



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

December 19, 2018

Mr. Daniel G. Stoddard
Senior Vice President
and Chief Nuclear Officer
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

**SUBJECT: NORTH ANNA POWER STATION – NRC DESIGN BASES ASSURANCE
INSPECTION (TEAM) REPORT 05000338/2018010 AND 05000339/2018010**

Dear Mr. Stoddard:

On November 30, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your North Anna Power Station, Units 1 and 2, and the NRC inspectors discussed the results of this inspection with Mr. E. Hendrixson and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented one finding of very low safety significance (Green) in this report. This finding involved a violation of NRC requirements. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2.a of the 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 U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement; and the NRC resident inspector at the North Anna Power Station.

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/

Omar Lôpez-Santiago, Chief
Engineering Branch 1
Division of Reactor Safety

Docket Nos. 50-338, 50-339
License Nos. NPF-4, NPF-7

Enclosure:
Inspection Report 05000338/2018010 and
05000339/2018010

cc: Distribution via ListServ

SUBJECT: NORTH ANNA POWER STATION – NRC DESIGN BASES ASSURANCE
INSPECTION (TEAM) REPORT 05000338/2018010 AND 05000339/2018010
dated December 19, 2018

DISTRIBUTION:

- G. Crespo RII
- N. Morgan, RII
- C. Franklin, RII
- G. Ottenberg, RII
- M. Yeminy, NRR
- A. Della-Greca, NRR
- O. Lopez-Santiago, RII
- D. Hardage, RII

*See previous page for concurrence

PUBLICLY AVAILABLE NON-PUBLICLY AVAILABLE SENSITIVE NON-SENSITIVE

ADAMS: Yes ACCESSION NUMBER: **ML 18353A824** SUNSI REVIEW COMPLETE FORM 665 ATTACHED

OFFICE	RII:DCO	RII:DRS	RII:DRS	RII:DRS	CONTRACTOR
SIGNATURE	GXC2	NSM	CAF4	GKO	MX4
NAME	G. Crespo	N. Morgan	C. Franklin	G. Ottenberg	M. Yeminy
DATE	12/14/2018	12/17/2018	12/14/2018	12/17/2018	12/16/2018
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO
OFFICE	CONTRACTOR	RII: DRS	RII: DRS	RII: DRP	RII: DRS
SIGNATURE	ALD4	MCM4	ORL	DHH1	ORL
NAME	A. Della-Greca	M. Magyar	O. Lopez-Santiago	D. Hardage	O. Lopez-Santiago
DATE	12/15/2018	12/17/2018	12/ 19 /2018	12/ 19 /2018	12/ 19 /2018
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO

OFFICIAL RECORD COPY

**U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report**

Docket Numbers: 50-338, 50-339

License Numbers: NPF-4, NPF-7

Report Numbers: 05000338/2018010 and 05000339/2018010

Enterprise Identifier: I-2018-010-0056

Licensee: Virginia Electric and Power Company

Facility: North Anna Power Station, Units 1 and 2

Location: Mineral, VA

Inspection Dates: October 29, 2018, to November 30, 2018

Inspectors: G. Ottenberg, Senior Reactor Inspector (Lead)
C. Franklin, Reactor Inspector
N. Morgan, Reactor Inspector
G. Crespo, Sr. Construction Inspector
A. Della-Greca, Contractor
M. Yeminy, Contractor
M. Magyar, Reactor Inspector (trainee)

Approved By: O. Lôpez-Santiago, Chief
Engineering Branch 1
Division of Reactor Safety

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring Virginia Electric and Power Company's performance by conducting a Design Bases Assurance Inspection (Team) at North Anna Power Station, Units 1 and 2, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/oversight.html> for more information. NRC-identified findings and violations are summarized in the table below.

List of Findings and Violations

Failure to Adequately Describe Discovered Degraded Condition of Service Water Pump House Ventilation Equipment In Accordance With The Corrective Action Program			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000338, 339/2018010-01 Closed	None	71111.21M – Design Bases Assurance Inspection
The inspectors identified a Green finding and associated Non-Cited Violation (NCV) of Criterion V, "Instructions, Procedures, and Drawings," in Appendix B of 10 Code of Federal Regulations (10 CFR), for the licensee's failure to follow their corrective action procedure. Specifically, entering degraded conditions into the station's corrective action program is an activity affecting quality, and station personnel did not accomplish the activity in accordance with the prescribed steps in procedure PI-AA-200. As a result, the licensee failed to perform required operability/functionality and maintenance rule evaluations and delayed taking corrective actions.			

INSPECTION SCOPE

Inspections were conducted using the appropriate portions of the inspection procedure (IP) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at <http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html>. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors reviewed selected procedures and records, observed activities, performed walk downs, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

REACTOR SAFETY

71111.21M - Design Bases Assurance Inspection (Team)

The inspectors evaluated the following components, permanent modifications, and operating experience during the weeks of October 29 to November 2, 2018, and November 26 to 30, 2018.

