Arkansas Nuclear 1
1Q/2016 Plant Inspection Findings

Initiating Events

Significance: G Mar 31, 2016
Identified By: NRC
Item Type: NCV Non-Cited Violation
Failure to Assess and Manage Hot Work Risk
The inspectors identified a Green finding and an associated non-cited violation of 10 CFR 50.65(a)(4), "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," for the failure to assess and manage the increase in risk due to performing hot work near risk-significant Unit 1 non-vital switchgear. Specifically, the licensee failed to identify the work as having "low integrated risk," and implement required risk management actions to protect available fire pumps and brief the fire brigade. As immediate corrective actions, the licensee stopped the hot work until they completed a risk assessment and risk management actions. This finding was entered into the licensee's corrective action program as Condition Report CR-ANO-1-2016-00348.

The failure to assess and manage the increase in risk of performing hot work near risk-significant Unit 1 non-vital switchgear is a performance deficiency. The finding is more than minor because it adversely affected the protection against external factors (i.e., fires) attribute of the initiating event cornerstone to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the licensee failed to assess the potential for hot work to cause a fire, and manage the risk to critical safety functions. Because the finding affects the assessment of risk associated with performing maintenance activities, NRC Manual Chapter 0609, Attachment 4, "Initial Characterization of Findings," directs significance determination using NRC Manual Chapter 0609, Appendix K, "Maintenance Risk Assessment and Risk Management Significance Determination Process." A regional senior reactor analyst used Manual Chapter 0609, Appendix K, Flowchart 2, "Assessment of Risk Management Actions," dated May 19, 2005, to assess the significance of the finding. The licensee site probabilistic risk assessment engineer provided information which estimated the incremental core damage probability deficit of 3.3E-10. The analyst confirmed similar results using the NRC probabilistic risk assessment model. The incremental large early release probability deficit was conservatively estimated to be equal to the incremental core damage probability deficit. Since this issue dealt only with the failure to take risk management actions, Flowchart 2, "Assessment of Risk Management Actions," of Appendix K was used. In accordance with Flowchart 2, because the incremental core damage probability deficit was less than 1E-10 and the incremental large early release probability deficit was less than 1E-7, the finding screened as having very low safety significance (Green). The inspectors determined this finding has a problem identification and resolution cross-cutting aspect in the area of Teamwork, because the most significant contributor involved the failure to communicate and coordinate activities across organizational boundaries to ensure nuclear safety is maintained. Specifically, work groups did not inform operations work control personnel that hot work was part of the intended work.
Inspection Report# : 2016001 *(pdf)*

Significance: G Mar 31, 2016
Identified By: Self-Revealing
Item Type: FIN Finding
Failure to Identify and Repair Intermittent Card Failure Before Returning to Service Causes Reactor Trip
The inspectors reviewed a self-revealing Green finding for the failure to fully understand a malfunction which resulted

in putting susceptible cards back into the Unit 1 integrated control system. In 2014, a failure caused a feedwater transient, which operators successfully mitigated. Troubleshooting identified and repaired some of cards susceptible to the intermittent problem. The licensee reinstalled cards that had not been repaired in the integrated control system, which later caused a feedwater transient and subsequent manual reactor trip on December 15, 2015. The licensee documented the issue in Condition Report CR-ANO-1-2015-04178 and replaced the cards.

The failure to fully understand a malfunction, which resulted in putting susceptible cards back into the Unit 1 integrated control system, is a performance deficiency. The finding is more than minor because it adversely affected the equipment performance attribute of the initiating event cornerstone to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the licensee placed the suspect cards back into the integrated control system, which caused a feedwater transient and contributed to a subsequent manual reactor trip. Using NRC Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, Exhibit 1, "Initiating Events Screening Questions," the finding screened as having very low safety significance (Green) because the deficiency resulted in a reactor trip, but mitigation equipment remained unaffected. Specifically, main feedwater remained available. The inspectors determined this finding has a problem identification and resolution cross-cutting aspect in the area of Evaluation, because the primary cause of the performance deficiency involved the failure to thoroughly evaluate a 2014 integrated control system failure so that the resolution addressed the cause commensurate with safety significance.
Inspection Report# : 2016001 *(pdf)*

