UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 EAST LAMAR BOULEVARD
ARLINGTON, TEXAS 76011-4511

January 23, 2019

Mr. Richard L. Anderson, Site Vice President
Arkansas Nuclear One
Entergy Operations, Inc.
N-TSB-58
1448 S.R. 333
Russellville, AR 72802-0967

SUBJECT: ARKANSAS NUCLEAR ONE – NRC INTEGRATED INSPECTION REPORT 05000313/2018004 AND 05000368/2018004

Dear Mr. Anderson:

On December 31, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Arkansas Nuclear One, Units 1 and 2. On January 3, 2019, the NRC inspectors discussed the results of this inspection with Mr. J. Kirkpatrick, General Manager of Plant Operations, and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented one finding of very low safety significance (Green) in this report. This finding involved a violation of NRC requirements. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2 of the Enforcement Policy.

If you contest the violation or significance of this NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region IV; the Director, Office of Enforcement; and the NRC resident inspector at the Arkansas Nuclear One.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at http://www.nrc.gov/reading-rm/adams.html and at the NRC Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Neil O'Keefe, Chief
Project Branch D
Division of Reactor Projects

Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6

Enclosure:
Inspection Report 05000313/2018004
and 05000368/2018004 w/Attachment:
Documents Reviewed

U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Number(s):	05000313, 05000368
License Number(s):	DPR-51, NPF-6
Report Number(s):	05000313/2018004, 05000368/2018004
Enterprise Identifier:	I-2018-004-0005
Licensee:	Entergy Operations, Inc.
Facility:	Arkansas Nuclear One, Units 1 and 2
Location:	Russellville, Arkansas
Inspection Dates:	October 1, 2018 to December 31, 2018
Inspectors:	C. Henderson, Senior Resident Inspector M. Tobin, Resident Inspector T. Sullivan, Resident Inspector R. Bywater, Project Engineer J. Dixon, Senior Project Engineer S. Hedger, Emergency Preparedness Inspector
Approved By:	Neil O'Keefe Branch Chief Division of Reactor Projects

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting an integrated inspection at Arkansas Nuclear One, Units 1 and 2, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to https://www.nrc.gov/reactors/operating/oversight.html for more information. A self-revealed violation and additional items are summarized in the tables below.

List of Findings and Violations

Failure to Fully Implement Vendor Manual Recommended Preventive Maintenance			
Cornerstone	Significance	Cross-cutting Aspect	Inspection Procedure
Mitigating Systems	Green NCV 05000368/2018004-01 Closed	None	71152 – Problem Identification and Resolution
The inspectors reviewed a self-revealed, Green finding and associated non-cited violation of Arkansas Nuclear One, Unit 2, Technical Specification 6.4.1.a, for the licensee's failure to properly preplan maintenance that can affect the performance of safety-related equipment. Specifically, the licensee failed to fully implement vendor manual recommended preventive maintenance for the shunt trip attachment switches because only some electrical contacts were being cleaned. This resulted in the failure of train A safety-related breaker that provides power to the swing service water pump B (2P-4B) to automatically close and start pump 2P-4B during surveillance testing.			

Additional Tracking Items

Type	Issue number	Title	Inspection Procedure	Status
LER	0500313/2016-003-01	Tornado Vulnerabilities Resulting in Unanalyzed Condition Arkansas Nuclear One, Unit 1	71153	Closed
LER	0500368/2017-001-00	Inadequate Protection from Tornado Missiles Identified Due to Nonconforming Design Conditions	71153	Closed
LER	05000313/2018-002-01	Leak in Class 1 Reactor Coolant System Pressure Boundary Piping Due to Cyclic Fatigue Failure on a High Pressure Injection Line Drain Tap Weld	71153	Closed

PLANT STATUS

Unit 1 began the inspection period at full power. On November 29, 2018, power was lowered to 85 percent to perform main turbine valve testing and was returned to full power.

On December 18, 2018, Unit 1 had an automatic reactor trip from 100 percent power after the loss of power to non-vital 4160 volt bus A1. On December 21, 2018, Unit 1 commenced a reactor startup and the reactor was made critical. The unit was returned to rated thermal power on December 23, 2018.

Unit 2 began the inspection period in shutdown for Refueling Outage 2R26, which started on September 29, 2018. On November 19, 2018, Unit 2 commenced a reactor startup and the reactor was made critical. The unit was returned to full power on November 24, 2018.

