

North Anna 2

2Q/2010 Plant Inspection Findings

Initiating Events

Significance: TBD Jun 30, 2010

Identified By: NRC

Item Type: AV Apparent Violation

Failure to Follow Procedure to Trip 'A' Reactor Coolant Pump on High Bearing Temperature

TBD. An apparent violation of Technical Specifications 5.4.1a was identified by the inspectors for the failure to adequately implement procedural requirements resulting in operation of the 'A' reactor coolant system (RCS) pump (RCP) beyond the motor high bearing temperature limit of 195 degF for approximately 10 minutes. The licensee entered this problem into their corrective action program as corrective action 170278 associated with condition report 382725.

The inspectors determined that the failure to implement an alarm response procedure to trip the 'A' RCP in a timely manner was a performance deficiency. The finding was more than minor because it could be reasonably viewed as a precursor to a significant event due to RCP motor operation in an unknown condition of bearing performance in which the melting of Babbitt material can lead to excessive shaft vibrations and consequent adverse impact on RCP seal performance leading to a seal loss of coolant accident. In accordance with NRC Inspection Manual Chapter 0609, "Significant Determination Process," the inspectors performed a Phase 1 analysis and determined the finding required a phase 2 evaluation because assuming worst case degradation the TS limit for RCS leakage would have been exceeded. The significance of this finding is to be determined (TDB) pending completion of a phase 3 evaluation. This finding involved the cross-cutting area of human performance, the component of decision making and the aspect of decision communications, H.1(c), because a reactor operator failed to communicate the loss of component cooling to the RCP motors to the senior reactor operator which led to a failure to trip the 'A' RCP on exceeding the motor bearing high temperature limit.

Inspection Report# : [2010003](#) (*pdf*)

Significance:  Mar 31, 2010

Identified By: Self-Revealing

Item Type: FIN Finding

Failure to Follow Procedures Results in Loss of Offsite Power to 1H and 2J Emergency Buses

A Green, self-revealing finding was identified for the licensee's failure to follow or adhere to licensee procedures for switchyard relay maintenance, human performance and management oversight, which resulted in the loss of the Technical Specifications (TS) required offsite circuit for the '1H' and '2J' emergency buses and the consequent auto-start of the respective emergency diesel generators (EDGs). The licensee entered this problem into their corrective action program as condition report 361280.

The inspectors determined that the failure to follow procedures to successfully accomplish nuclear switchyard relay maintenance was a performance deficiency (PD). The PD had a credible impact on safety due to the loss of a TS required offsite power supply and the start of the respective EDGs to restore power to the affected emergency buses. The inspectors determined the PD was more than minor because it impacted the initiating events cornerstone objective to limit the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown as well as power operations, and the related attribute of human performance due to human error in the implementation of a non-safety nuclear switchyard related procedures. In accordance with NRC Inspection Manual Chapter 0609, "Significant Determination Process," the inspectors performed a Phase 1 risk analysis and determined the finding was of very low safety significance (Green)

because the finding did contribute to a reactor trip but did not contribute to the likelihood that mitigation equipment or functions would not be available. This finding involved the cross-cutting area of human performance, the component of the work practices, and the aspect of personnel use human error prevention techniques commensurate with risk for the assigned task, H.4(a), because a licensee technician's failure to use proper human error prevention techniques resulted in a partial loss of offsite power on both units.

Significance:  Mar 31, 2010

Identified By: Self-Revealing

Item Type: FIN Finding

Failure to Establish a Procedure for Undervoltage Timers Results in Main Turbine/Reactor Trip

A Green, self-revealing finding was identified for the licensee's failure to establish an adequate procedure for calibration of under voltage timers which resulted in the failure of the Unit 2 'G' bus to fast transfer from 'C' reserve station service transformer (RSST) to the 'B' RSST and consequent loss of main turbine condenser vacuum causing a main turbine/reactor trip. The licensee entered this problem into their corrective action program as condition report 361280.

A self-revealing performance deficiency (PD) involving a Unit 2 turbine trip on loss of condenser vacuum was identified and resulted from the failure to establish an adequate procedure for the calibration of the time delay relays associated with the "G" bus cross-tie fast transfer circuit. This PD was the result of the failure to establish an adequate procedure for calibration of fast transfer relays. Specifically, licensee did not have mandated documentation in place to require technicians to use a proven method for timer calibration. The cause of PD was reasonably within the licensee's ability to foresee and correct. Specifically, the NRC previously issued NCV 05000338/2008002-03, "Inoperability of '1H' EDG Due to Failure to Adequately Establish Procedural Requirements for Protective Relay Testing," which involved a lack of procedural guidance and reliance of worker skill of the craft to successfully complete the activity. The PD adversely impacted the Initiating Events cornerstone objective to limit the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown as well as power operations and was related to the attribute of procedure quality because the correct timing relay calibration methodology was not documented in a procedure. In accordance with NRC Inspection Manual Chapter 0609, "Significant Determination Process," a phase 1 significance determination process (SDP) screening determined that a phase 2 evaluation was required as the finding contributed to both the likelihood of a reactor trip and the likelihood that mitigation equipment would not be available. A phase 3 SDP evaluation was performed by a regional SRA since the North Anna Risk

