



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
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ATLANTA, GEORGIA 30303-1257

November 8, 2017

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

**SUBJECT: NORTH ANNA POWER STATION – NRC INTEGRATED INSPECTION
REPORT 05000338/2017003 AND 05000339/2017003**

Dear Mr. Stoddard:

On September 30, 2017, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your North Anna Power Station, Units 1 and 2. On October 18, 2017, the NRC inspectors discussed the results of this inspection with Mr. L. Lane and other members of your staff. Inspectors documented the results of this inspection in the enclosed inspection report.

No NRC-identified or self-revealing findings were identified during this inspection.

However, NRC inspectors documented one licensee-identified violation, which was determined to be of very low safety significance, in this report. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2.a of the NRC Enforcement Policy.

If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-001; with copies to the Regional Administrator Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the North Anna Power Station.

D. Stoddard

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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/

Anthony D. Masters, Chief
Reactor Projects Branch 5
Division of Reactor Projects

Docket Nos.: 05000338, 05000339
License Nos.: NPF-4, NPF-7

Enclosure:
IR05000338/2017003 and 05000339/2017003
w/Attachment: Supplemental Information

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos: 50-338, 50-339

License Nos: NPF-4, NPF-7

Report No: 05000338/2017003 and 05000339/2017003

Licensee: Virginia Electric and Power Company (VEPCO)

Facility: North Anna Power Station, Units 1 & 2

Location: Mineral, Virginia 23117

Dates: July 1, 2017 through September 30, 2017

Inspectors: G. Croon, Senior Resident Inspector
G. Eatmon, Resident Inspector
R. Carrion, Senior Inspector (Sections 1R07 and 1R08)
R. Kellner, Senior Health Physicist (Sections 2RS1, 2RS7, 4OA1
and 4OA7)
J. Rivera, Health Physicist (Section 2RS8)
W. Pursley, Health Physicist (Section 2RS6)

Approved by: Anthony D. Masters, Chief
Reactor Projects Branch 5
Division of Reactor Projects

Enclosure

SUMMARY

IR 05000338/2017003, 05000339/2017003; July 1, 2017 – September 30, 2017; North Anna Power Station, Units 1 and 2. Routine Integrated Inspection Report.

The report covered a three-month period of inspection by resident inspectors, one regional based inspector, and three health physicists. The significance of inspection findings are indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP), dated April 29, 2015. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated February 4, 2015. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

No NRC-identified or self-revealing findings were identified.

A licensee-identified violation of very low safety significance has been reviewed by the inspectors. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program. This violation and its associated corrective action tracking number are listed in Section 4OA7 of this report.

REPORT DETAILS

Summary of Plant Status

Unit 1 began the inspection period at approximately 100 percent rated thermal power (RTP), and operated at RTP for the remainder of the inspection period.

Unit 2 began the inspection period at approximately 100 percent RTP. On September 9, 2017, the unit was taken offline for a planned refueling outage. The unit remained offline for the remainder of the inspection period.

REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection

.1 Seasonal Extreme Weather Conditions

a. Inspection Scope

The inspectors reviewed the licensee's adverse weather preparations for hot weather operations, specified in 0-GOP-4.1, "Hot Weather Operations," Rev. 36, 0-GOP-5.5, "EDG Hot Weather Operation," Rev. 14, and the licensee's corrective action program (CAP) database for hot weather related issues. The inspectors walked down two risk-significant systems/areas listed below to verify compliance with the procedural requirements and to verify that the specified actions provided the necessary protection for the structures, systems, or components.

b. Findings

No findings were identified.

.2 Impending Adverse Weather Conditions

a. Inspection Scope

The inspectors performed a site-specific weather-related inspection due to anticipated adverse weather conditions. On April 17, 2017, the inspectors reviewed the licensee response to severe storm warnings, with tornado watch, and high wind warnings of 40 miles an hour for the area. Specifically, the inspectors reviewed licensee adverse weather response procedures, including 0-AP-41, "Severe Weather Conditions," Rev. 61, and site preparations including work activities that could impact the overall maintenance risk assessments.

b. Findings

No findings were identified.

.3 Offsite Power and Alternate AC Power

a. Inspection Scope

The inspectors verified that plant features and procedures for operation and continued availability of offsite and alternative alternating current (AC) power systems were appropriate. The inspectors reviewed the licensee's procedures affecting those areas, and the communications protocols between the transmission system operator and the nuclear power plant to verify that the appropriate information was exchanged when issues arose that could impact the offsite power system. The inspectors evaluated the readiness of the offsite and alternative AC power systems by reviewing the licensee's procedures that address measures to monitor and maintain the availability and reliability of the offsite and alternative AC power systems. The inspectors walked down one risk-significant system/area listed below to verify compliance with the procedural requirements and to verify that the specified actions provided the necessary protection for the structures, systems, or components.

b. Findings

No findings were identified.

1R04 Equipment Alignment

Partial Walkdowns

a. Inspection Scope

The inspectors conducted four equipment alignment partial walkdowns, listed below, to evaluate the operability of selected redundant trains or backup systems with the other train or system inoperable or out of service. The inspectors reviewed the functional systems descriptions, UFSAR, system operating procedures, and Technical Specifications (TS) to determine correct system lineups for the current plant conditions. The inspectors performed walkdowns of the systems to verify the operability of a redundant or backup system/train or a remaining operable system/train with a high risk significance for the current plant configuration (considering out-of-service, inoperable, or degraded condition); or a risk-significant system/train that was recently realigned following an extended system outage, maintenance, modification or testing; or a risk-significant single-train system. The inspector conducted the reviews to ensure that critical components were properly aligned, and to identify any discrepancies which could affect operability of the redundant train or backup system. Documents reviewed are listed in the Attachment.

- Unit 1, Quench spray system, train A
- Unit 2, Quench spray system, train B
- Unit 1, Recirculation spray system, train A
- Unit 2, Control room ventilation system

b. Findings

No findings were identified.

1R05 Fire Protection

Quarterly Fire Protection Walkdowns

a. Inspection Scope

The inspectors conducted focused tours of the four areas listed below that are important to reactor safety to verify the licensee's implementation of fire protection requirements as described in fleet procedures CM-AA-FPA-100, "Fire Protection/Appendix R (Fire Safe Shutdown) Program," Rev. 10, CM-AA-FPA-101, "Control of Combustible and Flammable Materials," Rev. 8, and CM-AA-FPA-102, "Fire Protection and Fire Safe Shutdown Review and Preparation Process and Design Change Process," Rev. 5. The inspectors evaluated, as appropriate, conditions related to: (1) licensee control of transient combustibles and ignition sources; (2) the material condition, operational status, and operational lineup of fire protection systems, equipment, and features; and, (3) the fire barriers used to prevent fire damage or fire propagation. Documents reviewed are listed in the Attachment.

- Units 1 and 2, Service water pumphouse
- Unit 2, Motor generator set house
- Units 1 and 2, Turbine building fire fighting strategy
- Unit 2, Containment

b. Findings

No findings were identified.

1R07 Heat Sink Performance

Triennial Review of Heat Sink Performance

a. Inspection Scope

The inspectors selected the Unit 2 B Component Cooling Heat Exchanger (2-CC-E-1B), the Unit 2 D Recirculation Spray Heat Exchanger (2-RS-E-1D), and the Unit 1 A Control Room Chiller (1-HV-E-4A-2) based on their risk-significance in the licensee's probabilistic safety analysis, and their importance to safety-related mitigating system support functions.