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors performed plant status activities described in IMC 2515, Appendix D, "Plant Status," and conducted routine reviews using IP 71152, "Problem Identification and Resolution." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

REACTOR SAFETY

71111.04—Equipment Alignment

Partial Walkdown (5 Samples)

The inspectors evaluated system configurations during partial walkdowns of the following systems/trains:

(1) Unit 2 train A spent fuel pool cooling during full core offload on November 6, 2018
(2) Unit 2 train A shutdown cooling system on November 10, 2018
(3) Unit 1 train A high pressure injection system on November 21, 2018
(4) Unit 1 and Unit 2 quality condensate storage tank on November 28, 2018
(5) Unit 2 train A plant protective system on December 31, 2018

71111.05AQ—Fire Protection Annual/Quarterly

Quarterly Inspection (6 Samples)

The inspectors evaluated fire protection program implementation in the following selected areas:

(1) Unit 1 emergency feedwater pump area, Fire Area C, Zone 38-Y, on October 23, 2018

(2) Unit 2 fuel handling area, Fire Area B, Zone 2151-A, on October 23, 2018

(3) Unit 2 train A 2A3 switchgear room, Fire Area II, Zone 2101-AA, on November 22, 2018

(4) Unit 2 train A 2B53 switchgear room, Fire Area B, Zone 2091-BB, on November 22, 2018

(5) Unit 1 north emergency diesel generator room, Fire Area D, Zone 86-G, on November 27, 2018

(6) Unit 1 east (B) decay heat removal pump room, Fire Area A, Zone 10-EE, on November 28, 2018

71111.07—Heat Sink Performance

Heat Sink (1 Sample)

The inspectors evaluated Unit 2 reactor building containment coolers 2VCC-2A/B/C/D performance on December 17, 2018.

71111.11—Licensed Operator Requalification Program and Licensed Operator Performance

Operator Requalification (1 Sample)

The inspectors observed and evaluated Unit 1 licensed operator requalification scenario on November 27, 2018.

Operator Performance (2 Samples)

The inspectors observed and evaluated:

(1) Unit 2 reactor plant startup from Refueling Outage 2R26 on November 19, 2018
(2) Unit 1 turbine stop valve testing on November 29, 2018

71111.12—Maintenance Effectiveness

Routine Maintenance Effectiveness (1 Sample)

The inspectors evaluated the effectiveness of routine maintenance activities associated with the following equipment and/or safety-significant functions:

(1) Unit 1 and Unit 2 50.65(a)(3) periodic evaluation on December 10, 2018

Quality Control (1 Sample)

The inspectors evaluated maintenance and quality control activities associated with the following equipment performance issues:

(1) Unit 2 control element assembly CEA-5 capacitor replacement on December 10, 2018

71111.13—Maintenance Risk Assessments and Emergent Work Control (4 Samples)

The inspectors evaluated the risk assessments for the following planned and emergent work activities:

(1) Unit 1 Technical Specification 3.0.3 entry for control room emergency air cleanup system when securing Unit 2 emergency diesel generator 2 on October 31, 2018

(2) Unit 2 plant protective system maintenance activities on October 31, 2018

(3) Unit 1 and Unit 2 stator heavy lift from onsite storage area to the barge on November 13, 2018

(4) Unit 1 emergent work for the loss of the train A non-vital 4160 volt bus A1 troubleshooting and repair on December 18, 2018

71111.15—Operability Determinations and Functionality Assessments (3 Samples)

The inspectors evaluated the following operability determinations and functionality assessments:

(1) Unit 2 reactor coolant system thermal sleeves operability assessment on November 2, 2018

(2) Unit 2 reactor vessel monitoring level system detector (RadCal) operability assessment on November 26, 2018

(3) Unit 1 sodium hydroxide spray additive system tank pitting below minimum wall thickness operability assessment on December 12, 2018

71111.18—Plant Modifications (2 Samples)

The inspectors evaluated the following permanent modifications:

(1) Unit 2 control element assembly upper gripper coil stack replacements on October 26, 2018

(2) Unit 2 removal of timing uncertainty from the control element assembly drop time test on December 31, 2018

71111.19—Post Maintenance Testing (7 Samples)

The inspectors evaluated the following post-maintenance tests:

(1) Unit 2 rod drop timing surveillance November 16, 2018

(2) Unit 2 valve 2CV-5255-1 as left local leak-rate test on November 17, 2018

(3) Unit 2 control element assembly CEA-5 capacitor replacement and control element assembly upper gripper coil replacement on November 17, 2018

(4) Unit 2 reactor vessel monitoring level system detector (Radcal) replacement on November 20, 2018

(5) Unit 2 check valve 2SI-14A inspection due to valve chattering on November 27, 2018

(6) Unit 1 main feedwater block isolation valves repair on December 18, 2018

(7) Unit 2 restoration of lifted electrical leads during integrated safeguards testing on December 31, 2018

71111.20—Refueling and Other Outage Activities (2 Samples)

(1) The inspectors evaluated Unit 2 Refueling Outage 2R26 activities from September 29 to November 2, 2018.