Informed Inspection Notebook did not have the level of detail to accurately assess the finding. The NRC's SPAR model was utilized to assess the risk significance of the finding modeling the impact of a loss of power to the 2G Bus without the fast transfer circuit available resulting in a reactor trip due to low condenser vacuum. The dominant sequence was a reactor trip without the condenser heat sink, caused by loss of power to the 2G bus with a failure of the cross-tie fast transfer circuit, with subsequent failures of main feedwater, auxiliary feedwater, and failure of feed and bleed cooling leading to core damage. The evaluation determined that the risk increase in core damage frequency was $1E-6$ per year, a finding of very low safety significance, Green. This finding involved the cross-cutting area of human performance, the component of the resources, and the aspect of complete, accurate and up-to-date procedures, H.2(c), because the licensee failed to establish an accurate procedure to ensure correct calibration of under voltage timers.

Inspection Report# : [2010002](#) (pdf)

Significance:  Oct 15, 2009

Identified By: Self-Revealing

Item Type: FIN Finding

Failure to Determine Cause and Related Corrective Action Results in Loss of a Required Offsite Power Supply

A self-revealing finding was identified for the licensee's failure to comply with the standards established in their corrective action program (CAP) to determine the correct cause and take corrective action to preclude repetition (CAPR) which resulted in the loss of the required offsite circuit for the '2H' emergency bus and the consequent auto-start of the '2H' emergency diesel generator (EDG). The licensee entered this problem into their CAP as condition report 332636.

The inspectors determined the finding was more than minor because it impacted the initiating events cornerstone objective to limit the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown as well as power operations, and the related attribute of equipment performance relative to offsite power reliability. The inspectors evaluated the finding using the significance determination process and determined that the finding was of very low significance or Green because the finding did not contribute to both the likelihood of a reactor

trip and the likelihood of unavailability of mitigation equipment functions. This finding involved the cross-cutting area of problem identification and resolution, the component of the corrective action program, and the aspect of thorough evaluation of problems such that resolutions address extent of condition, (P.1.c), because the licensee failed to determine the appropriate root cause and commensurate corrective actions.
Inspection Report# : [2009004](#) (pdf)

Mitigating Systems

Significance: G Jun 30, 2010

Identified By: Self-Revealing

Item Type: NCV NonCited Violation

Failure to Promptly Correct a Condition Adverse to Quality For 2-RH-MOV-2700 Breaker

Green: A self-revealing non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," was identified for the failure to promptly identify and correct a condition adverse to quality for the breaker associated with 2-RH-MOV-2700, Loop 'A' Hot Leg to RH Pump Isolation Valve. The licensee entered this problem into their corrective action program as condition report 372940.

The inspectors determined that the licensee's failure to promptly correct a known condition adverse to quality, as required by 10 CFR 50, Appendix B, Criterion XVI, was a performance deficiency. The inspectors reviewed IMC 0612, Appendix E and determined the finding was more than minor because it was similar to examples 4d and 4f. The phase 1 screening resulted in a need to perform phase 2 and phase 3 evaluations due to the finding resulting in the loss of mitigating function, specifically the ability to perform decay heat removal. A phase 3 analysis was performed by a regional senior risk analyst in accordance with the guidance of NRC Inspection Manual Chapter 0609 Appendix A. The significance determination process phase 3 risk evaluation resulted in a risk increase for the finding $<1E-6$ for core damage frequency (CDF) and $<1E-7$ for large early release frequency (LERF). The dominant sequence involved a steam generator tube rupture, followed by failure of the RHR system, and failure of the operators to refill the emergency condensate storage tank to continue secondary side cooling. The analysis assumed the operators, given the additional time while cooling the core using the secondary side, would be able to manually open 2-RH-MOV-2700. The finding was characterized as of very low safety significance (Green). The cause of this finding involved the cross-cutting area of problem identification and resolution, the component of corrective action program, and the aspect of implementation of corrective action (P.1(d)) because the licensee failed to correct the safety issue that existed with 2-RH-MOV-2700 in a timely manner, commensurate with its safety significance and complexity.