For the two heat exchangers and a control room chiller, the inspectors reviewed the licensee's inspection, maintenance, and monitoring of biotic fouling and macrofouling programs to ensure that they were adequate. The inspectors also reviewed the licensee's inspection and cleaning activities to determine if they had established acceptance criteria consistent with industry standards, and the as-found results were recorded, evaluated, and appropriately dispositioned to maintain structural integrity.

The inspectors reviewed the condition and operation of the Unit 2 B Component Cooling Heat Exchanger, the Unit 2 D Recirculation Spray Heat Exchanger, and the Unit 1 A Control Room Chiller to ensure they were consistent with design assumptions in heat transfer calculations, as described in the final safety analysis report. This included determining whether the number of plugged tubes was within pre-established limits based on capacity and heat transfer assumptions for the Unit 2 B Component Cooling Heat Exchanger, and the Unit 1 A Control Room Chiller. The inspectors also determined that the licensee had established adequate controls and operational limits to prevent heat exchanger degradation due to excessive flow-induced vibration during operation.

The inspectors determined whether the performance of ultimate heat sinks (UHS), and their subcomponents such as piping, intake screens, pumps, valves, etc., was appropriately evaluated by tests or other equivalent methods, to ensure availability and accessibility to the in-plant cooling water systems.

The inspectors determined whether the licensee's inspection of the UHS was thorough and of sufficient detail to identify degradation of the impoundment protection, or loss of structural integrity. This included determination of whether vegetation present along the slopes was trimmed, maintained, and not adversely impacting the embankment. In addition, the inspectors determined whether the licensee ensured sufficient reservoir capacity by trending and removing debris in the UHS.

The inspectors reviewed the licensee's inspection of the UHS to determine if it was comprehensive and of significant depth to ensure sufficient reservoir capacity. This included the review of licensee's periodic monitoring and trending of sediment buildup and heat transfer capability. In addition, the inspectors reviewed licensee's periodic performance monitoring of the UHS structural integrity, to determine whether adjacent non-seismic or nonsafety-related structures could degrade, or block safety-related flow paths, during a severe weather or seismic event. The inspectors also performed walkdowns of accessible portions of the UHS supply and return piping to look for possible settlement, or movement and piping conditions that would indicate loss of structural integrity.

The inspectors performed a system walkdown of the service water intake structure to determine whether the licensee's assessment on structural integrity and component functionality was adequate. In addition, the inspectors determined whether service water pump bay silt accumulation was monitored, trended, and maintained at an acceptable level by the licensee, and that water level instruments were functional and routinely monitored. The inspectors also determined whether the licensee's ability to ensure functionality during adverse weather conditions was adequate.

The inspectors reviewed condition reports related to the heat exchangers/coolers and heat sink performance issues to determine whether the licensee had an appropriate threshold for identifying issues, and to evaluate the effectiveness of the corrective actions.

These inspection activities constituted four heat sink inspection samples as defined in IP 71111.07-05. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R08 Inservice Inspection Activities Unit 2 - Outage N2R25

a. Inspection Scope

Non-Destructive Examination Activities and Welding Activities: From September 18, through September 22, 2017, the inspectors conducted an onsite review of the implementation of the licensee's inservice inspection (ISI) program for monitoring degradation of the reactor coolant system, emergency feedwater systems, risk-significant piping and components, and containment systems in Unit 2. The inspectors' activities included a review of non-destructive examinations (NDEs) to evaluate compliance with the applicable edition of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (BPVC), Section XI (Code of Record: 2004 Edition with no Addenda; 4th Interval, 2nd Period, 3rd Outage), and to verify that indications and defects (if present) were appropriately evaluated and dispositioned in accordance with the requirements of the ASME Code, Section XI, acceptance standards.

The inspectors directly observed the following NDEs mandated by the ASME Code to evaluate compliance with the ASME Code Section XI and Section V requirements, and if any indications and defects were detected, to evaluate if they were dispositioned in accordance with the ASME Code, or an NRC-approved alternative requirement.

- UT of Component 12050-WMKS-0102B / 16-WFPD-423 / 40, Elbow to Nozzle
- UT of Component 12050-WMKS-0102A / 16-WFPD-424 / 75, Elbow to Nozzle
- PT of Component 12050-WMKS-0111AP / 6-SI-441 / 7, Valve to Pipe weld
- PT of Component 12050-WMKS-0111AQ / 6-CH-603 / 8, Valve to Pipe weld

The inspectors observed some welding activities and reviewed the welding documents for the activities referenced below in order to evaluate compliance with procedures and the ASME Code. Specifically, the inspectors reviewed the respective work orders, including the weld data sheets, welding procedures, procedure qualification records, and welder performance qualification records for the referenced welds.

- 02-RC-154-VALVE, Replace Valve IAW DC NA-17-00008, ASME Class 1, reviewed Work Order (WO) 59103055303
- 02-CH-MOV-2267B-VALVE, Replace Valve, ASME Class 2, reviewed WO 59102981224
- 02-CC-328-VALVE and Piping, Remove/Reinstall Valve and Piping, ASME Class 3, reviewed WO 59103105688 and observed some of the welding activities

During non-destructive surface and volumetric examinations performed since the previous refueling outage, the licensee did not identify any relevant indications that were analytically evaluated and accepted for continued service. Therefore, no NRC review was completed for this inspection procedure attribute.

Pressurized Water Reactor Vessel Upper Head Penetration Inspection Activities: For the Unit 2 vessel head, a bare metal visual examination was not required during this outage pursuant to 10 CFR 50.55a(g)(6)(ii)(D) and ASME Code Case N-729-4 as it had been performed during the previous outage (March 2016 during refueling outage N2R24). The inspectors also noted that the licensee had requested, and the NRC had approved, Relief Request N2-I4-NDE-002, which extended the Code Case N-729-1 Item B4.40 volumetric/surface examination schedule for the reactor vessel closure head nozzles and partial penetration welds from a ten-year to a fifteen-year period because the currently installed head is constructed of alloy 690/152/52 material. This material has exhibited much higher resistance to crack growth rates than the material of the original reactor vessel upper head, i.e., alloy 600/182/82 material. (The licensee replaced the original head in January 2003 after identifying extensive cracking in the attachment welds for reactor vessel head penetrations.) Note that the requirements for Item B4.40 of Code Case N-729-1 did not change for Item B4.40 of Code Case N-729-4. The Relief Request allows the licensee to postpone the volumetric and surface examinations until spring 2022, during scheduled outage N2R28 in the fifth ten-year ISI inspection interval. These examinations were last conducted in spring 2007 during N2R18.

Boric Acid Corrosion Control Inspection Activities: The inspectors reviewed the licensee's boric acid corrosion control (BACC) program activities to ensure implementation with commitments made in response to NRC Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary," and applicable industry guidance documents. Specifically, the inspectors performed an onsite record review of procedures and the results of the licensee's containment walkdown inspections performed during the current fall refueling outage (N2R25). The inspectors also interviewed the BACC program owner, conducted an independent walkdown of containment to evaluate compliance with licensee's BACC program requirements, and verified that degraded or non-conforming conditions such as boric acid leaks, were properly identified and corrected, in accordance with the licensee's BACC and corrective action programs.

