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Arkansas Nuclear 1 – Quarterly Plant Inspection Findings

4Q/2017 – Plant Inspection Findings

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Initiating Events

Significance: G May 10, 2017

Identified By: NRC

Item Type: NCV Non-Cited Violation

Inadvertent Reactivity Addition

Inspectors documented a Green self-revealing finding and associated non-cited violation of Unit 1 Technical Specification 5.4.1.a. Specifically, the licensee failed to properly pre-plan and perform maintenance of the integrated control system equipment that can affect the performance of safety-related equipment. The licensee failed to plan and perform post-maintenance testing on newly installed integrated control system cards before returning the system to service. As a result, the licensee failed to detect a failed card. When the associated controller was placed into automatic mode, the system responded to a false demand signal that resulted in an inadvertent rod withdrawal that required prompt operator action to terminate the power increase and restore power to the original level. To correct the failed card, the licensee installed a new card that had been tested and validated prior to installation. The licensee documented this issue in Condition Report CR-ANO-1-2016-05551.

Inspectors concluded that the failure to perform a post-maintenance test prior to placing a component in service is a performance deficiency. Specifically, the work order for replacing the steam generator reactor demand circuit card did not include a verification that the system was functioning properly after the replacement card was installed in the plant. The performance deficiency is more than minor because if left uncorrected, the performance deficiency has the potential to become a more significant safety concern. Specifically, if the operator had not taken prompt action to mitigate the event, it could have resulted in a more significant plant transient and could have challenged plant equipment. In accordance with Inspection Manual Chapter 0609, Attachment 4, "Initial Characterization of Findings," issued October 7, 2016, and Exhibit 1 of IMC 00609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Issued June 19, 2012, the inspectors determined the finding to be of very low safety significance

(Green) because the finding is associated with the initiating events cornerstone and did not cause a reactor trip. The finding was determined to have a cross-cutting aspect in the area of human performance associated with Work Management, because the licensee did not ensure that they followed a process of planning, controlling, and executing the work activities in a formalized manner, allowing the work order to not have complete instructions for a post-maintenance test.

Inspection Report# : 2017001 (*pdf*)

Significance: **Y** Feb 10, 2014

Identified By: NRC

Item Type: VIO Violation

Unit 1 - Failure to Follow the Materials Handling Program during the Unit 1 Generator Stator Move

Unit 1 Apparent Violation. The inspectors reviewed a self-revealing apparent violation of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," which states, in part, that "activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures or drawings." The licensee did not follow the requirements specified in Procedure EN-MA-119, "Material Handling Program," in that, the licensee did not perform an adequate review of the subcontractor's lifting rig design calculation and the licensee failed to conduct a load test of the lifting rig prior to use. The licensee initiated Condition Report CR-ANO-C-2013-00888 to capture this issue in the corrective action program. The licensee's corrective actions included repairing damage to the Unit 1 turbine deck, fire main system, and electrical system. In addition, changes were made to various procedures including Procedure EN-DC-114, "Project Management," to provide guidance on review of calculations, quality requirements, and standards associated with third party reviews.

The inspectors determined that the finding was more than minor because it was associated with the procedural control attribute of the initiating event cornerstone, and adversely affected the cornerstone's objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown, as well as power operations. The stator drop affected offsite power to Unit 1, resulting in a loss of offsite power for approximately 6 days and a loss of the alternate AC diesel generator. The inspectors used Inspection Manual Chapter 0609, Attachment 0609.04, "Initial Characterization of Findings," dated June 19, 2012, to evaluate the significance of the finding. Since the plant was shutdown, the inspectors were directed to Inspection Manual Chapter 0609, Appendix G, Attachment 1, "Shutdown Operations Significance Determination Process Phase 1 Operational Checklists for Both PWRs and BWRs," Checklist 4, dated May 25, 2004. Using Appendix G, Attachment 1, Checklist 4, the inspectors concluded that this finding represented a degradation of the licensee's ability to add reactor coolant system inventory when needed since a loss of offsite power occurred and therefore, this finding required a Phase 3 analysis. A shutdown risk model was developed by modifying the at-power Arkansas Nuclear One Unit 1 Standardized Plant Analysis Risk Model, Revision 8.19. The NRC risk analyst assessed the significance of shutdown events by calculating an instantaneous conditional core damage probability. The results were dominated by two sequences. The largest risk contributor (approximately 97 percent) was based on a failure of the emergency diesel generators without recovery. The second largest risk contributor was the failure to recover decay heat removal. The result of the analysis was an instantaneous conditional core damage probability of $3.8E-4$; therefore, this finding was preliminarily determined to have high safety significance (Red).

