for Tanks and UFSAR Section 18.1.3, Tank Inspection Activities

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0-PT-89.4A, Underground Diesel Fuel Oil Storage Tank 1-EG-TK-2A Draining, Cleaning, and Inspecting, Revision 9
 CM-AA-CTG-104, Revision 2, Condition Assessment of Internally Coated/Lined Tanks, Components, and Pipes Subject to Immersion Service
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Commitment 11 - Follow Industry Activities Related to Failure Mechanisms for Small Bore Piping; Evaluate Changes to Inspection Activities Based on Industry Recommendations; and UFSAR Section 18.2.11, Inservice Inspection (ISI) Program - Component and Component Support Inspections

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Commitment 12 - Follow Industry Activities Related to Core Support Lugs. Evaluate Need to Enhance Inspection Activities Based on Industry Recommendations; and UFSAR Section 18.2.13, ISI Program - Reactor Vessel

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Commitment 13 – Inspect Representative Sections of Polar Crane Box Girders, and UFSAR Section 18.2.10, Inspection Activities - Load Handling Cranes and Devices

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Commitment 14 – Follow Industry Activities Related to Reactor Vessel Internals Issues Such as Void Swelling, Thermal and Neutron Embrittlement. Evaluate Industry Recommendations. Inspect Accordingly. And FSAR Section 18.2.15, Reactor Vessel Internals Inspection

CM-AA-SAR-101, Attachment 3, SAR Change Request, 12/13/14
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Commitment 15 - Implement Changes Into Procedures to Assure Consistent Inspection of Components for Aging Effects During Work Activities; Commitment 18 - Incorporate Management of Elastomers into the Work Control Activities; Commitment 21 - Inspectors Credited in the Work Control Process will be QMT or VT Qualified; Commitment 22 - Perform Audit of Work Control Inspections to Ensure Representation by All In-Scope License Renewal Systems and to Determine Need for Supplemental Inspections; Commitment 29 - Inspect Similar Material/Environment Components, Both Within the System and Outside the System, If Aging Identified in a Location Within the System Cannot be Explained by Environmental/Operational Conditions at that Specific Location; and UFSAR Section 18.2.19, Work Control Process

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Commitment 19 – Develop and Implement Inspection Program for Non-EQ Cables;
Commitment 26 – Address NRC Staff Final Guidance Regarding Fuse Holders When Issued;
and UFSAR Section 18.1.4, Non-EQ Cable Monitoring

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Commitment 20 – Follow Industry Activities Related to Alloy 82/182 Weld Material. Implement
Activities Based on Industry Recommendations, as Appropriate; and UFSAR Section 18.3.5.3,
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 ETE-CEP-2012-1002, Identification and Evaluation of RCS Alloy 600 Locations – Pressure
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Commitment 23 – Measure the Sludge Buildup in the Service Water Reservoir at North Anna Power Station; and UFSAR Section 18.2.17, Service Water System Inspections

0-PT-75.22, Engineering Periodic Test, Service Water System Reservoir Sludge Depth Measurement, Revision 7

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Commitment 24 – Provide Inspection Details for PZR Surge Line Inspections to the NRC for Review and Approval; Commitment 25 - Provide Inspection Details for Safety Injection (SI) and Charging Line Inspections to the NRC for Review and Approval; and UFSAR Section 18.3.2.4, Environmentally Assisted Fatigue

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Commitment Item 30 – Supplement the NFPA Pressure and Flow Rate Testing Credited in Each LRA as Part of the Fire Protection Program Activity with the Work Control Process Activity in Order to Manage Aging Effects for the Fire Protection System Piping and UFSAR Section 18.2.7, Fire Protection Program

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LIST OF ACRONYMS USED

AAC	Alternate Alternating Current
ADAMS	Agency wide Document Access Management System
AMP	Aging Management Program
ASME	American Society of Mechanical Engineers
BPVC	Boiler and Pressure Vessel Code
CA	Corrective Action
CAL	Confirmatory Action Letter
CAS	Corrective Action System
CFR	Code of Federal Regulations
CR	Condition Report
EDG	Emergency Diesel Generator
EPRI	Electric Power Research Institute
EQ	Environmental Qualification <u>or</u> Environmentally Qualified
GALL	NUREG-1801 "Generic Aging Lessons Learned"
IP	Inspection Procedure
IR	Inspection Report
ISI	Inservice Inspection
LR	License Renewal
LRA	License Renewal Application
LTOPS	Low Temperature Overpressure Protection System
MRP	Materials Reliability Program
MWt	Mega Watts thermal
NAPS	North Anna Power Station
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association

NRC	U.S. Nuclear Regulatory Commission
NUREG	NRC Technical Report
PAMS	Plant Asset Management System
PARS	Publicly Available Records
PEO	Period of Extended Operation
P-T	pressure/temperature
PTS	Pressurized Thermal Shock
PWROG	Pressurized Water Reactor Owners Group
PZR	Pressurizer
QMT	Quality Maintenance Team
RT _{NDT}	nil-ductility transition temperature
SER	Safety Evaluation Report
SI	Safety Injection
SSC	Structures, Systems, and Component
SW	Service Water
TAA	Time Limited Aging Analysis
UFSAR	Updated Final Safety Analysis Report
USE	Upper Shelf Energy
VT	Visual Test or Inspection
WCP	Work Control Process
WO	Work Order