Component (4 Samples)

- (1) Unit 1 "B" Low Head Safety Injection Pump, [1-SI-P-1B]
 - a) Material condition and configuration (i.e., visual inspection during a walkdown)
 - b) Normal, abnormal, and emergency operating procedures
 - c) UFSAR, Design Criteria, and other design basis and licensing basis document accuracy
 - d) Protection against seismic events
 - e) Component testing adequacy and trending results
 - f) Maintenance effectiveness
 - g) Consistency between station documentation (e.g., procedures, design criteria) and vendor specifications
 - h) Translation of vendor specifications
 - i) System isolation valve condition and monitoring (non-single failure proof)
 - j) Recent major modifications to the system
 - k) Various hydraulic and net positive suction head calculations associated with this system (e.g., runout, minimum flow, Pump performance/capability)
 - l) Latest system health report
 - m) Surveillance and in-service testing (IST) procedure, acceptance criteria, and results
 - n) Voltage available at motor during degraded voltage conditions

- (2) Service Water Pumphouse Ventilation [1-HV-MOD-127A(B)-1, 2, 3 & 1-HV-F-49A(B)]
 - a) Material condition and configuration (i.e., visual inspection during a walkdown)
 - b) Normal and abnormal, operating procedures
 - c) Component health, corrective maintenance records, and corrective action history
 - d) Methods and inputs for determining actuator output capability and linkage adequacy
 - e) Review of system flow rates and single failure criteria
 - f) Operations monitoring of area temperatures

- g) Maintenance effectiveness
 - h) Vendor Operating instructions
 - i) Testing and recent test results
- (3) Unit 1 “B” Service Water Pump [1-SW-P-1B]
- a) Material condition and configuration (i.e., visual inspection during a walk-down)
 - b) Normal, Abnormal, and Emergency operating procedures
 - c) Control logic design
 - d) Maintenance effectiveness
 - e) Component health reports, corrective maintenance records, and corrective action history
 - f) Surveillance testing, IST, and recent test results
 - g) Vendor drawings and installations and operating instructions
 - h) Modifications performed/pump upgrades
 - i) Review of system hydraulic calculations, including discharge pressure, developed head, NPSH, and pump runout
 - j) Reverse leakage through discharge check valves and idle pumps
 - k) Vendor specifications and pump refurbishments/upgrades
- (4) “B” Reserve Station Service Transformer [B-RSST]
- a) Material condition and configuration (i.e., visual inspection during a walk-down)
 - b) B-RSST transformer test report from 2015 and documentation for post life expectancy of the transformer that included the specifications for the design, fabrication, and installation for this component
 - c) Voltage profile and short circuit calculations
 - d) Calculations for safety related emergency bus running loads and accident loads.
 - e) Relay setting calculations and coordination studies for the B-RSST transformer and transfer bus overcurrent protective devices.
 - f) Maintenance activities on B-RSST transformer cooling radiators to clear bird’s nests and keep the unit operating properly
 - g) Procedures that provided instructions to recover from a power loss
 - h) Calculations for the replacement of obsolete B-RSST protective relays for bus differential protection, back up ground relay, overload alarm and pilot wire relays.
 - i) Work orders for load tap changer control circuit component replacement on 01-EP-ST-2B-TRANSF for changing timer 66 relay and 84D relay and inspection and calibration of this component
 - j) Calculations to validate the existing RSST transformer ratings and allowable range of impedances for the replacement transformers

Component- Large Early Release Frequency (LERF) (1 Sample)

- (1) Unit 1 “H” Emergency Diesel Generator [1H-EDG]
- a) Material condition and configuration (i.e., visual inspection during a walkdown)
 - b) Operating procedure
 - c) Maintenance effectiveness
 - d) Component health reports, corrective maintenance records, and corrective action history
 - e) Consistency between station documentation (e.g., procedures) and vendor specifications
 - f) Bus loading and voltage calculations
 - g) Overcurrent protection and coordination

- h) Protective device selection and settings
- i) Short circuit capacity
- j) EDG starting/stopping and bus supply breakers control circuitry
- k) Degraded grid voltage relay/timer setting and surveillance testing
- l) EDG battery sizing and voltage drop calculations
- m) EDG Surveillance testing
- n) Station DC Voltage Drop Calculation
- o) Action resulting from recent operating experience (information notices)
- p) Fuel oil tank volume and transfer capacity calculations
- q) Observed Periodic Operations Test
- r) Inservice test results

Permanent Modification (4 Samples)

- (1) SI-MOV-1862A/B Torque Switch Bypass Modification [NA-17-00134]
- (2) 2-MS-117 Check Valve Replacement/NAPS/Unit 2 [NA-15-00090]
- (3) Station Service Bus to Emergency Bus Crosstie Installation [NA-13-00016]
- (4) Duct Bank "N" and "P" 4160V Underground Cable Replacement [NA-14-00038]

Operating Experience (1 Sample)

- (1) IN 2017-03: Anchor/Darling Double Disc Gate Valve Wedge Pin and Stem-Disc Separation Failures

INSPECTION RESULTS

Failure to Adequately Describe Discovered Degraded Condition of Service Water Pump House Ventilation Equipment In Accordance With The Corrective Action Program			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000338, 339/2018010-01 Closed	None	71111.21M – Design Bases Assurance Inspection
<p>The inspectors identified a Green finding and associated Non-Cited Violation (NCV) of Criterion V, "Instructions, Procedures, and Drawings," in Appendix B of 10 Code of Federal Regulations (10 CFR), for the licensee's failure to follow their corrective action procedure. Specifically, entering degraded conditions into the station's corrective action program is an activity affecting quality, and station personnel did not accomplish the activity in accordance with the prescribed steps in procedure PI-AA-200. As a result, the licensee failed to perform required operability/functionality and maintenance rule evaluations and delayed taking corrective actions.</p>			
<p><u>Description:</u></p> <p>The North Anna Power Station Updated Final Safety Analysis Report (UFSAR) section 9.4.10.2, "System Description and Evaluation," stated:</p> <p style="padding-left: 40px;">"The service water ventilation system consists of two redundant exhaust fans with associated dampers connected to separate emergency power sources. All fans, dampers, and damper operators are seismically qualified. Each fan is interlocked with two supply air dampers and has the capacity to maintain the design space temperature. Therefore, a single failure of a fan damper, or damper operator, does not adversely affect the equipment in the space."</p> <p>The Service Water Pumphouse (SWPH) ventilation system is considered a support system for the Service Water (SW) system and is not directly discussed in the plant Technical Specifications (TS). However, TS Bases 3.7.8, "Background," stated,</p> <p style="padding-left: 40px;">"The SW System has sufficient redundancy to withstand a single failure, including the failure of an emergency diesel generator on the affected unit."</p> <p>When either of the two redundant trains of SWPH ventilation is non-functional, the system does not meet its description in UFSAR section 9.4.10.2. Additionally, the SW system would not be able to withstand a single failure as stated in its TS bases. This loss of conformance to the licensing basis descriptions represents a non-conforming condition as defined in station procedure, OP-AA-102, Operability Determination, which expected corrective actions to be completed at the first opportunity to resolve the non-conforming condition.</p> <p>The inspectors identified an example where the licensee did not describe a non-conforming condition in a condition report (CRs) in accordance with procedure PI-AA-200, Corrective Action. The revision of the procedure in use at the time of the CR entry required the CR writer to "PROVIDE sufficient information to ensure that the deviating condition can be understood by</p>			