The inspectors reviewed the condition reports (CRs) and associated corrective actions (CAs) listed in the Documents Reviewed Attachment related to boric acid leakage to evaluate if the corrective actions completed were consistent with the requirements of the ASME Code Section XI and 10 CFR Part 50, Appendix B, Criterion XVI.

Identification and Resolution of Problems: The inspectors performed a review of a sample of ISI-related problems that were identified by the licensee and entered into the corrective action program as CRs. The inspectors reviewed the CRs to confirm that the licensee had appropriately described the scope of the problem, and had initiated corrective actions. The review also included the licensee's consideration and assessment of operating experience events applicable to the plant. The inspectors performed this review to ensure compliance with 10CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requirements. The corrective action documents reviewed by the inspectors are listed in the report Attachment. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R11 Licensed Operator Regualification Program and Licensed Operator Performance

.1 Resident Inspector Quarterly Review

a. Inspection Scope

The inspectors reviewed a licensed operator performance on August 3, 2017, during a simulator scenario. The inspectors observed the following elements of crew performance in terms of communications: (1) ability to take timely and proper actions; (2) prioritizing, interpreting, and verifying alarms; (3) correct use and implementation of procedures, including the alarm response procedures; (4) timely control board operation and manipulation, including high-risk operator actions; and (5) oversight and direction provided by the shift supervisor, including the ability to identify and implement appropriate TS actions. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

.2 Quarterly Control Room Operator Performance Observations

a. Inspection Scope

During the inspection period, the inspectors conducted two observations of licensed reactor operators actions and activities to ensure that the activities were consistent with the licensee procedures and regulatory requirements. These observations took place during both normal and off-normal plant working hours. As part of this assessment, the inspectors observed the following elements of operator performance: (1) operator compliance and use of plant procedures including technical specifications; (2) control board/in-plant component manipulations; (3) use and interpretation of plant instruments, indicators and alarms; (4) documentation of activities; (5) management and supervision of activities; and (6) communication between crew members.

The inspectors observed and assessed licensed operator performance during the following events:

- 2-OP-3.7, "Unit Shutdown from Mode 1 to Mode 5 for Refueling"
- Unit 1 during reset of U1 generator automatic voltage regulator to AUTO after experiencing oscillations.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness

a. Inspection Scope

For the four equipment issues listed below, the inspectors evaluated the effectiveness of the respective licensee's preventive and corrective maintenance. The inspectors

performed walkdowns of the accessible portions of the systems, performed in-office reviews of procedures and evaluations, and held discussions with licensee staff. The inspectors compared the licensee's actions with the requirements of the Maintenance Rule (10 CFR 50.65), and licensee procedure ER-AA-MRL-10, "Maintenance Rule Program," Rev. 6. Documents reviewed are listed in the Attachment.

- Fuel cooling pump, 1-FC-P-1B, motor in alert range for vibration
- Charging pump, 1-CH-P-1A, in alert range of vibration
- 1-VG-RM-180, Gaseous Effluent Monitor Out of Service
- 1-SA-P-1A, 1A service air pump trip

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control

a. Inspection Scope

The inspectors evaluated, as appropriate, the four activities listed below for the following: (1) effectiveness of the risk assessments performed before maintenance activities were conducted; (2) management of risk; (3) appropriate and necessary steps taken to plan and control the resulting emergent work activities upon identification of an unforeseen situation; and (4) adequate identification and resolution of maintenance risk assessments and emergent work problems. The inspectors reviewed these maintenance activities to verify that the licensee was in compliance with the requirements of 10 CFR 50.65 (a)(4) and the data output from the licensee's safety monitor associated with the risk profile of Units 1 and 2. The inspectors reviewed the corrective action program to verify that deficiencies in risk assessments were being identified and properly resolved. Documents reviewed are listed in the Attachment.

- Motor replacement of 1-FC-P-1B due to high vibration
- 2B slave relay PT, 2-PT-213.2A
- Appendix R Alternate Shutdown/Maintenance Rule (a)(4) Fire Risk Equipment (Technical Response Manual 7.5 for charging crosstie U1/U2)
- U2 overpressure protection, 2-PT-44.4.1

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments

Operability and Functionality Review

a. Inspection Scope

The inspectors reviewed five operability determinations (OD) and functionality assessments, listed below, affecting risk-significant mitigating systems, to assess, as appropriate: (1) the technical adequacy of the evaluations; (2) whether continued

system operability was warranted; (3) whether other existing degraded conditions were considered as compensatory measures; (4) whether the compensatory measures, if involved, were in place, would work as intended, and were appropriately controlled; and (5) where continued operability was considered unjustified, the impact on TS Limiting Conditions for Operation and the risk significance in accordance with the SDP. No samples of operator work arounds (OWA) were reviewed because there were no OWAs existing for either unit during the calendar year 2016. The inspectors' review included a verification that ODs were made as specified by procedure OP-AA-102, "Operability Determination," Rev. 13. Documents reviewed are listed in the Attachment.

- Operability Determination, CA3063143, Degraded Non-Conforming Condition of SW Traveling Screens due to Electrical Design Inadequacy Identified in CR 1074806
- CA286656, 1-CC-P-1B Oil Sample has Visible Ferrous Particles
- Feedwater ultrasonic flow meter
- 1-CH-P-1A operability in alert vibrations
- Increased reactor coolant system leakage from U1 reactor coolant pump

b. Findings

No findings were identified.

1R19 Post Maintenance Testing

a. Inspection Scope

The inspectors reviewed five post-maintenance test procedures and/or test activities, listed below, for selected risk-significant mitigating systems to assess whether: (1) the effect of testing on the plant had been adequately addressed by control room and/or engineering personnel; (2) testing was adequate for the maintenance performed; (3) acceptance criteria were clear and adequately demonstrated operational readiness consistent with design and licensing basis documents; (4) test instrumentation had current calibrations, range, and accuracy consistent with the application; (5) tests were performed as written with applicable prerequisites satisfied; (6) jumpers installed or leads lifted were properly controlled; (7) test equipment was removed following testing; and (8) equipment was returned to the status required to perform in accordance with VPAP-2003, "Post Maintenance Testing Program," Rev. 14. Documents reviewed are listed in the Attachment.

- Main Control Room Chiller 4B
- Fire Protection Pumps – Annual Testing for 1-FP-P-2, Diesel-Driven Fire Pump, after maintenance
- SR102 Shunt Breaker Spare replacement and oil leak repair
- 2-RS-MR02 casing cooler chiller failure and repair
- 1-RM-CNUT-193, N-16 signal converter replacement

b. Findings

No findings were identified.

1R22 Surveillance Testinga. Inspection Scope

For the six surveillance tests listed below, the inspectors examined the test procedures, witnessed testing, or reviewed test records and data packages, to determine whether the scope of testing adequately demonstrated that the affected equipment was functional and operable, and that the surveillance requirements of TS were met. The inspectors also determined whether the testing effectively demonstrated that the systems or components were operationally ready and capable of performing their intended safety functions. Documents reviewed are listed in the Attachment.