Inspection Report# : [2010003](#) (pdf)

Significance: G Mar 31, 2010

Identified By: Self-Revealing

Item Type: NCV NonCited Violation

Inadequate Procedure Implementation Results in Inoperability of a Fire Suppression System

A self-revealing, non-cited violation of Technical Specifications 5.4.1d was identified for the failure to adequately implement procedural requirements to reset a high pressure carbon dioxide (CO₂) fire suppression system for the EDG pump room #1. The licensee entered this problem into their corrective action program as condition report 371298.

A self-revealing performance deficiency (PD) was identified for the failure to adequately implement fire protection procedure requirements of 0-PT-104.2 to ensure zone 3 was adequately reset. This PD had a credible impact on safety due to an inoperable fire suppression system for safety-related components. The PD was more than minor because it impacted the mitigating systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences and the respective attributes of external events regarding fire due to the adverse impact on the capability of the fire suppression system and human performance due to the failure to properly implement a test procedure. In accordance with NRC Inspection Manual Chapter 0609, "Significant Determination Process," the inspectors performed a Phase 1 analysis and determined the finding was of very low safety significance (Green)

because core damage frequencies related to the fuel oil pump room #1 were less than 1E-6 and the duration of the system inoperability was less than three days. This finding involved the cross-cutting area of human performance, the component of work practices and the aspect of personnel do not proceed in the face of unexpected circumstances, H.4(a), because licensee personnel encountered problems with a CO2 system reset and failed to stop for proper guidance from supervision.

Inspection Report# : [2010002](#) (pdf)

Significance:  Jan 25, 2010

Identified By: NRC

Item Type: FIN Finding

Failure to Ensure RSST 'A' LTC Controller Settings Were Correctly Implemented

Green: The inspectors identified a finding having very low safety significance (Green) involving the failure of the licensee to ensure that the control settings for the non-safety related reserve station service transformer (RSST) 'A' replacement load tap changer (LTC) controller installed through design change package (DCP) 05-108 were correctly implemented such that the LTC could respond as expected and credited across the range of design conditions. The licensee declared the RSST inoperable and implemented a change to the controller settings in compliance with design, and is tracking further actions under CR 358215.

The inspectors concluded that the finding was more than minor in that it is associated with the reactor safety mitigating systems cornerstone attribute of equipment performance and affects the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, failure of the LTC to operate, as credited, due to incorrect LTC controller set points or inadequate control voltages, would have caused the 4kV safety related buses to prematurely disconnect from offsite power during a design basis event. The finding is of very low safety significance as it did not result in an actual loss of safety function. Further, this finding did not constitute a violation of NRC requirements as the RSST 'A' is a non-safety related component. The team also evaluated the finding for cross-cutting aspects and determined it to involve a failure to ensure adequately trained resources were available to design, check, and review complex digital controllers and their settings, and so involved the human performance (H) resources component cross cutting aspect (H.2.(c)).

Inspection Report# : [2009007](#) (pdf)

Significance:  Jan 25, 2010

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to Ensure the Adequacy of Control Voltage to the 4160 and 480 VAC Equipment

Green: The team identified a finding of very low safety significance and associated NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the failure to ensure the adequacy of control voltage to the 4160 and 480 VAC equipment in support of mitigating system loads; specifically, a lack of voltage drop analysis for 125 VDC control power to breaker open/close coil, spring charging motors, and other miscellaneous DC loads. The licensee entered this issue into the corrective action program as CR361181.

The inspectors concluded that the finding is more than minor in that it involves the mitigating systems cornerstone attribute of design control and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

The inspectors determined the failure to assure and verify that adequate control voltage was available to close and open the 4160 VAC and 480 VAC breakers could have affected the capability of safety-related equipment to respond to initiating events. The finding is of very low safety significance as it did not result in an actual loss of safety function. The team also evaluated the finding for cross-cutting aspects and none were identified as this was determined to not be indicative of current licensee performance.

Inspection Report# : [2009007](#) (pdf)

Significance:  Nov 12, 2009

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to Adequately Address the Potential for CO2 Over-pressurization within the Unit 2 Cable Vault &

Tunnel

The inspectors identified a Green non-cited violation (NCV) of North Anna Nuclear Station Operating License Condition 2. (D), "Fire Protection," in that the licensee failed to adequately address the potential for carbon dioxide (CO₂) over-pressurization within Fire Area (FA) 3-2, the Unit 2 Cable Vault & Tunnel (CV&T). The team determined that adequate CO₂ venting did not exist, resulting in the potential failure of the CO₂ gas boundary. This condition had the effect of allowing gas migration from the CV&T (Zone 2-2) into the CV&T electrical penetration room (Zone 2-4) due to the failure of the door between the two areas to remain closed. The licensee entered and tracked this issue in the corrective action program via Condition Report (CR) 019539, and Apparent Cause Evaluation, ACE000693.