(2) The inspectors evaluated Unit 1 Forced Outage 2018-002 activities from December 18 to December 21, 2018.

71111.22—Surveillance Testing

The inspectors evaluated the following surveillance tests:

Routine (6 Samples)

(1) Unit 2 reactor vessel foreign object search and retrieval on October 23, 2018

(2) Unit 1 and Unit 2 personnel airlock door seal leakage testing on October 23, 2018

(3) Unit 2 rod drop testing on November 14, 2018

(4) Unit 2 as-found local leak-rate test for valve 2CV-5255-1 on November 16, 2018

(5) Unit 2 integrated safety system testing on November 16, 2018

(6) Unit 2 emergency feedwater check valves 2EFW-28, 29, 30, and 31, on December 14, 2018

71114.04—Emergency Action Level and Emergency Plan Changes (1 Sample)

The licensee submitted a summary of Emergency Action Level classification procedure changes (Revision 57) to the NRC on October 4, 2018. The inspector conducted an in-office review of the changes from December 4, 2018, to December 14, 2018. This evaluation does not constitute NRC approval.

OTHER ACTIVITIES – BASELINE

71151—Performance Indicator Verification (4 Samples)

The inspectors verified licensee performance indicators submittals listed below:

(1) MS09: Unit 1 and Unit 2 Residual Heat Removal Systems (10/01/2017–09/30/2018)
(2) MS10: Unit 1 and Unit 2 Cooling Water Support Systems (10/01/2017–09/30/2018)

71152—Problem Identification and Resolution

Semiannual Trend Review (2 Samples)

The inspectors reviewed the licensee's corrective action program for trends that might be indicative of more significant safety issues:

(1) Procedural quality involving the adequacy of surveillance testing acceptance criteria and testing methodology

(2) Common cause analysis of the ANO Unit 1 Refueling Outage 1R27 human performance issues, Condition Report CR-ANO-C-2018-02728

Annual Follow-up of Selected Issues (1 Sample)

The inspectors reviewed the licensee's implementation of its corrective action program related to the following issues:

(1) Unit 2 failure of train A safety-related 4160 volt breaker 2A-303 to automatically close and service water pump B to start during surveillance testing on December 17, 2018

71153—Follow-up of Events and Notices of Enforcement Discretion

Events (2 Samples)

(1) Unit 2 steam dump and bypass control system malfunction that caused an atmospheric dump valve to open and steam to enter the train A vital 4160 volt switchgear room on November 16, 2018

(2) Unit 1 automatic reactor trip due to the loss of the train A non-vital 4160 volt bus A1 on December 18, 2018

Licensee Event Reports (3 Samples)

The inspectors evaluated the following licensee event reports which can be accessed at https://lersearch.inl.gov/LERSearchCriteria.aspx:

(1) Licensee Event Report 0500313/2016-003-01, Tornado Vulnerabilities Resulting in Unanalyzed Condition Arkansas Nuclear One, Unit 1, on December 10, 2018

(2) Licensee Event Report 0500368/2017-001-00, Inadequate Protection from Tornado Missiles Identified Due to Nonconforming Design Conditions, on December 10, 2018

(3) Licensee Event Report 05000313/2018-002-01, Leak in Class 1 Reactor Coolant System Pressure Boundary Piping Due to Cyclic Fatigue Failure on a High Pressure Injection Line Drain Tap Weld, on November 16, 2018

INSPECTION RESULTS

<table>
<tr><td colspan="4">Failure to Fully Implement Vendor Manual Recommended Preventative Maintenance</td></tr>
<tr><td>Cornerstone</td><td>Significance</td><td>Cross-cutting Aspect</td><td>Inspection Procedure</td></tr>
<tr><td>Mitigating Systems</td><td>Green
NCV 05000368/2018004-01
Closed</td><td>None</td><td>71152 – Problem Identification and Resolution</td></tr>
<tr><td colspan="4">The inspectors reviewed a self-revealed, Green finding and associated non-cited violation of Arkansas Nuclear One, Unit 2, Technical Specification 6.4.1.a, for the licensee's failure to properly preplan maintenance that can affect the performance of safety-related equipment. Specifically, the licensee failed to fully implement vendor manual recommended preventive maintenance for the shunt trip attachment switches. This resulted in the failure of train A safety-related breaker that provides power to the swing service water pump B (2P-4B) to automatically close and start pump 2P-4B during surveillance testing.</td></tr>
<tr><td colspan="4">Description: On October 23, 2018, the train A safety-related 4160 V switchgear 2A-303 breaker that provides power to pump 2P-4B failed to automatically close and start pump 2P-4B during surveillance testing. It was determined that an interlock on the train A safety-related 4160 V switchgear 2A-302 breaker that powers train A service water pump (2P-4A) prevented 2A-303 from automatically closing and starting pump 2P-4B. This interlock is designed to prevent both the 2P-4A and 2P-4B pumps from both automatically starting when aligned to emergency diesel generator 1. The interlock was comprised of a shunt trip attachment (STA) switch in the 2A-302 breaker. The licensee entered this issue into their corrective action program as Condition Report CR-ANO-2-2018-03454.