IST Pump or Valve Test:

- 1-PT-71.3Q, "1-FW-P-3B, B Motor-Driven AFW Pump and Valve Test," Revision 53

RCS Leakage:

- 1-GOP-52.2A, "Identifying Increased RCS Leakage," Rev 01

Containment Isolation Valve:

- 2-PT-57.5A, Leak Rate Test of 2-SI-P-1A and Associated Piping and Inservice Inspection for 2-SI-6, Rev 21
- 2-PT-57.5B, Leak Rate Test of 2-SI-P-1B and Associated Piping and Inservice Inspection for 2-SI-29, Rev 21

Other Surveillance Tests:

- 2-PT-17.1, Control Rod Operability, Revision 41
- 2-PT-83.12H, 2H Diesel Generator Test (Start by ESF Actuation) Followed by 24-hour Run and Hot Restart Test, Revision 29

b. Findings

No findings were identified.

2. RADIATION SAFETY (RS)

2RS1 Radiological Hazard Assessment and Exposure Controls (Seven Inspection Samples Completed)a. Inspection Scope

Hazard Assessment and Instructions to Workers: During facility tours, the inspectors directly observed radiological postings and container labeling for areas established within the radiologically controlled area (RCA) of the Unit 2 (U2) Reactor Building, Unit 1 (U1) and U2 Auxiliary Buildings, and radioactive waste (radwaste) processing and storage locations. The inspectors independently measured radiation dose rates or directly observed conduct of licensee radiation surveys for selected RCA areas. The

inspectors reviewed survey records for several plant areas including surveys for airborne radioactivity, gamma surveys with a range of dose rate gradients, surveys for alpha-emitters and other hard-to-detect radionuclides, and pre-job surveys for upcoming tasks. The inspectors also discussed changes to plant operations that could contribute to changing radiological conditions since the last inspection. The inspectors attended pre-job briefings and reviewed Radiation Work Permit (RWP) details to assess communication of radiological control requirements and current radiological conditions to workers.

Control of Radioactive Material: The inspectors observed surveys of material and personnel being released from the RCA using small article monitor, personnel contamination monitor, and portal monitor instruments. The inspectors discussed equipment sensitivity, alarm setpoints, and release program guidance with licensee staff. The inspectors also reviewed records of leak tests on selected sealed sources and discussed nationally tracked source transactions with licensee staff.

Hazard Control: The inspectors evaluated access controls and barrier effectiveness for selected High Radiation Area (HRA), Locked High Radiation Area (LHRA), and Very High Radiation Area (VHRA) locations and discussed changes to procedural guidance for LHRA and VHRA controls with Radiation Protection (RP) supervisors. The inspectors reviewed implementation of controls for the storage of irradiated material within the spent fuel pool. Established radiological controls, including airborne controls and electronic dosimeter (ED) alarm setpoints, were evaluated for selected U2 Refueling Outage 25 (2R25) tasks including Incore Flux Thimble modifications, Reactor Vessel Head disassembly/assembly, and Valve Maintenance. In addition, the inspectors reviewed licensee controls for areas where dose rates could change significantly as a result of plant shutdown and refueling operations. The inspectors also reviewed the use of personnel dosimetry including extremity dosimetry and multi-badging in high dose rate gradients.

Radiation Worker Performance and RP Technician Proficiency: Occupational workers' adherence to selected RWPs and RP technician proficiency in providing job coverage were evaluated through direct observations and interviews with licensee staff. Jobs observed included incore flux thimble cutting, refueling, and various outage maintenance tasks in high radiation and contaminated areas. The inspectors also evaluated worker responses to dose and dose rate alarms during selected work activities.

Problem Identification and Resolution: The inspectors reviewed and assessed Corrective Action Program (CAP) documents associated with radiological hazard assessment and control. The inspectors evaluated the licensee's ability to identify and resolve the issues in accordance with licensee procedures. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: Radiation protection activities were evaluated against the requirements of Updated Final Safety Analysis Report (UFSAR) U2 Chapters 11 and 12, TS Section 5.7, 10 CFR Parts 19 and 20, and approved licensee procedures. Licensee programs for monitoring materials and personnel released from the RCA were evaluated against 10 CFR Part 20 and IE Circular 81-07, "Control of Radioactively Contaminated Material." Documents reviewed are listed in the Attachment..

b. Findings

No findings were identified.

2RS6 Radioactive Gaseous and Liquid Effluent Treatment (Six Inspection Samples Completed)

a. Inspection Scope:

Radioactive Effluent Treatment Systems: The inspectors walked-down selected components of the gaseous and liquid radioactive waste (radwaste) processing and effluent discharge systems. To the extent practical, the inspectors observed and evaluated the material condition of in-place waste processing equipment for indications of degradation or leakage that could constitute a possible release pathway to the environment. Inspected components included radwaste processing equipment in the clarifier building, turbine building, auxiliary building and associated piping and valves. The inspectors interviewed licensee staff regarding equipment configuration and effluent monitor operation. The inspectors also walked down and reviewed surveillance test records for the A and B trains of the Emergency Core Cooling System Pump Room Exhaust Air Cleanup System (ECCS PREACS) ventilation system filters.

Effluent Sampling and Discharge: The inspectors observed the collection and processing of liquid effluent samples from high capacity steam generator blowdown proportional tanks in the turbine building and from the clarifier proportional tanks in the waste disposal building and observed gaseous effluent sampling on the 291' elevation of the auxiliary building. Technician proficiency in collecting, processing, and preparing the applicable release permits was evaluated. The inspectors reviewed recent liquid and gaseous release permits including pre-release sampling results, effluent monitor alarm setpoints, and public dose calculations. For RM-111 (Clarifier Hold-Up Tank Outlet Liquid Effluent Monitor), RM-187 (Process Vent Gaseous Effluent Monitor), RM-188 (Plant Vent A Gaseous Effluent Monitor) and RM-121 (U1 Condensate Air Ejector Gaseous Effluent Monitor), the inspectors reviewed calibration and functional test records and evaluated traceability of radioactive calibration sources to National Institute of Standards and Technology (NIST) standards. The inspectors also evaluated the licensee's capability to collect high-range post-accident effluent samples from these monitoring systems if applicable. The inspectors reviewed and discussed with licensee staff methodology for determining vent and stack flow rates and compared current vent flows to design values in the Offsite Dose Calculation Manual (ODCM).

The inspectors reviewed the 2015 and 2016 Annual Radioactive Effluent Release Reports to evaluate reported doses to the public, review any anomalous events, and to review ODCM changes. The inspectors reviewed compensatory sampling data for time periods when selected radiation monitors were out of service. The inspectors reviewed the results of interlaboratory cross-checks for laboratory instruments used to analyze effluent samples. The inspectors also reviewed licensee effluent source term characterizations and changes to effluent release points. In addition, the inspectors evaluated recent land use census results.

Problem Identification and Resolution: The inspectors reviewed and discussed selected CAP documents associated with gaseous and liquid effluent processing and release activities including licensee sponsored assessments. The inspectors evaluated the licensee's ability to identify and resolve issues.