Significance: G Dec 31, 2015
Identified By: NRC
Item Type: NCV Non-Cited Violation
Failure to Assess Risk for Switchyard Work
The inspectors identified a non-cited violation of 10 CFR 50.65(a)(4), "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," for failure to assess the risk impact of switchyard maintenance. Specifically, the station failed to properly classify some switchyard work and assess risk as specified in Procedure COPD-024, "Risk Assessment Guidelines," Revision 055 during multiple periods of switchyard work between October 2 and 15, 2015. The work involved the repair of damaged conduit on the voltage regulators, transformer refurbishment, relay calibrations, and motor operated disconnect replacement. For immediate corrective actions, each operations shift manager provided training to their crews to ensure they were familiar with required station risk updates. This issue was entered into the licensee's corrective action program as Condition Report CR-ANO-C-2015-04147.

The failure to assess the increase in risk due to switchyard maintenance is a performance deficiency. The finding is more than minor because it adversely affected the protection against external factors attribute of the Initiating Event cornerstone to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the licensee failed to evaluate the potential impact of maintenance in the switchyard which could result in plant upsets or transients. Because the finding affects the licensee's assessment of risk associated with performing maintenance activities, NRC Manual Chapter 0609, Attachment 4, "Initial Characterization of Findings," directs significance determination via the use of NRC Manual Chapter 0609, Appendix K, "Maintenance Risk Assessment and Risk Management Significance Determination Process," dated May 19, 2005. A regional senior reactor analyst screened the change in core damage frequency to be <1E-6 for Unit 1 and calculated the change in core damage frequency to be 1.5E-7 for Unit 2. In accordance with Flowchart 1 of Appendix K, the significance of this finding was determined to be of very low safety significance (Green), because the calculated Incremental Core Damage Probability Deficits for both units were not greater than 1.0E-6. The inspectors determined this finding has a cross-cutting aspect in the area of Consistent Process, because the primary cause of the performance deficiency involved the failure to use a consistent, systematic approach to manage work decisions in the switchyard [H.13]. (Section 1R13)

Inspection Report# : 2015004 *(pdf)*

Significance: G Jun 30, 2015
Identified By: NRC
Item Type: NCV Non-Cited Violation
Inadequate Procedure for Severe Weather Preparation
The inspectors identified a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, & Drawings," for the failure to establish appropriate procedures for preparations for severe weather. Specifically, inspectors observed that the licensee failed to ensure that all outside areas were inspected in order to secure material prior to severe weather, to reduce the probability of light material missile damage on plant equipment. The licensee concluded that the assignment of responsibilities was unclear in Procedure EN-FAP-EP-010, "Severe Weather Response," Revision 1, leading to confusion among the two operating crews. This issue was entered into the licensee's corrective action program as Condition Reports CR-ANO-C-2015-00854 and CR-ANO-C-2015-00859.

The failure to have a procedure to ensure that all outside areas would be inspected in order to secure loose material prior to the arrival of severe weather, to reduce the probability of light material missile damage on plant equipment was a performance deficiency. The performance deficiency was more than minor because it was associated with the procedure quality attribute of the Initiating Events Cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, during severe weather, unsecured material could become a missile that impacts equipment and upsets plant stability. Using NRC Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," the inspectors determined that the finding had very low safety significance (Green) because it did not represent an actual reactor trip and the loss of mitigation equipment. This finding has a human performance crosscutting aspect associated with work management, in that the organization failed to implement a process of planning, controlling, and executing work activities, including coordination with different groups or job activities. Specifically, only one crew performed the required inspections when severe weather had been forecast since the procedure in use did not clearly assign responsibilities to both operating crews [H.5].

