North Anna 2
1Q/2011 Plant Inspection Findings

Initiating Events

Significance: G Mar 31, 2011
Identified By: NRC
Item Type: NCV NonCited Violation
Failure to Determine the Cause and Take Corrective Action to Preclude Repetition for Lightning Induced Reactor Trips
A non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," was identified by the inspectors for the licensee’s failure to determine the cause of a significant condition adverse to quality (SCAQ) involving an automatic reactor trip following a lightning strike on the Unit 2 containment building. This resulted in the Unit 2 automatic reactor trip on June 16, 2010, because of the insufficient corrective action to preclude repetition. The Licensee entered this issue into the Corrective Action Program as CR 384967.

The inspectors determined that the failure to determine the cause of a SCAQ was a performance deficiency (PD). The inspectors reviewed IMC 0612, Appendix B and determined the PD was more than minor because, if left uncorrected, it has the potential to lead to a more significant safety concern in that failing to identify the cause of SCAQs and thus failing to take corrective action to preclude repetition could result in additional initiating events or impacts on mitigating systems. In addition, the inspectors determined that it 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, specifically the attribute of Protection Against External Factors in that the removal of the Overtemperature Delta T lag function removed protection from lightning strikes on the reactor protection system. The inspectors reviewed IMC 0609, Attachment 4 and determined that the finding was of very low safety significance, or Green, because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation equipment or functions will not be available. The cause of this finding involved the cross-cutting area of problem identification and resolution, the component of operating experience, and the aspect of evaluation of identified problems, P.1(c) because the licensee failed to thoroughly evaluate the cause of the 2005 reactor trip and conduct effectiveness reviews of corrective actions to ensure the problems are resolved.

Inspection Report# : 2011002 *(pdf)*

Significance: G Dec 31, 2010
Identified By: NRC
Item Type: FIN Finding
Failure to Maintain PM Procedures for Circuit Breakers Current with Industry Information and OE
A Green, self-revealing finding was identified for the failure to maintain a preventative maintenance (PM) procedure for circuit breakers current with industry information and operating experience (OE), as required by procedure, DNAP-2001, “Equipment Reliability Process,” Revision 0. The licensee entered this problem into their corrective action program as condition report 331819.

The failure to maintain an adequate preventive maintenance (PM) procedure led to an age related failure of a motor starter (main contactor) causing a fire in safetyrelated breaker cubicle J1 of motor control center (MCC) 1J1-2S which supplied power to the D control rod drive mechanism cooling fan, 01-HV-F-37D. The failure to establish an adequate PM task for testing the main contactor of a circuit breaker to ensure that it is in good operating condition and will operate reliably until the next scheduled maintenance was determined to be a performance deficiency. Significance Determination Process (SDP) phase 1 screening of the finding was performed and the finding was determined to increase the likelihood of a fire external event and required a phase 3 SDP evaluation. A phase 3 SDP analysis was performed by a regional SRA in accordance with Inspection Manual Chapter 0609 Appendix F, NUREG /CR -6850 as amended by NUREG/CR -6850 supplement 1, with the NRC North Anna SPAR risk model used to determine the conditional core damage probability (CCDP) for the fire scenarios. The

dominant sequence was a fire in MCC1J1-2S damaging MSIV cables resulting in a reactor trip transient with failure of high pressure recirculation and residual heat removal due to fire effects
leading to core damage. The evaluation concluded that the core damage frequency (CDF) increase of the potential fire scenarios was characterized as of very low safety significance (Green). This finding involved the cross-cutting area of problem identification and resolution, the component of OE, and the aspect of implementation and institutionalization of OE through changes to station processes and procedures
(P.2(b)), because the licensee failed to incorporate existing industry OE to ensure procedural guidance was adequate for testing of the main contactor.
Inspection Report# : 2010005 *(pdf)*

Significance: G Sep 30, 2010
Identified By: Self-Revealing
Item Type: FIN Finding
Failure to conduct adequate review of calculation results in main turbine/reactor trip
A self-revealing finding was identified for the licensee's failure to conduct an adequate review of calculations for the operation of the Unit 2 main generator automatic voltage regulator (AVR), as required by licensee procedure CM-AA-CLC-301, "Engineering Calculations", Rev. 3, which resulted in the actuation of a main generator protective lockout relay and subsequent main turbine/reactor trip. The licensee entered this problem into their corrective action program as condition report 378800.