Inspection Criteria: Radwaste system operation and effluent processing activities were evaluated against requirements and guidance documented in the following: 10 CFR Part 20; 10 CFR Part 50 Appendix I; ODCM; UFSAR Chapters 9 and 11; Regulatory Guide (RG) 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants"; RG 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50 Appendix I"; and TS Section 5, Administrative Requirements Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

2RS7 Radiological Environmental Monitoring Program (REMP) (Three Inspection Samples Completed)

a. Inspection Scope

REMP Implementation: The inspectors reviewed the (2015 and 2016) Annual Radiological Environmental Operating Reports and the (2015 and 2016) Annual Radioactive Effluent Release Reports. Selected environmental measurements were reviewed for consistency with licensee effluent data, evaluated for radionuclide concentration trends, and compared with detection level sensitivity requirements as described in the ODCM. The inspectors assessed the licensee's response to any missed or anomalous environmental samples. The inspectors also reviewed the results of interlaboratory cross-checks for laboratory instruments used to analyze environmental samples. Any changes to the ODCM, Land Use Census, or environmental program processes were discussed with licensee staff.

The inspectors observed routine collection of airborne particulate and iodine air samples and verified placement of environmental dosimeters and surface water sampling equipment at selected locations as required by the licensee's ODCM. The inspectors noted the material condition of the continuous air samplers, water samplers, and environmental dosimeters. The inspectors also reviewed calibration and maintenance records for the selected the environmental sampling equipment.

Meteorological Monitoring Program: The inspectors observed the physical condition of the meteorological tower and its instrumentation and discussed equipment operability and maintenance history with licensee staff. The inspectors evaluated transmission of locally generated meteorological data to other licensee groups such as emergency operations personnel and main control room operators. Calibration records for the meteorological measurements of wind speed, wind direction, and temperature were reviewed. The inspectors also reviewed meteorological measurement data recovery for 2015 and 2016.

Ground Water Protection: The inspectors reviewed the licensee's continued implementation of the industry's Ground Water Protection Initiative (Nuclear Energy Institute (NEI) 07-07) and discussed any changes to the program. The inspectors discussed program guidance for dealing with spills, leaks, and unexpected discharges with licensee staff and reviewed recent monitoring well results and any voluntary communications. The inspectors also reviewed recent entries into the 10 CFR 50.75(g) decommissioning file. The inspectors reviewed and discussed the licensee's program for monitoring of structures, systems, and components with the potential to release radioactive material to the environment. Potential effluent release points due to onsite surface water bodies were also evaluated.

Problem Identification and Resolution: The inspectors reviewed CAP documents in the areas of radiological environmental monitoring and meteorological tower maintenance. The inspectors evaluated the licensee's ability to identify and resolve the issues. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: The inspectors evaluated REMP implementation and meteorological monitoring against the requirements and guidance contained in: 10 CFR Part 20; Appendices E and I to 10 CFR Part 50; TS Section 5.0; Offsite Dose Calculation Manual (North Anna); UFSAR Chapter 11; RG 4.15, Quality Assurance for Radiological Monitoring Programs (Normal Operation) - Effluent Streams and the Environment; Branch Technical Position, "An Acceptable Radiological Environmental Monitoring Program" – 1979; Safety Guide 23 "Onsite Meteorological Programs"; NEI 07-07, "Industry Groundwater Protection Initiative – Final Guidance Document"; and approved licensee procedures Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

2RS8 Radiological Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation (Six Inspection Samples Completed)

a. Inspection Scope

Radioactive Material: The inspectors walked down indoor and outdoor areas inside the protected area as well as radioactive material storage warehouses and the steam generator storage facility outside of the protected area (PA). During the walk-downs, the inspectors observed the physical condition and labeling of storage containers and the radiological postings for satellite radioactive material storage areas. The inspectors also reviewed the licensee's radwaste procedures for routine surveys and waste storage.

Radioactive Waste System Walkdown, Characterization and Classification: The inspectors walked down accessible sections of the liquid and solid radwaste systems to assess material condition and conformance of equipment with system design diagrams. This included portions of the radwaste processing building. The inspectors discussed the function of radwaste components with the radwaste operator. The inspectors discussed possible changes to the radwaste processing systems with radwaste staff. The processes for the dewatering of resins, spent resin tank recirculation, resin sampling, and transfer of resins from the processing pads to the shipping casks and temporary storage casks were reviewed and discussed with resin processing contractor.

The inspectors reviewed the 2016 Radioactive Effluent Release Report and the most recent radionuclide characterization and classification for the dry active waste and primary resin waste streams. The inspectors evaluated analyses for hard-to-detect nuclides, reviewed the use of scaling factors, and examined quality assurance comparison results between licensee waste stream characterizations and outside laboratory data. The inspectors also evaluated how changes to plant operational parameters were taken into account in waste characterization.

Shipment Preparation and Records: There were no outgoing radioactive material shipments available for observation during the week of the inspection. The inspectors observed the radiological survey of an incoming limited quantity shipment. The inspectors reviewed four shipping records for consistency with licensee procedures and compliance with NRC and Department of Transportation regulations. This included review of emergency response information, waste classification, radiation survey results, information on the waste manifest, and the authorization of the receiving licensee to receive shipments. Training records for selected individuals currently qualified to ship radioactive material were reviewed for compliance with 49 CFR Part 172 Subpart H.

Problem Identification and Resolution: The inspectors reviewed CAP documents in the areas of radwaste/shipping. The inspectors evaluated the licensee's ability to identify and resolve the issues. The inspectors also reviewed recent self-assessment results.

Inspection Criteria: Radioactive material and waste storage activities were reviewed against the requirements of 10 CFR Part 20. Radwaste processing activities and equipment configuration were reviewed for compliance with the licensee's Process Control Program. Waste stream characterization analyses were reviewed against regulations detailed in 10 CFR Part 20, 10 CFR Part 61, and guidance provided in the Branch Technical Position on Waste Classification (1983). Transportation program implementation was reviewed against regulations detailed in 10 CFR Part 20, 10 CFR Part 71 (which requires licensees to comply with Department of Transportation regulations in 49 CFR Parts 107, 171-180, and 390-397), as well as the guidance provided in NUREG-1608. Training activities were assessed against 49 CFR Part 172 Subpart H. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator (PI) Verification (Four Inspection Samples Completed)

.1 Reactor Safety

a. Inspection Scope

The inspectors reviewed a sample of the performance indicator (PI) data, submitted by the licensee, for the Unit 1 and Unit 2 PIs listed below. The inspectors reviewed plant records compiled between June 2016 to June 2017 to verify the accuracy and completeness of the data reported for the station. The inspectors verified that the PI data complied with guidance contained in Nuclear Energy Institute 99-02, "Regulatory

Assessment Performance Indicator Guideline,” and licensee procedures. The inspectors verified the accuracy of reported data that were used to calculate the value of each PI. In addition, the inspectors reviewed a sample of related corrective action documents to verify the licensee was identifying and correcting any deficiencies associated with PI data. Documents reviewed are listed in the attachment.

Cornerstone: Mitigating Systems

- safety system functional failure (MS05)

Cornerstone: Barrier Integrity

- reactor coolant system specific activity (BI01)

b. Findings

No findings were identified.

.2 Radiation Safety

a. Inspection Scope

Occupational Radiation Safety Cornerstone: (OR01) The inspectors reviewed the Occupational Exposure Control Effectiveness PI results for the Occupational Radiation Safety Cornerstone from April 2016 through July 2017. For the assessment period, the inspectors reviewed ED alarm logs and CAP documents related to controls for exposure significant areas. Documents reviewed are listed in the Attachment.