subsequent reviewers.” and it also required the CR writer to provide or identify the following information on the CR: the missed expectation, the consequence of the deviating condition, and the risk associated with it. An attachment to the procedure further stated that “Sufficient information is required to allow proper operability and reportability determinations to be performed.”

While reviewing corrective action documents and operations logs, inspectors noted that the description in CR 325048, dated February 27, 2009, did not fully describe a discovered degraded condition on a SWPH exhaust fan’s motor operated damper. It described the discovered condition as a missing pivot pin in damper 1-HV-MOD-127B-1, associated with SWPH exhaust fan 1-HV-F49B. No impact or potential impact to the required function of the damper or SWPH ventilation system was described in the CR, and no operability or functionality evaluation was requested to be completed. Additionally, a maintenance rule functional failure determination was not requested to be performed regarding the described condition.

Review of operations logs, recorded around the time the CR was written, revealed that motion in the motor-operated damper was the opposite of what was demanded (i.e., open when desired closed, closed when desired open); this detail was not discussed in the CR. In this condition, the SWPH ventilation system, as a support system to the SW system, would not have met its functional description in the UFSAR or the TS Bases, and neither the SWPH ventilation system nor the SW system were considered non-conforming. Because the opposite train’s fan and dampers were functional at the time of the degraded condition, the SW system was correctly considered operable, although the SWPH ventilation system should have been considered non-conforming. The degraded fan damper was eventually repaired in June 2009 under work order 59076838401.

Corrective Actions: The licensee entered the issue into their corrective action program and recommended additional communication and staff training to ensure conformance to their PI-AA-200 procedure.

Corrective Action Reference: CR 1111471

Performance Assessment:

Performance Deficiency: The inspectors determined that the licensee’s failure to describe the missed expectation, the consequence of the deviating condition, and the risk associated with it in the CR, as required by procedure PI-AA-200, Corrective Action, was a performance deficiency.

Screening: The performance deficiency was more than minor because the performance deficiency was associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the result of the failure to adequately describe the degraded condition in the condition report was missed evaluations of operability/functionality, reportability, and reliability. Since the condition documented in the CR represented a degradation of the system to below the functional description in the station’s UFSAR, the licensee, had they performed an operability/functionality assessment, would have considered the support system non-conforming and required it to be fixed at the first available opportunity.

Significance: The team evaluated the finding in accordance with NRC Inspection Manual Chapter (IMC) 0609, Attachment 4, "Initial Characterization of Findings," issued October 7, 2016, for Mitigating Systems, and IMC 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," issued June 19, 2012, and determined the finding to be of very low safety significance (Green) because the finding was a deficiency affecting the design of a mitigating structure, system, or component (SSC), and the SSC maintained its operability or functionality. Specifically, although the condition resulted in the SWPH Ventilation System deviating from its description in the UFSAR, the unaffected train was sufficient to support operability of the SW pumps.

Cross Cutting Aspect: No cross cutting aspect was assigned to this finding because the inspectors determined the finding did not reflect present licensee performance.

Enforcement:

Violation: Criterion V, "Instructions, Procedures, and Drawings," in Appendix B of 10 CFR 50, required, in part, "Activities affecting quality shall be prescribed by documented instructions, procedures, and drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures or drawings."

Contrary to the above, in 2009, the licensee did not accomplish an activity affecting quality in accordance with their prescribed procedure. Specifically, entering degraded conditions into the station's corrective action program is an activity affecting quality, and station personnel did not accomplish the activity in accordance with the prescribed steps in procedure PI-AA-200.

Enforcement Actions: This violation is being treated as a Non-Cited Violation, consistent with Section 2.3.2 of the Enforcement Policy.

EXIT MEETINGS AND DEBRIEFS

The inspectors confirmed that proprietary information was controlled to protect from public disclosure.

- On November 30, 2018, the inspectors presented the design bases assurance (team) inspection results to Mr. E. Hendrixson, Director of Engineering, and other members of the licensee staff.