The inspectors determined that the failure to conduct an adequate owner's review of calculation EE-0826, as required by licensee procedure CM-AA-CLC-301, "Engineering Calculations", Rev. 3, was a performance deficiency (PD). The inspectors reviewed IMC 0612, Appendix E and determined the PD was more than minor, because it was similar to example 4.b in that the procedural error resulted in a reactor trip or other transient. In addition, the inspectors determined that it 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, specifically the attribute of Design Control in that the AVR design change was not properly controlled and Human Performance in that licensee personnel conducting the owner's review failed to follow the requirements of CM-AA-CLC-301 and conduct an owner's review of calculation EE-0826. The inspectors reviewed IMC 0609 Attachment 4 and determined that the finding was of very low safety significance, or Green, because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation equipment or functions will not be available. The cause of this finding involved the cross-cutting area of human performance, the component of decision making, and the aspect of conservative assumptions and safe actions, H.1(b), because the licensee failed to use conservative assumptions and demonstrate that the proposed action was safe in making the decision that the incorrect inputs for the five-point curve would not be used by the MEL tuning software. (Section 4OA3.1.1)

Inspection Report# : 2010004 *(pdf)*

Significance: G Sep 30, 2010
Identified By: Self-Revealing
Item Type: FIN Finding
Inadequate set point for balbance-of-plant bus undervoltage relay
A self-revealing finding was identified for the failure to establish an adequate set point for a balance-of-plant 4160 V bus undervoltage protection relay. The inadequate set point caused a reactor trip upon automatic start of a steam generator feedwater pump. The event was reported to the NRC in Licensee Event Report (LER) 0500339/2010-002-00. Corrective action has been taken to reduce the probability of recurrence of the problem. The licensee has placed this issue in their corrective action program as Root Cause Evaluation (RCE) 001012.

The fact that the motor starting voltage dip of the twin 4500 horsepower motor feedwater pump was below the set point of the bus undervoltage protection relays was a performance deficiency. The typical industry standard practice for bus undervoltage is that the set point be below the motor starting voltage dip to preclude spurious actuation of the undervoltage relays for expected voltage transients such as motor stating. This industry standard practice is documented in Institute of Electrical and Electronics Engineers Standard 666-1991, "IEEE Design Guide for Electric Power Service Systems for Generating Stations." Table 7.2, "Motor Protection Devices," states that the suggested setting for undervoltage relay is that it be set to override voltage drop due to motor starting. The potential for spurious

tripping of the undervoltage relays has nuclear safety ramifications, in that it can contribute to a reactor trip, as it did on May 28, 2010. The performance deficiency is more than minor because it was associated with the attribute of design control and adversely affected the objective of the initiating event cornerstone. The inappropriate undervoltage relay set point contributed to a reactor trip which is an event that upset plant stability and challenged critical safety functions. The finding was evaluated for significance using Inspection Manual Chapter 0609, Appendix E. The finding was determined to be very low safety significance, Green, because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation functions will not be available. The cause of the finding was evaluated in the licensee's corrective action program as RCE001012. According to the LER and RCE001012, the cause of the finding was determined to be lack of a design basis for the undervoltage protection relay. Since the set point was established well outside the two-year window of current performance and there was no prior event that provided an opportunity to identify this problem, this issue did not represent current licensee performance. Therefore, no associated cross-cutting aspect was identified. (Section 4OA3.3)
Inspection Report# : 2010004 *(pdf)*