Public Radiation Safety Cornerstone: (PR01) The inspectors reviewed the Radiological Control Effluent Release Occurrences PI results for the Public Radiation Safety Cornerstone from April 2016 through July 2017. For the assessment period, the inspectors reviewed cumulative and projected doses to the public contained in liquid and gaseous release permits and CAP documents related to Radiological Effluent Technical Specifications/ODCM issues. The inspectors also reviewed licensee procedural guidance for collecting and documenting PI data. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution

.1 Review of Items Entered into the Corrective Action Program

a. Inspection Scope

As required by NRC Inspection Procedure 71152, “Identification and Resolution of Problems,” and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed a daily screening of items

entered into the licensee's CAP. This review was accomplished by reviewing daily CR report summaries and periodically attending daily CR Review Team meetings.

b. Findings and Observations

No findings were identified.

.2 Semiannual Trend Review: Procedural Adherence

a. Inspection Scope

The inspectors performed a review regarding the licensee's procedural adequacy. The inspectors, through document review and interviews with licensee, reviewed the establishment and effectiveness of a licensee program in addressing procedural adequacy in operations and maintenance activities.

b. Findings and Observations

No findings were identified.

40A6 Meetings, Including Exit

On October 18, 2017, the resident inspectors presented the quarterly inspection results to Mr. L. Lane and other members of the staff. The licensee acknowledged the results of these inspections. The inspectors verified no proprietary information was retained by the inspectors or documented in this report.

40A7 Licensee-Identified Violations

The following violation of very low safety significance (Green) was identified by the licensee and is a violation of NRC requirements which meet the criteria of the NRC Enforcement Policy, for being dispositioned as a Non-Cited Violation.

TS 5.4.1 requires, that "Written procedures shall be established, implemented, and maintained covering the following activities: a. The applicable procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, February 1978." Regulatory Guide (RG) 1.33, Appendix A, identifies "Access control to radiation areas, including a Radiation Work Permit (RWP) system" as one of the areas requiring procedural controls. Additionally, procedure VPAP-2101, "Radiation Protection Program", Revision 35, Attachment 1, "RCA Work Practices," identifies what workers should know prior to entering the RCA (minimum requirements). Attachment 1 states, in part, "All workers entering the RCA are required to: 1) Notify RP prior to entering the RCA." Contrary to the above requirements, on September 15, 2017, two maintenance workers entered U2 Containment, a posted High Radiation Area (HRA), while signed in on an incorrect RWP, and without checking in at the Health Physics Shift Supervisor window prior to entering containment. The workers signed in on the RWP they had used earlier in the day which did not allow entry into a HRA. The containment building had been posted as a HRA in preparation for lifting the reactor head while the workers were out of containment. HP personnel in the remote monitoring facility identified that the individuals were on an incorrect RWP, informed HP personnel in containment, and the workers exited containment prior to the head lift. This finding was of very low safety

significance (Green) because there was no substantial potential for overexposure and the licensee's ability to assess dose was not compromised. The immediate corrective actions were documented in CR 1078223. Corrective actions included a human performance review, coaching of the individuals by RP Management, and distribution of a site-wide message discussing the incident and reminding site personnel to remain aware of radiological safety.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel:

M. Becker, Manager, Nuclear Outage and Planning
R. Galbraith, ISI/NDE Supervisor
A. Garcia-Santiago, Auxiliary System Programs Engineer II
J. Jenkins, Manager, Nuclear Site Services
R. Hanson, Manager, Nuclear Protection Services
E. Hendrixson, Director, Nuclear Site Engineering
L. Hilbert, Plant Manager
J. Jenkins, Manager, Nuclear Maintenance
L. Lane, Site Vice President
K. LeBarron, Nuclear Technical Specialist III
J. Leberstien, Technical Advisor, Licensing
D. McGinnis, Technical Specialist II
R. Page, Licensing Engineer
J. Plossl, Supervisor, Nuclear Station Procedures
J. Schleser, Manager, Nuclear Organizational Effectiveness
R. Simmons, Manager, Radiation Protection and Chemistry
J. Slattery, Manager, Nuclear Operations
W. Standley, Director, Nuclear Station Safety & Licensing
D. Taylor, Manager, Station Licensing
B. Thompson, Manager, Nuclear Training
B.J Thompson, Superintendent, Radiation Protection Technical Services
M. Whalen, Technical Advisor, Licensing
J. Collins – Corporate Director, Emergency Preparedness (EP)
B. Miller – EP Specialist
D. Plogger – EP Specialist
T. Shalaski – EP Specialist
N. Turner, EP Manager

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened and Closed

None

LIST OF DOCUMENTS REVIEWED

Section 1R04: Equipment Alignment

Procedures, Guidance Documents, and Manuals

1-OP-7.4A, "Valve Checkoff – Quench Spray System," Revision 10.
CR1041263 "BACC 1-QS-P-1A at shaft seal"

Section 1R05: Fire Protection

Procedures, Guidance Documents, and Manuals

2-FS-C-1, "Loss Prevention Fire Strategy, Containment – Unit 2," Revision 4
2-PT-105.4.1, "Loss Prevention Periodic Test, Fire Protection – Hose Station Flow Test,"
Revision 3
1-FS-SW-1, "Loss Prevention Fire Strategy, Service Water Pump House Units 1 and 2,"
Revision 2
0-PT-105.3, "Loss Prevention Periodic Test, Hose House Inspection," Revision 5
CM-AA-FPA-100, "Fire Protection/Appendix R (Fire Safe Shutdown) Program," Revision 13
0-PT-105.1.1, "Loss Prevention Period Test, Fire Door Inspection – Turbine Building, Control
Room, and Office Area," Revision 10
0-FS-TB-1, "Loss Prevention Fire Strategy, Turbine Building Fire Fighting Strategy," Revision 2
2-FS-MG-1, "Firefighting Strategy, Motor Generator Set House Unit 2," Dated May 28, 1992

Section 1R07: Heat Sink Performance

Procedures

0-AP-12, Abnormal Procedure, Loss of Service Water, Revision 40
0-EPM-2303-01, Inspection of Service Water Cathodic Protection System, Revision 12
0-EPM-2303-02, Corrosion Survey of Service Water Cathodic Protection System, Revision 0
0-OP-49.1, Operating Procedure, Service Water System Normal Operation, Revision 20
0-OP-49.6, Operating Procedure, Service Water System Throttling Alignment, Revision 24
0-PT-75.7, Engineering Periodic Test, Service Water Reservoir – Ground Water Level,
Revision 7
0-PT-75.8, Engineering Periodic Test, Service Water Reservoir Loss Monitoring Procedure,
Revision 5
0-PT-75.24A, Service Water MIC Leakage Inspection – Units 1 and 2, Revision 9
0-PT-75.12, Engineering Periodic Test, Visual Inspection of the Service Water Reservoir Dike
and Toe, Revision 7
0-PT-75.15, Engineering Periodic Test, Generic Letter 89-13 Service Water System Testing
Requirements Coordination, Revision 6
0-PT-75.22, Engineering Periodic Test, Service Water System Reservoir Sludge Depth
Measurement, Revision 7
0-PT-115, Engineering Periodic Test, Survey of Settlement Monitoring Points, Revision 13
1-PT-75.6, Engineering Periodic Test, Service Water System Flow Balance, Revision 24-MR1
2-PT-75.6, Engineering Periodic Test, Service Water System Flow Balance, Revision 23
ER-AA-AMP-101, Implementation of Activities Performed by License Renewal Aging
Management Coordinators, Revision 7
ER-AA-BPM-10, Underground Piping and Tank Integrity Program Description, Revision 7
ER-AA-BPM-101, Underground Piping and Tank Integrity Program, Revision 10
ER-AA-HTX-10, Heat Exchanger Program, Revision 6