LIST OF DOCUMENTS REVIEWED

CALCULATIONS

01040.4910-E-1, Emergency Diesel Generator DC System Sizing Verification (Battery Charger and Cables), Rev. 1
01040.4910-E-1, Emergency Diesel Generator DC System Sizing Verification (Battery Charger and Cables), Addenda A thru F, Rev. 1, dated 6/13/95 thru 5/28/15
11715/12050-M-107, Pressure Loss from the Air Receivers to the Emergency Diesel Generators, Rev. 0
11715-7.1-FO-2, Fuel Oil Tank - Underground Emergency Generators, Rev. 0
11715-7.1-V-1, Service Water Pump House Ventilation, Rev. 0, Add. A
14258.79-M-25, Service Water Pump House – Effect of Loss of Ventilation, Rev. 1
2044498-C-010C, Seismic/Weak Link Calculation for MOV's: 1-SI-MOV-1862A/B, Rev. 0
CME-97-0064, Main Service Water Pumps Operational Pressure Limits, Rev. 1
EE-0008, North Anna Voltage Profiles, Addenda A thru X, Rev. 2, dated 6/19/08 thru 8/7/18
EE-0008, North Anna Voltage Profiles, Rev. 2
EE-0025, North Anna Station Electrical Load List, Addenda A thru C, Rev. 3, dated 5/21/12 thru 8/2/17
EE-0025, North Anna Station Electrical Load List, Rev. 3
EE-0026, Documentation of Voltage and Frequency Effects as a Result of DC NA-11-01183, Emergency Diesel Generator Governor Control Replacement, Addendum A, Rev. 1, dated 8/9/17
EE-0026, Emergency Diesel Generator Voltage & Frequency Response, Rev. 1
EE-0027, Emergency Diesel Generator Lad Sequencing, Addenda A thru D, Rev. 3, dated 1/9/12 thru 12/14/17
EE-0027, Emergency Diesel Generator Lad Sequencing, Rev. 3
EE-0140, North Anna Low Head Safety Injection Flow Indication Uncertainty, Rev. 4
EE-0343, 15H11 Directional Overcurrent Relay Replacement, Addendum A, Rev. 2, dated 8/9/17
EE-0343, Relay Settings for Safety Bus 1H, Rev. 2
EE-0345, Documents Acceptability of Relay Setpoints on Component Cooling Motor Feeder Breaker in 1H 4160V Bus, Addendum A, Rev. 4, dated 4/13/18
EE-0345, Relay Settings for Safety Bus 1H, Rev. 4
EE-0373, 4.16kV Degraded Voltage & Loss of Voltage Relay Safety Limits, Rev. 2
EE-0373, 4.16kV Degraded Voltage & Loss of Voltage Relay Safety Limits, Addenda A thru D, Rev. 2, dated 3/15/13 thru 3/25/15
EE-0394, EDG Fault Current and Voltage, Rev. 1
EE-0397, ASME XI Pump Test Instrumentation Uncertainty for Low Head Safety Injection Pumps, Rev. 0
EE-0504, North Anna Emergency Diesel Generator Protective Relaying, Rev. 0
EE-0806, NAPS 4160V and 480V Short-Circuit Analysis, Addenda A & B, Rev. 1, dated 3/18/15 & 4/12/18
EE-0806, NAPS 4160V and 480V Short-Circuit Analysis, Rev. 1
EE-0857, NAPS Station Battery1-III Voltage Profile Calculation, Addenda A thru F, Rev 0, dated 6/3/15 thru 3/22/18
EE-0857, NAPS Station Battery1-III Voltage Profile Calculation, Rev 0
EE-0858, NAPS Station Battery1-II Voltage Profile Calculation, Addenda A thru E, Rev 0, dated 8/18/15 thru 4/5/16
EE-0858, NAPS Station Battery1-II Voltage Profile Calculation, Rev 0
EE-0878, 1H Emergency Diesel Generator Battery Voltage Drop Analysis, Rev. 0
ETE-NA-2017-0062, Transmittal of North Anna Anchor Darling Double Disc Gate Valve

Classification, Rev. 0
 ME-0119, Maximum Differential Pressure Across Safety Injection MOV's, Rev. 0
 ME-0282, through Addendum 00A, EDG Fuel Oil Tanks, Rev. 0
 ME-0305, Service Water Pump NPSH, Rev. 0
 ME-0572, through Addendum 00H, TDAFW Pump Operation at the Point the RHR System is placed in Service, Rev. 0
 ME-0628, Minimum Delivered LHSI Flow for LB LOCA Analysis and Acceptance Criteria for LHSI Pump Operability Verification Testing, Rev. 1
 ME-0629, Minimum Low Head and High Head Safety Injection System Flow Determination for Containment Analysis Input, Rev. 3
 ME-0968, Evaluation of the TDAFW Pump Performance at Low Steam Generator Pressures, Rev. 0
 ME-3067, JOG Calculation of Required Thrust Settings for MOV 1-SI-MOV-1862A, Rev. 1
 MEC-12050-DAC-230, Low Head Safety Injection Line Pipe Rupture, Rev. 0
 MEC-ME-0620, Minimum Delivered Service Water Flow and Acceptance Criteria for SW Pump Operability, Rev. 1
 NA-CALC-EEP-EE-0008, "North Anna Voltage Profiles", Rev. 2, dated 10/30/2006
 NA-CALC-EEP-EE-0008, Addendum M, "New RSST Transformer Development", Rev. 2, dated 8/13/2013
 NA-CALC-EEP-EE-0008, Addendum N, "Change Unit 1 & 2 GSU Taps", Rev. 2, dated 8/14/2013
 NA-CALC-EEP-EE-0008, Addendum O, "Normal to Unit 2 Emergency Bus Tie Addition", Rev. 2, dated 12/10/2013
 NA-CALC-EEP-EE-0008, Addendum V, "Duct Bank "N" and "P" Underground 4160V Cable Replacement", Rev. 2, dated 12/13/2016
 NA-CALC-EEP-EE-0025, Addendum A, North Anna Station Electrical Load List, Rev. 3, dated 5/21/2012
 NA-CALC-EEP-EE-0025, Addendum B, North Anna Station Electrical Load List, Rev. 3, dated 7/6/2016
 NA-CALC-EEP-EE-0025, Addendum C, North Anna Station Electrical Load List, Rev. 3, dated 8/2/2017
 NA-CALC-EEP-EE-0025, North Anna Station Electrical Load List, Rev. 3, dated 4/25/2012
 NA-CALC-EEP-EE-0318, Addendum 1A, Relay Setpoint Changes, Rev. 1, dated 11/23/1994
 NA-CALC-EEP-EE-0318, Addendum D, Relay Settings for Safety Bus 1J, Rev. 1, dated 12/2/2009
 NA-CALC-EEP-EE-0318, Addendum E, Relay Settings for Safety Bus 1J, Rev. 1, dated 2/16/2016
 NA-CALC-EEP-EE-0318, Relay Settings for Safety Bus 1J, Rev. 1, dated 4/28/1994
 NA-CALC-EEP-EE-0338, Addendum D, Relay Settings for Safety Bus 1J, Rev. 2, dated 5/2/1994
 NA-CALC-EEP-EE-0338, Addendum F, Relay Settings for Safety Bus 1J, Rev. 2, dated 6/18/2009
 NA-CALC-EEP-EE-0338, Addendum G, Relay Settings for Safety Bus 1J, Rev. 2, dated 7/7/2016
 NA-CALC-EEP-EE-0338, Addendum H, Relay Settings for Safety Bus 1J, Rev. 2, dated 4/13/2018
 NA-CALC-EEP-EE-0343, Addendum A, Relay Settings for Safety Bus 1H, Rev. 2, dated 8/9/2017
 NA-CALC-EEP-EE-0343, Relay Settings for Safety Bus 1H, Rev. 2, dated 7/27/2017
 NA-CALC-EEP-EE-0345, Addendum A, Relay Settings for Safety Bus 1H, Rev. 4, dated 4/13/2018