This finding is a performance deficiency because the licensee did not consider the potential for CO₂ over-pressurization within the Unit 2 CV&T (FA 3-2) according to the applicable industry code of record for the facility. The finding is more than minor because the CO₂ system is required to provide primary suppression coverage for the Cable/Tunnel area of Fire Area 3-2, and the finding is associated with the reactor safety, mitigating systems, cornerstone attribute of protection against external factors, (i.e. fire), and it substantially affects the objective of ensuring reliability and capability of systems that respond to initiating events. The inspectors assessed the finding using Inspection Manual Chapter (IMC) 0609, Appendix F, "Fire Protection Significance Determination Process." The finding was assigned a low degradation rating since the issue screened as very low in the SDP Phase 2 evaluation. This was the case because the only creditable ignition sources in the CV&T are transients which are administratively controlled. Also, the safe shutdown analysis (SSD) already assumes that all cables in the CV&T are damaged; therefore a gas boundary failure within the fire area would affect the fire suppression component of defense-in-depth only and not the capability to safely shutdown. In addition, the CO₂ system was backed up by a manual sprinkler system and a manual deluge system.

The inspectors reviewed guidance contained in IMC 0305 to determine if any cross-cutting aspects existed. The inspectors concluded that because the licensee's failure to address the potential for CO₂ over-pressurization in the Unit 2 CV&T (FA 3-2) resulted from lack of original CO₂ test data and occurred during initial plant start-up, it did not reflect current licensee performance and no cross-cutting aspect was identified.

Inspection Report# : [2009008](#) (pdf)

Significance:  Oct 15, 2009

Identified By: NRC

Item Type: FIN Finding

Degradation of a Flood Protection Feature

A finding was identified by the NRC for the licensee's failure to maintain the functionality of an internal flood protection feature which was installed to reduce core damage frequency based on evaluations performed for the plant. The licensee entered this problem in their corrective action program as condition reports 337066 and 339918.

The finding is more than minor because if left uncorrected the finding has the potential to lead to a more significant safety concern because degradation of the internal flood protection feature for extended periods of time would unacceptably increase the risk of core damage. The inspectors evaluated the finding using the significance determination process (SDP) and determined a Phase III evaluation was required. A regional senior reactor analyst performed a Phase III evaluation under the SDP, and the performance deficiency was determined to be of very low safety significance (Green).

The dominant accident sequences consisted of service water ruptures in the chiller room that were not isolated before water impacted the IRR and ESGR. Significant assumptions were the flooding frequency, duration of the performance deficiency (3days), and that water reaching a height of 24 inches in the relay room and reaching the ESGR would be considered to cause core damage. A human reliability analysis was performed to determine the probability of the operator failing to implement leak isolation before the flood impacted the ESGR which assumed that the operator would be responding to level alarms in the affected spaces and have obvious diagnosis of the problem and considerable time to implement leak isolation. There was no cross-cutting aspect due to the legacy aspect related to the finding (not indicative of current licensee performance).

Inspection Report# : [2009004](#) (pdf)

Significance: G Oct 15, 2009

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to Adequately Design and Install Oil Collection Devices for Reactor Coolant Pump Motor Stator Air Coolers

The inspectors identified a non-cited violation of the North Anna Power Plant Facility Renewed Operating Licensee NPF-4 & 7, Condition D, Fire Protection Program, which involved a failure to ensure an adequate design of the Units 1 and 2 reactor coolant pumps (RCP) oil collection system associated with the motor stator air coolers. The licensee entered the problem into their corrective action program as condition report 325879.

The finding was more than minor because it impacted the mitigating systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences, and the related attribute of protection against external factors such as fire. This finding has a credible impact on safety because the inadequate design of the oil collection system presented a degradation of a fire confinement component which has a fire prevention function of not allowing an oil leak to reach hot surfaces. The finding was of very low safety significance or Green because of the low degradation rating of the fire confinement category related to the as found condition of oil accumulation at the motor stator air coolers, the extremely low frequency of RCP oil leaks, minor actual RCP oil leaks during the past operating cycle, and other area fire protection defense-in-depth features such as automatic fire detection, manual suppression capability (fire brigade), and safe shutdown capability from the main control room. There was no cross-cutting aspect due to the legacy aspect related to both examples (not indicative of current licensee performance).

Inspection Report# : [2009004](#) (*pdf*)

Barrier Integrity

Emergency Preparedness

Occupational Radiation Safety

Public Radiation Safety

Physical Protection

Although the NRC is actively overseeing the Security cornerstone, the Commission has decided that certain findings pertaining to security cornerstone will not be publicly available to ensure that potentially useful information is not provided to a possible adversary. Therefore, the [cover letters](#) to security inspection reports may be viewed.

Miscellaneous

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