Significance: G Sep 30, 2010
Identified By: NRC
Item Type: NCV NonCited Violation
Failure to follow procedure to trip "A" reactor coolant pump on high bearing temperature
A non-cited violation of Technical Specifications 5.4.1a was identified by the inspectors for the failure to adequately implement procedural requirements which resulted 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 (PD). The PD 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. Significance determination process (SDP) phase 1 screening determined the finding to be a primary system loss of coolant accident initiator contributor as RCP operation without motor bearing cooling could lead to motor bearing failure, RCP vibration and potential vibration induced RCP seal damage. The finding was determined to fit under the Initiating Events cornerstone in that assuming worst case degradation the potential seal leakage could exceed the technical specification limit for RCS leakage and required phase 2 analysis. Since the North Anna SDP pre-solved worksheet did not specifically address loss of cooling to the RCP motor bearings, a phase 3 analysis was performed by a regional SRA using the NRC's North Anna SPAR model. The sequence was a reactor trip transient caused by a lightning strike in the switchyard, loss of the 1H emergency bus, RCP motor bearing damage due to loss of bearing cooling, failure to trip the RCP, RCP seal failure, failure of high pressure injection, successful depressurization and failure of low pressure injection leading to core damage. A diagnosis and action human error probability for RCP trip was developed for the event conditions. The risk of the event was mitigated by the availability of seal cooling, seal
injection and the time and cues available to the operator to trip the RCP prior to vibration induced seal failure. The phase 3 risk evaluation determined that the risk increase of the finding was <1E-6 for core damage frequency and <1E-7 for Large Early Release Frequency, a finding of very low risk significance (Green). 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 the failure to trip the 'A' RCP on exceeding the motor bearing high temperature limit. (Section 4OA5.3)
Inspection Report# : 2010004 *(pdf)*

Mitigating Systems

Significance: G Mar 31, 2011
Identified By: NRC
Item Type: NCV NonCited Violation

Inadequate Installation of Unit 2 Low Head Safety Injection Piping and Related Supports
A non-cited violation of 10 CFR 50, Appendix B, Criterion V, “Instructions, Procedures and Drawings,” was identified by the NRC for the failure to accomplish the installation of Unit 2 low head safety injection (LHSI) piping and supports in accordance with prescribed drawings which resulted in no contact between piping and two different pipe supports and caused an operable but degraded and nonconforming condition. The licensee entered this problem into their corrective action program as condition reports 413315 and 418989.

A performance deficiency was identified by the NRC for the failure to adequately install Unit 2 LHSI pipe supports in accordance with prescribed drawings. This PD had a credible impact on safety due to the loss of design basis margin resulting in a reasonable doubt regarding reliability and capability during a seismic event. The PD was more than minor because it impacted the mitigating systems cornerstone objective to ensure the reliability and capability of systems which respond to initiating events and the related attribute of equipment performance because the reliability of the support configurations had been impacted by the reduction in design margin. In accordance with NRC IMC 0609, “Significant Determination Process,” the inspectors performed a Phase 1 analysis and determined the finding was of very low safety significance or Green due to a design deficiency confirmed not to result in a loss of operability or functionality. The finding had no cross-cutting aspects due to its legacy nature.

Inspection Report# : 2011002 *(pdf)*

Significance: G Mar 31, 2011
Identified By: NRC
Item Type: NCV NonCited Violation
Inadequate Post Maintenance Test Program Instructions for Safety-Related Instrument and Control Preventative Maintenance
A Green, non-cited violation of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was identified by the NRC for failure to adequately prescribe the correct program instructions to ensure safety-related instrument and control (I&C) preventative maintenance (PMs) received the appropriate post maintenance testing (PMT). The licensee entered this problem into their corrective action program as condition report 417730.