NA-CALC-EEP-EE-0345, Relay Settings for Safety Bus 1H, Rev. 4, dated 9/14/2017
 NA-CALC-EEP-EE-0361, Relay Settings for Safety Buses 2H & 2J, Rev. 1, dated 5/5/1994
 NA-CALC-EEP-EE-0364, Addendum A, Relay Set Point Changes, Rev. 1, dated 6/13/1995
 NA-CALC-EEP-EE-0364, Addendum B, Relay Settings for Safety Bus 2H, Rev. 1, dated 12/2/2009
 NA-CALC-EEP-EE-0364, Addendum C, Relay Setting for the Protection of Bus 2H (Breaker 15E1, 15E3, 25H11, and Bus 1E Undervoltage Protection), Rev. 1, dated 2/27/2017
 NA-CALC-EEP-EE-0364, Relay Setting for the Protection of Bus 2H (Breaker 15E1, 15E3, 25H11, and Bus 1E Undervoltage Protection), Rev. 1, dated 4/29/1994
 NA-CALC-EEP-EE-0364, Relay Settings for the Protection of Bus 2H, Rev. 1, dated 4/29/1994
 NA-CALC-EEP-EE-0365, Relay Settings for Safety Bus 2J, Rev. 2, dated 4/13/2017
 NA-CALC-EEP-EE-0366, Relay Settings for the Protection of RSSTB, Rev. 2, dated 5/24/2016
 NA-CALC-EEP-EE-0806, NAPS 4160V and 480V Short Circuit Analysis, Rev. 1, dated 6/30/2014
 NA-CALC-ZZZ-11715-NMB-341-HZQ, LHSI Pump Turbulence Limiter, Rev. 0
 NA-CAL-ZZZ-1250-NMB-291-DAC, Low Head Safety Injection Line Pipe Rupture Analysis, Rev. 0
 SE-0018, through Addendum 00A, Emergency Diesel Generator Day Tank Capacity, Rev. 1
 SM-1176, North Anna TWST Volumes and Levels for Containment Analysis, Rev. 1