This finding had a cross-cutting aspect in the area of human performance associated with field presence, because the licensee did not ensure adequate supervisory and management oversight of work activities, including contractors and supplemental personnel. Specifically, the licensee did not provide a sufficient level of oversight in that, the requirements in Procedure EN-MA-119, for design approval and load testing of the temporary hoisting assembly, were not followed [H.2].

Issued as preliminary Red AV in IR 05000313,368/2013012 dated March 24, 2014.

Final significance was determined to be Yellow. NOV issued in IR 05000313,368/2014008 dated June 23, 2014.

Inspection Report# : 2013012 (*pdf*)

Inspection Report# : 2014008 (*pdf*)

Inspection Report# : 2016007 (*pdf*)

Inspection Report# : 2016008 (*pdf*)

Mitigating Systems

Significance: G Sep 21, 2017

Identified By: NRC

Item Type: NCV Non-Cited Violation

Failure to Promptly Identify and Correct an Inadequate Design Bases Calculation

The inspectors identified a Green, non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Actions," requires, in part, that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformance are promptly identified and corrected. Specifically, from 1996 until August 10, 2017, the licensee failed to properly resolve the environmental conditions in room 38 following a high-energy line break, even when challenged during a self-assessment by members of the quality assurance group in June 29, 2015. In response to this issue, the licensee determined that in the event of a break in the letdown line, an engineered safety feature signal automatic closure of both the inside and outside reactor building isolation valves occurs in approximately 40 seconds, preventing room 38 from going "harsh." This finding was entered into the licensee's corrective action program as Condition Report CR-ANO-1-2017-02441.

The inspectors determined that the licensee's failure to adequately evaluate and take prompt corrective actions to resolve an identified condition adverse to quality related to the high energy line break analysis for room 38 was a performance deficiency. The performance deficiency was more than minor because it was associated with the design control attribute of the Mitigating Systems Cornerstone and affected the associated objective to ensure availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, when the licensee identified that the environmental conditions in room 38 of the auxiliary building were "harsh," as determined by Design Bases Calculation CALC-01-EQ-1002-02, they failed to properly resolve the condition adverse to quality. In accordance with Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, Exhibit 2, "Mitigating Systems Screening Questions," dated July 1, 2012, the inspectors determined that the finding was of very low safety significance (Green) because the finding (1) was not a deficiency affecting the design and qualification of a mitigating structure, system, or component, and did not result in a loss of operability or functionality; (2) did not represent a loss of system and/or function; (3) did not represent an actual loss of function of at least a single train for longer than its allowed outage time, or two separate safety systems out-of-service for longer than their technical specification allowed outage time; and (4) does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety-significant for greater than 24 hours in accordance with the licensee's maintenance rule program. The finding has a cross-cutting aspect in the area of human resources, training, because the organization failed to provide training and ensure knowledge transfer to maintain a knowledgeable, technically competent workforce and instill nuclear safety values

Inspection Report# : 2017007 (*pdf*)

Significance:  Aug 03, 2017

Identified By: NRC

Item Type: NCV Non-Cited Violation

Failure to Comply with ECCS Technical Specifications

The inspectors reviewed a Green self-revealing finding and associated non-cited violation of Unit 1 Technical Specification 3.5.2, "Emergency Core Cooling System (ECCS) - Operating," for the licensee's failure to ensure the operability of the P36A high pressure injection pump after reinstalling its feeder breaker during a unit outage. A violation of Unit 1 Technical Specification 3.0.4 was also identified for making a mode change without meeting the requirements to do so. Following unit restart, the pump failed to start during routine equipment rotation, resulting in one train of emergency core cooling system being inoperable for longer than allowed by Unit 1 Technical Specifications. The licensee subsequently identified that the feeder breaker had not been fully racked into position. Inspectors also noted that the breaker had been racked in manually rather than using the normal electric racking tool, and no special precautions had been taken to ensure this infrequently-used method was successful. When the breaker was correctly racked in, the pump was satisfactorily tested. The licensee subsequently verified that all similar breakers were correctly racked into position. The licensee entered this issue into their corrective action program as Condition Report CR-ANO-1-2017-01764.