ER-NA-INS-101, Main Dam Annual Inspection, Revision 2
 ER-NA-SYS-320, Generic Letter 89-13 Program, Revision 2
 CH-32.939, Service Water Chemical Addition System: Operation, Revision 14
 CH-32.940, Service Water System: Aqua Shade Addition, Revision 2
 CHAP-0105, Auxiliary Cooling Water System Chemistry Control Program (North Anna),
 Revision 26
 VPAP-0811, Service Water System Inspection and Maintenance Program, Revision 6

Corrective Action Documents

CR 0580154, Service Water flow indication on 'B' supply header is indicating high
 CR 1010758, Extension shaft material for SW Spray Array MOVs (and Bypass MOVs) do not
 support torque requirement
 CR 1010761, Unable to confirm material removed from the "B" SW header
 CR 1010918, Through-Wall Leak in the 1B2 Spray Array Piping
 CR 1010927, Through-Wall Leak identified on the 2A2 Spray Array
 CR 1010934, 2A2 SW spray array surging
 CR 1010936, 2-SW-MOV-222A Internal Inspection Findings
 CR 1011052, Mop head fibers lodged in 2" continuous drains
 CR 1050193, 2-SW-354 has a MIC leak at the pipe weld
 CR 1071375, Weld Repairs identified on 10" Tee off of 24"-WS-102-151-Q3

Work Orders (WOs)

WO 59102243628, Control Room Chiller Equipment Performance Test (1-HV-E-4A)
 WO 59102493734, Inspection and Cleaning of 01-HV-E-4A-2-HTEXCH
 WO 59102498132, CC Heat Exchanger Tube Cleaning/Plugging 02-CC-E-1B HTEXCH
 WO 59102888926, Annual Corrosion Survey of Service Water Cathodic Protection System per
 0-EPM-2303-02
 WO 59102999245, Eddy Current Testing of 01-RS-E-1B-HTEXCH
 WO 59102999267, Perform Eddy Current Testing / As-Found Tubesheet Inspection of
 01-RS-E-1 D-HTEXCH

Other Documents Reviewed

Main Dam Annual Inspection using ER-NA-INS-101, dated 10/16/14
 Main Dam Annual Inspection using ER-NA-INS-101, dated 8/19/15
 Main Dam Annual Inspection using ER-NA-INS-101, dated 11/3/16
 Calculation 07797-US(B)-280, Containment Recirculation Heat Exchanger UAs, dated 5-3-00
 Calculation ME-0530, Component Cooling Heat Exchanger Tube Plugging, dated 2/10/97
 Calculation ME-0932, Evaporator and Condenser Tube Plugging Evaluation for the Main
 Control Room Chillers and Front Office Chillers, dated 10/16/12
 Design Change NA-15-00106, Removal of Weko Pipe Seals in the "A" Service Water Return
 Header (36"-WS-4-151-Q3)
 Design Change NA-16-00058 Removal of Weko Pipe Seals in the "B" Service Water Supply
 Header (36"-WS-2-151-Q3)
 Engineering Periodic Test, Service Water Reservoir-Ground Water Level using 0-PT-75.7,
 dated 11/25/14
 Engineering Periodic Test, Service Water Reservoir-Ground Water Level using 0-PT-75.7,
 dated 6/10/15
 Engineering Periodic Test, Service Water Reservoir-Ground Water Level using 0-PT-75.7,
 dated 1/6/16
 Engineering Periodic Test, Service Water Reservoir-Ground Water Level using 0-PT-75.7,
 dated 6/20/16

Engineering Periodic Test, Service Water Reservoir-Ground Water Level using 0-PT-75.7, dated 1/10/17

Engineering Periodic Test, Service Water Reservoir-Ground Water Level using 0-PT-75.7, dated 6/15/17

Engineering Periodic Test, Service Water Reservoir Loss Monitoring using 0-PT-75.8, dated 1/28/15

Engineering Periodic Test, Service Water Reservoir Loss Monitoring using 0-PT-75.8, dated 7/30/15

Engineering Periodic Test, Service Water Reservoir Loss Monitoring using 0-PT-75.8, dated 2/4/16

Engineering Periodic Test, Service Water Reservoir Loss Monitoring using 0-PT-75.8, dated 8/9/16

Engineering Periodic Test, Service Water Reservoir Loss Monitoring using 0-PT-75.8, dated 1/25/17

Engineering Periodic Test, Service Water Reservoir Loss Monitoring using 0-PT-75.8, dated 6/19/17

Engineering Periodic Test, Visual Inspection of the Service Water Reservoir Dike Crest and Toe using 0-PT-75.12, dated 11/26/14

Engineering Periodic Test, Visual Inspection of the Service Water Reservoir Dike Crest and Toe using 0-PT-75.12, dated 5/6/15

Engineering Periodic Test, Visual Inspection of the Service Water Reservoir Dike Crest and Toe using 0-PT-75.12, dated 12/7/15

Engineering Periodic Test, Visual Inspection of the Service Water Reservoir Dike Crest and Toe using 0-PT-75.12, dated 6/16/16

Engineering Periodic Test, Visual Inspection of the Service Water Reservoir Dike Crest and Toe using 0-PT-75.12, dated 12/5/16

Engineering Periodic Test, Visual Inspection of the Service Water Reservoir Dike Crest and Toe using 0-PT-75.12, dated 5/31/17

Engineering Periodic Test of Generic Letter 89-13 Service Water System Testing Requirements Coordination using 0-PT-75.15, dated 8/31/15

Engineering Periodic Test of Generic Letter 89-13 Service Water System Testing Requirements Coordination using 0-PT-75.15, dated 8/12/16

Engineering Periodic Test, Service Water System Sludge Depth Measurement using 0-PT-75.22, dated 12/6/16

Engineering Periodic Test of Generic Letter 89-13 Service Water System Components using 0-PT-75.15, dated 8/31/15

Engineering Periodic Test of Generic Letter 89-13 Service Water System Components using 0-PT-75.15, dated 8/12/16

Engineering Periodic Test, Survey of Settlement Monitoring Points using 0-PT-115, dated 10/2/14

Engineering Periodic Test, Survey of Settlement Monitoring Points using 0-PT-115, dated 3/27/15

Engineering Periodic Test, Survey of Settlement Monitoring Points using 0-PT-115, dated 9/30/15

Engineering Periodic Test, Survey of Settlement Monitoring Points using 0-PT-115, dated 3/31/16

Engineering Periodic Test, Survey of Settlement Monitoring Points using 0-PT-115, dated 10/2/16

Engineering Periodic Test, Survey of Settlement Monitoring Points using 0-PT-115, dated 3/21/17

Engineering Periodic Test, Service Water System Flow Balance using 1-PT-75.6, dated 3/13/15