Inspection Report# : 2015002 *(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# : 2016007 *(pdf)*
Inspection Report# : 2014008 *(pdf)*
Inspection Report# : 2013012 *(pdf)*

Mitigating Systems

Significance: G Dec 31, 2015
Identified By: NRC
Item Type: NCV Non-Cited Violation
Failure to Identify and Correct Rain Water Accumulation in the Emergency Diesel Generator System Exhausts
The inspectors identified a non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for failure to identify a condition adverse to quality. Specifically, the licensee failed to identify rain water accumulation in the exhaust systems for the Units 1 and 2 emergency diesel generators due to clogged water drains. As a result, rainwater in the exhaust piping may have caused the emergency diesel generators to exceed the seismic rating of the exhaust systems during a seismic event. The inspector identified that when ANO removed the rain shields in 1998, they planned to implement periodic drain line cleaning to avoid clogging, but never created the preventive maintenance item to implement the cleaning. In response, the licensee cleaned the drain lines, drained the exhaust pipes, and implemented preventative maintenance activities to periodically clean the drain lines. This issue was entered into the licensee's corrective action program as Condition Report CR-ANO-C-2015-04570.

The failure to identify that rainwater was accumulating in all four emergency diesel exhaust systems and could impact the availability of the system is a performance deficiency. The performance deficiency is more than minor because it

affected the protection against external factors attribute of the Mitigating Systems Cornerstone objective 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, operators failed to recognize that drain lines were blocked during routine operations to drain the exhaust lines, which allowed rain water to accumulate that exceeded the allowed seismic loading of the piping. Using NRC Manual Chapter 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," the inspectors determined that a detailed risk evaluation was required. A senior reactor analyst performed a detailed risk evaluation and determined that the increase in core damage frequency was 1.3E-7/year (Green). The dominant risk was determined to involve seismically induced losses of offsite power. Emergency feedwater and a Unit 2 emergency diesel generator remained available to successfully avoid core damage. The inspectors determined this finding has a cross-cutting aspect in the area of Avoid Complacency because the primary cause of the performance deficiency involved the failure to plan for or recognizing latent conditions involving clogged drain lines [H.12]. (Section 1R18)
Inspection Report# : 2015004 *(pdf)*

Significance: G Sep 30, 2015
Identified By: Self-Revealing
Item Type: NCV Non-Cited Violation
Failure to Promptly Correct a Condition Adverse to Quality Involving Motor Control Center Bus Stabs
Green. The inspectors reviewed a self-revealing violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for the failure to correct conditions adverse to quality. Specifically, the licensee failed to promptly replace short bus stabs with longer bus stabs in six 480V safety-related motor control centers as planned following a 2007 motor control center fault. Subsequently, safety-related motor control centers remained susceptible to a fault because corrective actions had not been implemented. This issue was entered into the licensee's corrective action program as Condition Report 2015-2661. The licensee has completed the modifications to all breakers except those requiring an outage.

The failure to promptly correct conditions adverse to quality associated with 480V breaker connections to bus bars was a performance deficiency. The performance deficiency is more than minor because it is associated with the equipment performance attribute of Mitigating Systems Cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events. Specifically, untimely corrective actions allowed an increased likelihood of a fault to continue to exist that would result in the loss of the associated safety-related motor control centers if the fault occurred. Using NRC Inspection Manual Chapter 0609 Appendix A, "Significance Determination Process (SDP) for Findings At-Power," the inspectors determined that the finding was of very low safety significance (Green) because the finding was not a deficiency affecting design or qualification, did not represent a loss of system and/or function, and did not represent an actual loss of function. This finding was not assigned a cross-cutting aspect because it was not indicative of current plant performance; the licensee decided to remove the corrective actions from the corrective action program more than 3 years ago.
Inspection Report# : 2015003 *(pdf)*

Significance: G Jun 30, 2015
Identified By: NRC
Item Type: NCV Non-Cited Violation
Failure to Perform Testing of Diesel Fuel Oil Transfer Piping
The inspectors identified a non-cited violation of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," for the licensee's failure to establish and maintain an adequate testing program for the fuel oil transfer piping for Units 1 and 2. Specifically, the licensee did not establish inservice testing to detect degradation of the fuel oil piping between the fuel oil storage tanks and the emergency diesel generator day tanks. This issue was entered into the licensee's corrective action program as Condition Report CR-ANO-2-2015-01092.