A performance deficiency was identified by the NRC for the failure to adequately prescribe programmatic PMT instructions to ensure safety-related I&C PMs had proper PMT. The inspectors reviewed Inspection Manual Chapter (IMC) 0612, Appendix B, and determined the finding was more than minor because if left uncorrected it would have the potential to result in a more significant safety event. In accordance with IMC 0609, “Significant Determination Process,” the inspectors performed a Phase 1 analysis and determined that the finding was of very low significance because the finding was not a design deficiency, did not represent a loss of safety function and did not screen as potentially risk significant due to a seismic, flooding or severe weather initiating event. This finding involved the cross-cutting area of human performance, the component of the resources, and the aspect of complete documentation, H.2(c), because the licensee failed to adequately prescribe programmatic PMT instructions to ensure safety-related I&C PMs had proper PMT.
Inspection Report# : 2011002 *(pdf)*

Significance: G Dec 31, 2010
Identified By: NRC
Item Type: NCV NonCited Violation
Inadequate Corrective Action for Fatigued Fuse Clips in Safety-Related Breakers
A Green, non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," was identified by the NRC for failure to promptly identify and correct a condition adverse to quality regarding fatigued fuse clips associated with safety-related breakers. The licensee entered this problem into their corrective action program as condition report 400128.

The inspectors determined that the failure to promptly initiate corrective actions for fatigued fuse clips was a performance deficiency (PD) which resulted in two safetyrelated breaker failures. The inspectors reviewed IMC 0612, Appendix B, and determined 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 related attribute of design control for the initial structure, system,

component design. In accordance with NRC Inspection Manual Chapter (IMC) 0609, “Significance Determination Process,” the inspectors performed a Phase 1 analysis and determined that the finding was of very low significance because the finding was not a design deficiency, did not represent a loss of safety function and did not screen as potentially risk significant due to a seismic, flooding or severe weather initiating event. 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 initiate adequate corrective actions to address
extent of condition for fatigued fuse clips.
Inspection Report# : 2010005 *(pdf)*

Significance: G Dec 31, 2010
Identified By: NRC
Item Type: NCV NonCited Violation
Inadequate Design Control Measures for Field Changes Affecting Station Battery Cables
The inspectors identified a non-cited violation of 10 CFR 50, Appendix B, Criterion III, “Design Control,” for the failure to ensure that design control measures for field changes impacting the support of station battery cables were commensurate with those applied to the original design requirements. The licensee entered this problem into their corrective action program as condition report 358461.
The inspectors determined that the failure to adhere to the requirements of Criterion III for field changes involving the support of station battery cables was a performance deficiency (PD). This PD had a credible impact on safety due to an increase in battery post loading not analyzed by the vendor for a seismic event impacting the unsupported cables. 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 related attribute of design controls due to changes made to battery cable supports which created a condition adverse to quality. In accordance with NRC Inspection Manual Chapter (IMC) 0609, “Significant Determination Process,” the inspectors performed a Phase 1 analysis and determined that the finding was of very low significance (Green) because the design deficiency did not result in the loss of functionality. The finding had no cross-cutting aspects because it is not indicative of current licensee performance.
Inspection Report# : 2010005 *(pdf)*

Significance: G Sep 30, 2010
Identified By: Self-Revealing
Item Type: NCV NonCited Violation
Failure to correctly translate turbine driven auxiliary feedwater pump lube oil subsystem vent design basis into specifications or drawings
A self-revealing non-cited violation of 10 CFR 50, Appendix B, Criterion III, “Design Control,” was identified for the failure to correctly translate the design basis of the Unit 2 turbine driven auxiliary feedwater pump (TDAFWP) lube oil subsystem vent into specifications or drawings. The licensee entered this problem into their corrective action program as condition report 378798.

The inspectors determined that the licensee’s failure to correctly translate the Unit 2 TDAFWP lube oil subsystem vent into specifications or drawings as required by Criterion III was a performance deficiency (PD). The inspectors reviewed IMC 0612, Appendix E and determined the PD was more than minor, because it was similar to examples 3b and 3k in that the failure to correctly translate the design into drawings adversely impacted the operation of the system and resulted in reasonable doubt about the operability of the system. The inspectors reviewed IMC 0609 Attachment 4 and determined that the finding was of very low safety significance, or Green, because the finding was a design or qualification deficiency confirmed not to result in loss of operability or functionality. The cause of this finding did not involve a cross-cutting aspect because it is not indicative of current licensee performance. (Section 4OA3.1.2)

Inspection Report# : 2010004 *(pdf)*

Significance: 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)*

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

Last modified : June 07, 2011