The inspectors determined that the failure to verify that the P36A high pressure injection pump was operable after racking its feeder breaker into the switchgear cubicle was a performance deficiency. The performance deficiency was more than minor because it was associated with the human performance attribute of the Mitigating Systems Cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

The inspectors performed the initial significance determination for the performance deficiency using NRC Inspection Manual 0609, Appendix A, Exhibit 2, "Mitigating Systems Screening Questions," dated June 19, 2012, and concluded that it required a detailed risk evaluation because it involved the loss of a single train of mitigating equipment for longer than the technical specification allowed outage time. Therefore, a Region IV senior reactor analyst performed a bounding detailed risk evaluation. The estimate in the increase in core damage frequency is 4.4E-8 per year, or of very low safety significance (Green). This finding had a cross-cutting aspect in the area of Human Performance, Avoid Complacency, because the licensee failed to ensure that individuals recognize and plan for the possibility of mistakes, latent issues, and inherent risk, even while expecting successful outcomes. Specifically, the licensee failed to verify that the pump was operable after its breaker was reinstalled, even though an infrequently-used method was employed.

Inspection Report# : 2017002 (*pdf*)

Significance:  May 10, 2017

Identified By: NRC

Item Type: NCV Non-Cited Violation

Failure to Identify Damaged Lugs

The inspectors documented a self-revealing finding and associated non-cited violation of Unit 1 Technical Specification 5.4.1.a, for the failure to properly perform maintenance on the Unit 1 suction valve to the emergency core cooling system B and containment spray B. Specifically, the licensee failed to identify a damaged electrical lug on the valve actuator during maintenance. The lug subsequently failed and the valve failed to stroke fully open after being returned to service. The licensee repaired the lug and restored the valve to service. The licensee documented this issue in Condition Report CR-ANO-1-2017-00270.

The licensee failed to identify a damaged electrical lug on a motor-operated valve during maintenance, which is a performance deficiency. The performance deficiency is more than minor because it is associated with the human performance attribute of the mitigating systems cornerstone and adversely affected the cornerstone objective to ensure the reliability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the performance deficiency resulted in the failure of a suction valve for one train of emergency core cooling systems and containment spray systems after the valve was returned to service from the maintenance. Using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, Exhibit 2, "Mitigating Systems Screening Questions," the inspectors determined that the finding required a detailed risk evaluation because the finding represented an actual loss of function of a single train for greater than its technical specification allowed outage time. The analyst determined in a detailed risk evaluation that by combining internal and external event inputs yielded an estimate of the total increase in core damage frequency of $8.5E-7$ /year, or of very low safety significance (Green). The finding was determined to have a cross-cutting aspect in the area of human performance associated with Avoid Complacency because the primary cause of the performance deficiency involved the failure to plan for the possibility of mistakes and use appropriate error reduction tools.

Inspection Report# : 2017001 (*pdf*)

Significance:  May 10, 2017

Identified By: NRC

Item Type: NCV Non-Cited Violation

Failure to Evaluate All Required Functions for Operability

The inspectors identified a finding and an associated non-cited violation of 10 CFR 50, Appendix B, Criterion V, Instructions, Procedures, and Drawings, for failure to evaluate the impact of all the required safety functions for operability when the valve failed to fully open during a valid demand. Specifically, the licensee failed to evaluate the operability impact on the safety function to close for the Unit 1 motor-operated borated water storage tank outlet valve CV-1408 before de-energizing and locking open the valve and declaring it operable. After the inspectors questioned this decision, the licensee declared the valve inoperable and repaired the valve operator. The licensee documented this issue in Condition Report CR-ANO-1-2017-00324.

The failure to evaluate the operability impact of all required safety functions for Unit 1 motor-operated valve, CV-1408, before de-energizing and locking open the valve is a performance deficiency. The performance deficiency is more than minor because it is associated with the equipment performance attribute of the mitigating systems cornerstone and adversely affected the cornerstone objective to ensure the availability of systems that respond to initiating events to prevent undesirable consequences. Specifically, by locking the valve open, the licensee prevented Train B of the emergency core cooling system from being able to be remotely isolated from the borated water storage tank during the containment recirculation phase of a potential loss of coolant accident, which could have allowed air

binding of the pumps. Using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, Exhibit 2, "Mitigating Systems Screening Questions," the issue screened as having very low safety significance (Green) because it was not a design or qualification deficiency; did not represent a loss of system; did not result in the actual loss of function of a train of technical specification equipment for greater than its allowed outage time; and did not screen as potentially risk significant due to seismic, flooding, or severe weather. The inspectors determined that this finding has a cross cutting aspect in the human performance area of Consistent Process, because the performance deficiency was caused by not following a consistent, systematic approach to making a decision concerning operability of the affected train.