DRAWINGS

11715/12050-2.45-16B, Johnston Turbine Pumps, Rev. 4
 11715-12050-6.43-11D, 10x8x10 No. S350 W00 ASA series 1500, Welding Ends outside Screw & Yoke Gate Valve with Lip Seal and SMB-2-60 Limitorque Valve Actuator Control, Rev 5
 11715-12050-6.43-30A, 10x8x10 No. S350-1 DD ASA Series 1500 Welding Ends Outside Screw & Yoke Gate Valve With Lip Seal and SMB-2-60 Limitorque Valve Actuator Control, Rev 2
 11715-B-035A, Flow/Valve Operating Numbers Diagram, Yard – Fuel Oil Lines, Sheets 1 and 2, Rev. 43
 11715-ESK-11C, Sh. 1 of 10, Elementary Diagram, Emer. Diesel Gen. 1H, Sh. 1, North Anna Power Station – Unit 1, Rev. 28
 11715-ESK-11R, Elementary Diagram, Emergency Bus “1H” Undervoltage and Voltage Unbalance Circuit Testing, North Anna Power Station – Unit 1, Rev. 18
 11715-FE-1A, “Main One Line Diagram North Anna Power Station – Units 1 & 2”, Rev. 54
 11715-FE-1A, Main One Line Diagram, North Anna Power Station – Units 1 & 2, Rev. 54
 11715-FE-1AE, 120V AC & 125V DC One Line Diag. Vital Power, North Anna Power Station, Rev. 31
 11715-FE-1AF, 480V One Line Diagram, Emergency Buses 1H, 1H1, 1J, & 1J1, North Anna Power Station, Rev. 21
 11715-FE-1B, 4160V One Line Diagram – Sh. 1, Bus 1A & 1B, Transfer Bus D & E, North Anna Power Station, Rev. 26
 11715-FE-1BB, One Line Diagram Electrical Distribution System North Anna Power Station Units 1 & 2, Rev. 57
 11715-FE-1BB, One Line Diagram Electrical Distribution System, North Anna Power Station, Units 1 & 2, Rev. 57
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- 11715-FE-8AQ, Wiring Diagram, 4160V Transfer Bus “F”, Tie to Emerg. Gen. Bus 1H, Brk. 15F3, North Anna Power Station, Rev. 18
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- 11715-FE-8BC, Wiring Diagram, 4160V Emer. Bus “1H”, Emer. Gen. “A”, Brk. 15H2, North Anna Power Station, Unit 1, Rev. 17
- 11715-FE-8BN, Wiring Diagram, 4160V Emer. Bus “1H”, Tie to Transf. Bus F Supply Brk. 15H11, North Anna Power Station, Unit 1, Rev. 16
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 0-AP-12, Loss of Service Water, Rev. 40
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 Battery Repairs, Rev. 26
 0-ECM-0701-04, Inspection & Repair of Emergency Diesel Generator (EDG Annunciator
 Panels, Rev. 0
 0-ECM-0708-05, Woodward Digital Reference Unit (DRU) and 2301A Field Adjustments, Rev. 6
 0-ECM-1509-02, MOV Testing – Rising Stem Valves, Rev. 0
 0-ECM-2807-01, Replacement of Timers, Rev. 9
 0-EPM-0301-01, Testing of Single-Pole, Double-Pole, and Three-Pole Panel Type Molded-Case
 Circuit Breakers, Rev. 12
 0-GEP-50, General Engineering Procedure, Post-Modification Test Plan Development, Rev. 2
 0-GEP-51, General Engineering Procedure, Post-Modification Final Design Test Procedure
 Development, Rev. 2
 0-GEP-52, General Engineering Procedure, Conduct of Post-Modification Testing, Rev. 8
 0-GOP-1.7, General Operating Procedure, Rev. 21
 0-ICM-MIS-G-001, Repair, Replacement, or Re-Installation of Components, Rev. 14
 0-MCM-0419-02, Enertech Type DRV-Z Nozzle Check Valve Maintenance, Rev. 1
 0-OP-49.6, Service Water Throttling Alignment, Rev. 24
 0-PT-89.9K, Pressure Test of Line from 2-EG-P-2HB to 2-EG-TK-2H, Rev. 3
 1-AR-A-C4, 1-EI-CB-21A Annunciator C4, Rev. 4
 1-AR-H-F7, Alarm Response, 4kV Emer. Bus 1H UV, Rev. 1
 1-ICP-SW-P-101A, Service Water Pump A Discharge Pressure Calibration, Rev. 4
 1-OP-21.4, Fan Requirements to Support Operability/Functionality, Rev. 20
 1-PT-138, Valve Inservice Inspection – LHSI System Functional Verification, Rev. 32
 1-PT-230.1, 1H Emergency Diesel Generator Starting Air Subsystem (Compressor, Dryer,
 Aftercooler, Motor and Lister Diesel) Operability Test – Train A, Rev. 9
 1-PT-36.11H, Degraded Voltage/Loss of Voltage Operational and ESF Response Time Test: 1H
 Bus, Rev. 30 & 30-OTO1
 1-PT-36.11J, Degraded Voltage/Loss of Voltage Operational and ESF Response Time Test: 1J
 Bus, Rev. 28 & 29-OTO2
 1-PT-36.13H, Engineered Safety Feature Actuation System Channel Calibration for 4160-Volt
 Emergency Bus H Undervoltage (Loss of Voltage/Degraded Voltage), Rev. 18 & 18-OTO1
 1-PT-36.13J, Engineered Safety Feature Actuation System Channel Calibration for 4160-Volt
 Emergency Bus J Undervoltage (Loss of Voltage/Degraded Voltage), Rev. 16(OTO1)
 1-PT-36.9.1H, Degraded Voltage/Loss of Voltage Operational Test: 1H Bus, Revs. 15 & 16
 1-PT-36.9.1J, Degraded Voltage/Loss of Voltage Operational Test: 1J Bus, Revs. 14 & 15
 1-PT-57.1B, Emergency Core Cooling Subsystem – Low Head Safety Injection Pump (1-SI-P-
 1B), Rev. 57
 1-PT-57.1D, SI Throttle Valves, Rev. 3
 1-PT-57.4, Safety Injection Operational Test, Rev. 60