Engineering Periodic Test, Service Water System Flow Balance using 1-PT-75.6, dated 10/11/16

Engineering Periodic Test, Service Water System Flow Balance using 2-PT-75.6, dated 9/24/14

Engineering Periodic Test, Service Water System Flow Balance using 2-PT-75.6, dated 4/6/16

Engineering Technical Evaluation ETE-NA-2012-0064, Life Cycle Management Plan – Underground Piping and Tank Integrity Program – North Anna Power Station, Revision 4

EPRI TR-108009, Balance of Plant Heat Exchanger Condition Assessment and Inspection Guide, December 1999

EPRI TR-110392, Eddy Current Testing of Service Water Heat Exchangers for Engineers Guideline, February 1999

Federal Energy Regulatory Commission (FERC) Dam Safety Inspection Report on the Service Water Reservoir Dam, submitted on May 24, 2016

Plant Health Issues List (PHIL) 3171, Obsolescence: SW System Component Obsolete (SW Travelling Screens)

SDBD-NAPS-SW, System Design Basis Document for Service Water System - North Anna Power Station, Revision 19

Service Water System Health Report for 3rd Quarter 2014

Service Water System Health Report for 4th Quarter 2014

Service Water System Health Report for 1st Quarter 2015

Service Water System Health Report for 2nd Quarter 2015

Service Water System Health Report for 3rd Quarter 2015

Service Water System Health Report for 4th Quarter 2015

Service Water System Health Report for 1st Quarter 2016

Service Water System Health Report for 4th Quarter 2016

Service Water System Health Report for 1st Half 2017

Technical Report LR-2754, Service Water System Inspections, North Anna Power Station Unit 1 PT of isolation capabilities for interface valves between SW and non-safety-related or non-seismic piping using Operations Periodic Test Procedure 1-PT-57.4, dated 9/30/16

Unit 2 PT of isolation capabilities for interface valves between SW and non-safety-related or non-seismic piping using Operations Periodic Test Procedure 2-PT-57.4, dated 3/31/16

Updated Final Safety Analysis Report (FSAR) Section 9.2.1, Service Water System Water Hammer Analysis from the Service Water System Operational Performance Assessment, July 11 – July 29, 1994 (CNS Report No. 94-03- NAPS-A)

Section 1R08: Inservice Inspection Activities

Procedures

ER-AA-NDE-PT-301, ASME Section XI Liquid Penetrant Examination Procedure, Revision 7

ER-AA-NDE-PT-301, Balance of Plant (BOP) Liquid Penetrant Examination Procedure, Revision 7

ER-AA-NDE-UT-801, Ultrasonic Examination of Ferritic Piping Welds in Accordance with ASME Section XI, Appendix VIII, Revision 7

ER-AP-BAC-10, Boric Acid Corrosion Control Program, Revision 12

ER-AP-BAC-101, Boric Acid Corrosion Control Program (BACCP) Inspections, Revision 12

ER-AP-BAC-102, Boric Acid Corrosion Control Program (BACCP) Evaluations, Revision 13

Corrective Action Documents

CR 1044128, Manifold at 2-CH-MAN-2147 has moist boric acid leak

CR 1044134, Excessive boric acid leak found on 2-CH-249

CR 1050623, BACC packing leak on 2-SI-MOV-2867C excessive and discolored

CR 1050625, BACC actively leaking on 2-CH-250

CR 1054222, Excessive wet boric acid on 2-SI-RV-2857 Leak-Off Line
 CR 1055826, Excessive boric acid deposit on 2-CH-240
 CR 1055829, Discolored boric acid deposit on 2-SI-MOV-2867D
 CR 1060028, Excessive dry boric acid from packing on 1-CH-316
 CR 1063045, Manifold at 2-CH-MAN-2147 has moist boric acid leak
 CR 1064466, Excessive, discolored boric acid on 2-SI-83
 CR 1064483, Moist, discolored boric acid on 2-CH-MOV-2287A
 CR 1077711, Excessive boric acid leakage at 2-RC-48 packing
 CR 1077834, Excessive boric acid found on various components
 CR 1077970, 2-CH-ICV-3154 excessive boric acid leak
 CR 1077973, 2-CH-FT-2155A excessive discolored Boric Acid
 CR 1078234, Discolored boric acid noted at packing of 2-CH-ICV-3019

Corrective Actions (CAs)

CA3037522, Perform Boric Acid Review to Restore Full Qualification for Boric Acid Leak Found on 2-CH 249 (associated with CR1044134)
 CA3044983, Perform Boric Acid Review for Excessive Wet Boric Acid on 2-SI-RV-2857 Leak Off-Line (associated with CR1054222)
 CA3053391, Perform Boric Acid Review (02-CH-MAN-2147-VALVE) (associated with CR1063045)
 CA3054717, Perform Boric Acid Review for Excessive, Discolored Boric Acid on 2-SI-83 (associated with CR1064466)
 CA3054879, Perform Boric Acid Review: Moist, Discolored Boric Acid on 2-CH-MOV-2287A (associated with CR1064483)

Welding Documentation

Work Order (WO) 59103055303, Replace Valve IAW DC NA-17-00008 (02-RC-154-VALVE), ASME Class 1
 Repair/Replacement Plan 2017-102
 Weld Map for location 02-RC-154
 Weld Material Field Control Sheet for Welds # 50, 51, and 52A
 Weld Data Record for Welds # 50, 51, and 52A
 Procedure Qualification Record 801, Revision 2
 Procedure Qualification Record 830
 Procedure Qualification Record 831
 Liquid Penetrant Examination Report BOP-PT-17-790 of Weld 50
 Liquid Penetrant Examination Report BOP-PT-17-730 of Welds 51 & 52A
 Welder Performance Qualification (WPQ) of J. Hamilton, J. Olson, and A. Pennington
 Welding Technique Sheet for Welding Technique Number 801, Revision 8

WO 59102981224, Valve (02-CH-MOV-2267B-VALVE) Replacement Due to History of Leakby, ASME Class 2
 Repair/Replacement Plan 2017-019
 Weld Map for location 2-CH-MOV-2267B
 Weld Material Field Control Sheet for Welds # 7, 8, and SW32
 Welder Performance Qualification (WPQ) of J. Coleman, T. McGlothlin, and N. Sadler
 Welding Technique Sheet for Welding Technique Number 801, Revision 2
 Welding Technique Sheet for Welding Technique Number 803, Revision 9
 Welding Technique Sheet for Welding Technique Number 805, Revision 3
 Welding Technique Sheet for Welding Technique Number 809, Revision 2
 Welding Technique Sheet for Welding Technique Number 830

Welding Technique Sheet for Welding Technique Number 831
 Ultrasonic Examination Report BOP-UT-17-013 of Welds 7 and SW32
 Ultrasonic Examination Report BOP-UT-17-025 of Weld 8
 Liquid Penetrant Examination Report BOP-PT-17-733 of Final Welds 7 and SW32
 Liquid Penetrant Examination Report BOP-PT-17-771 of Final Weld 8
 Liquid Penetrant Examination Report PT-17-001 of 12050-WMKS-0111AP / 6-SI-441 / 7
 Liquid Penetrant Examination Report PT-17-002 of 12050-WMKS-0111AP / 6-SI-441 / SW32
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