Inspection Report# : 2017001 (*pdf*)

Significance:  May 01, 2017

Identified By: NRC

Item Type: FIN Finding

Inadequate FLEX Power Supply Connections

The team identified a finding for the failure to assure that FLEX power supply connections would be reliable following all required postulated beyond design basis external events. Specifically, the team identified that one installed cable configuration could potentially be damaged during high wind events preventing operation of the portable diesel generator required to operate plant equipment. This issue was entered into the licensee's corrective action program as Condition Report CR-ANO-C-2017-00316.

The failure to adequately install the electrical modification for connecting the portable diesel generator was a performance deficiency. The performance deficiency was more than minor because it was associated with the protection against external factors attribute of the Mitigating Systems Cornerstone and adversely affected the Mitigating Systems Cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The significance of the finding was evaluated using NRC Inspection Manual Chapter 0609, Appendix O, "Significance Determination Process for Mitigating Strategies and Spent Fuel Pool Instrumentation (Orders EA-12-049 and EA-12-051)," dated October 7, 2016, and Appendix M, "Significance Determination Process Using Qualitative Criteria," dated April 12, 2012. A bounding evaluation was performed using the exposure time, tornado frequency, and frequency of a random failure of both emergency diesel generators. The licensee's compliance date with the order was January 12, 2016, so an exposure time of one year was used. The tornado frequency selected was for an F2 or greater tornado striking the site ($5.31E-5$ /year). The random failure frequency of both unit's emergency diesel generators ($3.15E-3$ /year) was selected since the emergency diesel generators are protected from damage during high wind events. This is a conservative bounding analysis because it assumes that any tornado would result in damage causing a loss of offsite power and damage the cables in terminal panel 2TB1011 on the roof. The change in core damage frequency for the finding was determined to be $1.67E-7$ /year. Therefore, the finding was determined to a very low risk significance. The finding had a cross-cutting aspect in the challenge to the unknown component of Human Performance because the licensee failed to adequately address all potential damage scenarios when developing the modification design requirements for beyond design basis external events.

Inspection Report# : 2017008 (*pdf*)

Significance:  May 01, 2017

Identified By: NRC

Item Type: FIN Finding

Inadequate FLEX Procedures

The team identified a finding with three examples for the licensee failing to assure that FLEX procedures were adequate for implementation of the strategies credited in the licensee's Final Implementation Plan. This issue was entered into the licensee's corrective action program as Condition Reports CR-ANO-C-2017-00341, CR-ANO-C 2017-00344, CR-ANO-1-2017-00250, and CR-ANO-C-2017-00295.

The failure to provide adequate procedures for responding to an extended loss of all AC power due to a flooding or high wind event was a performance deficiency. The performance deficiency was more than minor because it was associated with the protection against external factors attribute of the Mitigating Systems Cornerstone and adversely affected the Mitigating Systems Cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The significance of the finding was evaluated using NRC Inspection Manual Chapter 0609, Appendix O, "Significance Determination Process for Mitigating Strategies and Spent Fuel Pool Instrumentation (Orders EA-12-049 and EA-12-051)," dated October 7, 2016, and Appendix M, "Significance Determination Process Using Qualitative Criteria," dated April 12, 2012. A bounding evaluation was performed using the exposure time, frequency of random failure of both emergency diesel generators, and tornado frequency or flood frequency. The licensee's order compliance date was January 12, 2016, so an exposure time of one year was used. The random failure frequency of both unit's emergency diesel generators ($3.15E-3/\text{year}$) was selected since the emergency diesel generators are protected from damage during high wind and flood events. For the two examples impacted by flood events, the flood frequency selected was for a flood exceeding the site elevation ($8.47E-5/\text{year}$). The change in core damage frequency for these examples was determined to be $2.67E-7/\text{year}$. For the example which would only impact the licensee's response to a high wind event, the tornado frequency selected was for an F2 or greater tornado striking the site ($5.31E-5/\text{year}$). The change in core damage frequency for this example was determined to be $1.67E-7/\text{year}$. Therefore, the three examples of the finding were determined to be of very low risk significance. The finding had a cross-cutting aspect in the Procedure Adherence component of the Human Performance area because the licensee failed to adequately perform reviews required by the licensee's procedure control program to confirm that: (1) instructions for implementing the strategies in the licensee's Final Implementation Plan were complete and appropriate; and (2) reviews for affected procedures related to other procedure revisions identified impacts on the implementing strategies and revised them appropriately.