1-PT-75.2A, Service water Pump (1-SW-P-1A) Quarterly Test, Rev. 57
 1-PT-75.2B, Operations Periodic Test, Rev. 59, performed 9/6/18
 1-PT-75.2B.1, Service Water Pump Head Curve Verification, Rev. 35, performed 7/16/18
 1-PT-82.2A, 1H Diesel Generator Test (Simulated Loss of Offsite Power), Rev. 57
 1-PT-82.5H, Fuel Oil Transfer System Operability Test (1H EDG)
 1-PT-82.8, Simultaneous Diesel Generator Start Test, Rev. 31
 1-PT-82H, 1H Emergency Diesel Generator Slow Start Test, Rev. 60
 1-PT-82H, 1H Emergency Diesel Generator Slow Start Test, Revs. 61 & 62
 1-PT-83.1, Simulated Loss of Offsite Power (LOOP) and ESF Actuation – H Bus, Rev. 65
 1-PT-83.12H, 1H Diesel Generator Test (Start by ESF Actuation) Followed by 24-Hr Run and Hot Restart Test, Rev. 29
 1-PT-83.3A, Load Sequencing Timers Verification Test, Rev. 0
 1-PT-83.4H, Loss of Offsite Power (LOOP) on Bus 1H for Shutdown Loads, Rev. 51
 1-PT-85, Electrical Periodic Test, DC Distribution System, Rev. 68
 1-PT-86E, Electrical Periodic Test, Quarterly DC Distribution System Test for Battery 1H, Rev. 15
 1-PT-86F, Electrical Periodic Test, Quarterly DC Distribution System Test for Battery 1J, Rev. 15
 1-PT-87.6H, Electrical Periodic Test, Emergency Diesel Generator Battery Charger 1H Service Test, Rev. 11
 1-PT-87.6J, Electrical Periodic Test, Emergency Diesel Generator Battery Charger 1J Service Test, Rev. 10
 1-PT-87E, Electrical Periodic Test, Intercell Connection Resistance Test for Battery 1H, Rev. 8
 1-PT-87F, Electrical Periodic Test, Intercell Connection Resistance Test for Battery 1J, Rev. 9
 1-PT-88H, Electrical Periodic Test, Emergency Diesel Generator 1H Battery Capacity Test, Rev. 23
 1-PT-88J, Electrical Periodic Test, Emergency Diesel Generator 1J Battery Capacity Test, Rev. 19
 1-PT-89.1A, Fuel Oil Sampling – 1H EDG and 2A Underground Tank
 1-WP-E1400038, Duct Bank “N” and “P” Underground 4160V Cable Replacement Temporary NSS Work Procedure, Rev. 2,
 2-MPM-1401-01, Unit 2 Terry Turbine Overspeed Trip Test Using Compressed Air, Rev. 11
 2-PT-138, Valve Inservice Inspection – LHSI System Functional Verification, Rev. 39
 2-PT-71.1Q, 2-FW-P-2, Turbine Driven Auxiliary Feedwater Pump, and Valve Test, Rev. 73
 2-PT-75.2A.1, Operations Periodic Test, Rev. 36, performed 10/2/18
 CM-AA-12, Configuration Management Change Process, Rev. 0
 CM-AA-DDC-301, Administrative Procedure, Post-Design Change Testing, Rev. 4
 Design Change DCU 16-3355 / DC Number: NA-14-00038 Section 6.0 Implementation Information
 DNES-AA-MOV-1001, Motor-Operated Valve Diagnostic Test Preparation and Evaluation, Rev. 2
 ENAP-0025, Department Administrative Procedure, Post-Modification Testing, Rev. 1
 ER-AA-102, Administrative Procedure, Preventive Maintenance Program, Rev. 12
 ER-AA-IST-104, ASME IST Program – Check Valve Condition Monitoring Program, Rev. 4
 ER-AA-MOV-10, Motor-Operated Valve Program, Rev. 2
 ER-AA-MOV-101, Motor-Operated Valve Program Process, Rev. 3
 LTC Controller Maintenance on Transformer Bank RSST B, NA-M-DSE-614, Rev. 10.
 NA-M-DSE-611, Reserve Station Service Transformer B (RSST) and Disconnect Switch #2415 Maintenance, Rev. 12
 NA-PROC59-000-0-AP-10, Loss of Electrical Power (with Twenty Attachments), Rev. 87
 OP-AA-102, Operability Determination, Rev. 3

PI-AA-200, Corrective Action, Revs. 5 & 34
 VPAP-1101, Station Administrative Procedure, Test Control, Rev. 8

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SDBD-NAPS-EG, System Design Basis Document for Emergency Diesel Generator System, Rev. 22
 SDBD-NAPS-EP, System Design Basis Document for Emergency Power System, Rev. 20
 SDBD-NAPS-ESS, System Design Basis Document for Station Service Power System, Rev. 20
 SDBD-NAPS-HO, System Design Basis Document for Miscellaneous Building Ventilation Systems, Rev. 9
 SDBD-NAPS-SI, System Design Basis Document for Safety Injection System, Rev. 25
 SDBD-NAPS-SW, System Design Basis for Service Water System, Rev. 23

PLANT MODIFICATIONS

Cable Pull Ticket Log and Termination Ticket Logs DC NA-14-00038 for cables 1FWEAOH001, 1RSOAOH001, 1SILBPH001, 1SILAOH001, and 1RSOBPH001. Cable replacements.
 DC NA-13-00016, Station Service Bus to Emergency Bus Tie Installation, dated 12/10/13
 DCP-04-100, Modify Torque Switch Bypass/NAPS/U-2, Rev. 0
 NA-17-00118, Replacement of Buried Fuel Lines-EDG Transfer Pumps to Day Tanks, Rev. 13
 NA-17-00134, SI-MOV-1862A/B Torque Switch Bypass Modification, Rev. 0
 NA-DC-000-NA-14-00038 – Duct Bank “N” and “P” Underground 4160V Cable Replacement.
 Post installed feeder testing: Cable 1FWEAOH001 (feeder to pump 1-FW-P-3A),
 Raceway Ticket Log DC NA-14-00038 for raceways 1CH997OA (cable 1FWEAOH001), 1CH946PA (cable 1FWEBPH001)
 Virginia Electric and Power Company (Dominion) North Anna Power Station Units 1 & 2
 Summary of Facility Changes, Tests, and Experiments, dated: 03/29/2017 – 10 CFR 50.59
 Evaluation: NAPS0-EVAL-2016-0008 DC-NA-13-01190, Reserve Station Service Transformer (RSST) “A” and “B” Replacement.

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 10000033737, Item Equivalency Evaluation, SBO Diesel Engine Governor Replacement, Rev. 0
 10000033909, Item Equivalency Evaluation, SBO Diesel Engine Governor Replacement ESI, Rev. 0
 1-EP-ST-2R CABLES 1,3,5 Tan Delta 34.5 kV, TD Report Summary, 9/19/2018.
 1-EP-ST-2R CABLES 2,4,6 Tan Delta 34.5 kV, TD Report Summary, 9/19/2018.
 1-LOG-6E, B-RSST Main Tank Oil Level, Rev. 104, dated 10/24/2018
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 59-J321-00001, Service water and Auxiliary Service Water Pumps, Rev. 17
 70246613, Hydroaire Service Johnston Pump Company / Sulzer /Serial Number 99JC1414S Certificate of Conformance, dated 6/14/13
 ACE 3005364, 0-AAC-DG-OM (SBO Diesel) Shutdown During 0-PT-82.12 (Quarterly Test on “E” Transfer Bus) Due to Oscillating Fuel Racks, dated 8/18/15