The failure to perform the required testing of the fuel oil piping is a performance deficiency. The performance deficiency is more than minor because it is associated with the protection against external factors attribute of the Mitigating Systems Cornerstone, and affects the cornerstone objective to ensure availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequence. Specifically, the licensee failed to perform examinations required to provide reasonable assurance that the piping could perform its intended function during design basis seismic events, and therefore maintain the ability to supply fuel to the emergency diesel generators. Using NRC Inspection Manual Chapter 0609, Appendix A, Exhibit 2, "Mitigating Systems," the inspectors determined the finding is of very low safety significance (Green) because the finding did not involve the loss or degradation of equipment or function specifically designed to mitigate a seismic initiating event. The finding has a cross-cutting aspect in the area of human performance, associated with conservative bias, because the licensee did not use decision-making practices that emphasized prudent choices over those that were simply allowable. Specifically, during the buried piping initiative inspections that were completed in August 2013, the licensee failed to identify that the condition of the safety-related piping had never been evaluated and was being treated as a run to failure component [H.14].

Inspection Report# : 2015002 *(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 x 10-3 and qualitatively determined to likely be less than 1 x 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# : 2016007 *(pdf)*
Inspection Report# : 2014010 *(pdf)*
Inspection Report# : 2014009 *(pdf)*

Barrier Integrity

Significance: G Dec 31, 2015
Identified By: NRC
Item Type: NCV Non-Cited Violation
Failure to Properly Translate the Design Requirements for the Unit 1 Decay Heat Vault Rooms Being Sealed
The inspectors identified a non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the failure to correctly translate the regulatory requirements and design basis into specifications, drawings, procedures, and instructions to ensure the Unit 1 decay heat vault boundary components could perform their safety-related function. Inspectors identified that the Unit 1 decay heat vaults had a safety-related function to limit accident dose consequences to the public and the control room operators, but some boundary components had not been classified as safety-related. In response to this issue, the licensee performed an immediate operability determination and reviewed

previous leakage testing on the containment spray and low pressure injection systems. This issue was entered into the licensee's corrective action program as Condition Report CR-ANO-1-2015-04195.

The inspectors determined that the failure to correctly translate the design requirement that the Unit 1 decay heat vaults be sealed to mitigate the dose consequences of an accident into specifications, drawings, procedures, and instructions was a performance deficiency. This performance deficiency was more than minor because it was associated with the design control and safety-related structures, systems, and components and barrier performance attributes of the Barrier Integrity cornerstone and adversely affected the cornerstone objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events for the auxiliary building. Specifically, the licensee failed to ensure that Unit 1 decay heat vault boundary components were designated as safety-related components and met the applicable requirements needed to assure the reliability and integrity of the barrier function. Using Inspection Manual Chapter 0609, Appendix A, Exhibit 3, "Barrier Integrity Screening Questions," the issue screened as having very low safety significance (Green) under the Control Room, Auxiliary, Reactor, or Spent Fuel Pool Building questions because the finding only represented a degradation of the radiological barrier function provided for the control room and the auxiliary building and it did not represent a degradation of the barrier function of the control room against smoke or a toxic atmosphere. The inspectors determined that this finding did not have a cross-cutting aspect because the most significant contributor did not reflect current licensee performance since this condition had existed since construction. (Section 4OA5)
Inspection Report# : 2015004 *(pdf)*

Emergency Preparedness

Occupational Radiation Safety

Public Radiation Safety

Security

Although the Security Cornerstone is included in the Reactor Oversight Process assessment program, the Commission has decided that specific information related to findings and performance indicators pertaining to the Security Cornerstone will not be publicly available to ensure that security information is not provided to a possible adversary. Other than the fact that a finding or performance indicator is Green or Greater-Than-Green, security related information will not be displayed on the public web page. Therefore, the cover letters to security inspection reports may be viewed.

Miscellaneous

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