Inspection Report# : 2017008 (*pdf*)

Significance: Y Aug 01, 2014

Identified By: NRC

Item Type: VIO Violation

Inadequate Flood Protection for Auxiliary and Emergency Diesel Fuel Storage Buildings

The inspectors identified a finding of preliminary substantial safety significance (Yellow) for the failure to design, construct, and maintain the Units 1 and 2 auxiliary and emergency diesel fuel storage buildings in accordance with the safety analysis reports' description of internal and external flood barriers so that they could protect safety-related equipment from flooding. Two apparent violations were associated with this finding:

- a. Contrary to 10 CFR Part 50, Appendix B, Criterion III, "Design Control," the licensee failed to assure that regulatory requirements and the design basis were correctly translated into specifications, drawings, procedures, and instructions, and that design changes were subjected to design control measures commensurate with those applied to the original design.
- b. Contrary to 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," the licensee failed to prescribe documented instructions for activities affecting quality and accomplish activities affecting quality in accordance with drawings.

The licensee entered these issues into the corrective action program as Condition Reports CR-ANO-C-2013-01304 and CR-ANO-C-2014-00259. The licensee resolved the safety concern by replacing the degraded seals or parts, installing penetration seals, implementing compensatory measures, and/or incorporating instructions into procedures.

The inspectors determined that the finding was more than minor because it was associated with the protection against external factors attribute of the mitigating systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the performance deficiency resulted in the vulnerability to flooding of safety-related equipment necessary to maintain core cooling in the auxiliary and emergency diesel fuel storage buildings. The inspectors used Inspection Manual Chapter 0609, Attachment 0609.04, "Initial Characterization of Findings," dated June 19, 2012, and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, to evaluate the significance of the finding. In accordance with Appendix A, Exhibit 4, the inspectors determined that a detailed risk evaluation was necessary because, if the flood barriers were assumed to be completely failed, two or more trains of a multi-train system would be degraded during an external flood.

The NRC risk analysts determined that the finding should be evaluated in accordance with NRC Inspection Manual Chapter 0609, Appendix M, "Significance Determination Process Using Qualitative Criteria," April 12, 2012. Appropriate quantitative significance determination process tools did not exist to provide a reasonable estimate of the significance because a plant-specific flood hazard analysis did not exist and was not expected to be available until sometime in 2015. The risk analysts used NRC Inspection Manual Chapter 0609, Appendix M, Table 4.1, "Qualitative Decision-Making Attributes for NRC Management Review," to determine the preliminary safety significance of the finding. The following were the dominant considerations in reaching a preliminary risk determination conclusion:

1. With respect to the auxiliary and emergency diesel fuel storage buildings, there were more than 100 unknown ingress pathways for a flooding event, therefore if an external flood above grade level were to occur, the buildings would flood.
2. The unexpected rate of flooding would likely be beyond the licensee's capability to prevent or mitigate as equipment and connections associated with alternative mitigating strategies, could be submerged.
3. All reactor core cooling and makeup could fail due to significant flooding of the auxiliary and emergency diesel fuel storage buildings.
4. The change in core damage frequency was quantitatively bounded below 2×10^{-3} and qualitatively determined to likely be less than 1×10^{-4} . The bounding and qualitative results are based on the frequency of the probable maximum flood event and a loss of all equipment needed for core cooling and makeup.

This finding was preliminarily determined to be of substantial safety significance (Yellow) for Unit 1 and Unit 2, as determined by a Significance and Enforcement Review Panel.

This finding had a cross-cutting aspect in the area of human performance related to maintaining design margins. Specifically, the licensee did not design, construct, and/or maintain over 100 flood barriers to ensure design margins were sustained.

The finding was determined to be Yellow (substantial safety significance) for both Units. Final significance determination and NOV issued January 22, 2015 (IR 05000313;638/2014010) (ML15023A076).

Inspection Report# : 2014010 (*pdf*)

Inspection Report# : 2014009 (*pdf*)

Inspection Report# : 2016008 (*pdf*)

Inspection Report# : 2016007 (*pdf*)

Barrier Integrity
Emergency Preparedness
Occupational Radiation Safety
Public Radiation Safety
Security

The security cornerstone is an important component of the ROP, which includes various security inspection activities the NRC uses to verify licensee compliance with Commission regulations and thus ensure public health and safety. The Commission determined in the staff requirements memorandum (SRM) for SECY-04-0191, "Withholding Sensitive Unclassified Information Concerning Nuclear Power Reactors from Public Disclosure," dated November 9, 2004, that specific information related to findings and performance indicators associated with the security cornerstone will not be publicly available to ensure that security-related information is not provided to a possible adversary. Security inspection report cover letters will be available on the NRC Web site; however, security-related information on the details of inspection finding(s) will not be displayed.

Miscellaneous

Current data as of : February 01, 2018

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