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 DC NA-13-00016, Station Service Bus to Emergency Bus Tie Installation, Partial Operational Acceptance Checklists 1 through 39, dated 9/20/14 through 10/6/17
 DC NA-13-00016, Station Service Bus to Emergency Bus Tie Installation, Test Plan, dated 5/25/16
 DNES-AA-GN-1002 Attachment 7 – Station Service Bus to Emergency Bus Cross Tie Installation, dated 9/20/2014
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 DNES-VA-ME-0028, Methodology for Including Instrument Uncertainties and Other Related Effects in Design Basis Flow Calculations. Rev. 0
 EG002, System EG, Emergency Diesel Generator Maintenance Rule Function
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 ET CME-95-0090, Letter regarding SWSOPA Item 02-94-2229-033, Rev. 0
 ETE-CME-2013-1024, Transmittal of Motor Operated Valve Setup Windows for NAPS Unit 1, Rev. 4
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 ET-N-06-0043, Evaluation of Emergency Diesel Generator Ambient Room Temperatures, Rev. 1
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 ME-0127, Motor Operated Valve Rate-of-Loading Effects Analysis, Rev. 1
 NA-13-00016, 0-GEP-2, Rev. 2 Attachment 1 – Test Plan North Anna Power Station, Rev. 7, dated 5/24/16
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 North Anna Power Station, Units 1 and 2, Issuance of Amendments Regarding Diesel Fuel Oil Testing Program (TAC Nos. MD2107 and MD2108), December 11, 2006
 NRC Information Notice 2007-36, Emergency Diesel Generator Voltage Regulator Problems
 NRC Information Notice 2010-04, Diesel Generator Voltage Regulation System Component Due to Latent Manufacturing Defect
 NRC Information Notice 2010-23, Malfunctions of Emergency Diesel Generator Speed Switch

Circuits

NUC-0001, Appendix A, Dominion Cable Technical Data Form, Rev. 5 dated 8/2014
 PIR1005191, Evaluate addition of cable withstand capability to 4160V switchgear coordination curves, dated 8/4/15
 SO-18-001, Operations Standing Order, ETE-CEE-2018-0014 (Engineering Technical Position to Support a Max TS Surveillance Steady State Voltage of 4400 Volts), 11/6/2018
 System Health Report EG – Emer. Diesel Gen., Q2-2018
 System Health Report EP – Electrical Power, Q2-2018
 System TQ - Q2 2018 EP – Electrical Power - System Health Report
 Virginia Power Response to Generic Letter 84-15 Proposed, Staff Actions to Improve and Maintain Diesel Generator Reliability, February 28, 1985
 VTM-000-59-P263-0002, Installation, Operation, and Maintenance Manual Enertech Nozzle Check Valve, Rev. 2
 VTM-59-I145-00002, Vendor Technical Manual, Medium-Voltage Power Circuit Breakers Type 5HK, 1200 thru 3000 Amperes, 5000 Volts, Rev. 5
 VTM-59-S834-00003, Vendor Technical Manual, Exceltronic AC Current or Voltage Transducers, Rev. 1

CONDITION REPORTS

016562	1033625	1091753	1101866	538587
1003398	1034569	1092653	1102321	550809
1005454	1034781	1092686	1102664	555688
1005481	1035416	1092687	1103654	566751
1005622	1035531	1092688	1104561	574214
1006400	1040785	1092724	1106519	574292
1006865	1055877	1092787	1108340	575112
1006913	1056668	1092827	365361	579001
1008144	1057678	1093102	404050	CA300322
1009947	1062184	1094674	519419	CA3139851
1013553	1064134	1098584	526962	CA3139852
1026046	1074806	1099783	528467	CA3139854
1033370	1083915	1101595	538006	CA3139857
1033509				CA3161559

WORK ORDERS

59100301803	59102665565	59102934165	59103021651	59103138173
59101302510	59102689808	59102934970	59103023194	59103138180
59101692217	59102696464	59102966336	59103023310	59103138187
59101743470	59102741195	59102971001	59103024418	59103140764
59102423433	59102779152	59102971021	59103027950	59203130165
59102461541	59102799616	59102971555	59103029897	59203130379
59102530602	59102801241	59102973761	59103042298	59203130790
59102548453	59102807270	59102973763	59103047150	59203136441
59102572947	59102809280	59102973770	59103068390	59203137600
59102590755	59102831490	59102973771	59103072200	59203138470
59102591932	59102839785	59102973772	59103076495	59203138553
59102616742	59102840264	59102973988	59103101881	59203139070
59102643167	59102841353	59102977100	59103102511	59203139141
59102649838	59102842109	59102977112	59103106381	59203139177
59102649839	59102844071	59102992461	59103107086	59203139199
59102654901	59102847825	59103001992	59103107093	59203140590

59102654961	59102848917	59103002602	59103107095	59203140694
59102655492	59102853507	59103012583	59103111351	59203144322
59102655667	59102854414	59103017817	59103117344	59203145552
59102656035	59102899986	59103017828	59103122505	59203268747
59102664976	59102899988	59103018571	59103125556	59203269588
59102665544	59102926794	59103019782		

CONDITION REPORTS WRITTEN DUE TO THIS INSPECTION

CR 1109221, DBAI inspector questioned the discharge flow of 1-HV-F-49B (SWPH Exhaust Fan)

CR 1109318, Missing explanation in weak link calculation

CR 1110556, IC in SW Pump Surveillance PT may require enhancement

CR 1110858, NRC DBAI - Calculation EE-0027 Methodology Concern

CR 1111451, During DBAI documentation concern with CM-AA-12

CR 1111471, NRC DBAI CR related CR Quality

CR 1111481, NRC DBAI - SW Pump House Ventilation Qualification Evaluation