The licensee performed an equipment failure evaluation, documented in Condition Report CR-ANO-2-2018-03454, and determined that an oxide layer on the contacts of the STA switch for the 2A-302 breaker was the cause of the failure of 2A-303 to automatically close and start pump 2P-4B. A review of STA switch failures in the previous 10 years revealed that in 2009, a similar failure occurred and the corrective action was to incorporate vendor manual instructions to inspect and, if necessary, burnish (clean) the contacts when performing Procedure OP-2416.007, "Unit 2 – 2A3 Bus Switchgear Inspection," Revision 17. The licensee added this step into the work instructions to minimize oxide layer formation that would prevent the contacts on the STA switch from functioning. However, the updated work instructions did not fully incorporate the vendor manual recommended preventive maintenance. Specifically, the work instructions only gave instructions on how to clean the outer set of contacts and did not include direction on how to clean the harder to reach inner contacts. The licensee determined that the inner contacts were dirty and had caused the interlock to fail in this case.

The inspectors determined that this failure did not result in a technical specification violation because 2P-4B is a swing pump that could be powered from and connected to either train; during the period when it was assumed that it could not be started from the train A bus, the train A pump 2P-4A was in service and credited for technical specification compliance.

Corrective Actions: The licensee moved the interlock from the failed contact to a spare contact that they verified to be in good condition to restore operability of the pump. The licensee also performed an extent of condition evaluation to identify other failed safety-related</td></tr>
</table>

and important to safety breakers. While several other contacts were in a condition that warranted cleaning, all of the other breakers tested would have functioned correctly if needed.

Corrective Action References: The licensee entered this issue into their corrective action program as Condition Reports CR-ANO-2-2018-03442, CR-ANO-2-2018-03454, and CR-ANO-2-2018-03750.

Performance Assessment:

Performance Deficiency: The licensee's failure to fully implement vendor manual recommended preventive maintenance for STA contact switches is a performance deficiency. Specifically, the licensee failed to provide maintenance instructions to clean the inner STA switch contacts that were in use, allowing them to become oxidized and develop a high resistance.

Screening: The inspectors determined the performance deficiency was more than minor, and therefore a finding, because it was associated with the equipment performance attribute of the Mitigating Systems Cornerstone and affected the associated cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the swing safety-related 4160 volt breaker 2A-303 was nonfunctional due to not fully implementing vendor recommended preventive maintenance on the inner half of the STA switches.

Significance: Using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 2, dated June 19, 2012, the inspectors determined that the finding had very low safety significance (Green) because the finding: (1) was not a design or qualification deficiency; (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 technical specification allowed outage time; and (4) did not result in the loss of a high safety-significant, nontechnical specification train. Specifically, the 2P-4B pump was never credited for technical specification compliance during the period when it would not automatically start from the train A bus.

Cross-cutting Aspect: A cross-cutting aspect was not assigned to this finding because the performance deficiency occurred in 2009, and therefore was not indicative of current plant performance.

Enforcement:

Violation: Technical Specification 6.4.1.a for Unit 2 requires, in part, that written procedures be established, implemented, and maintained covering the applicable procedures listed in Appendix A to Regulatory Guide 1.33, "Quality Assurance Program Requirements," Revision 2, dated February 1978. Regulatory Guide 1.33, Appendix A, Section 9.a, states, in part, that maintenance that can affect the performance of safety-related equipment should be properly preplanned and performed in accordance with written procedures, documented instructions, or drawings appropriate to the circumstances.

Contrary to the above, between October 2009 and October 2018, the licensee failed to properly pre-plan and perform maintenance that can affect performance of safety-related equipment in accordance with written procedures, document instructions, or drawings appropriate to the circumstances. Specifically, the licensee failed to maintain adequate work instructions to fully implement vendor recommended maintenance for safety-related breaker

STA switch contacts when performing Procedure OP-2416.007, “Unit 2 – 2A3 Bus Switchgear Inspection,” Revision 17, Supplement 1, “2A3 Bus and Cubicle Inspection and Cleaning.” This condition led to the failure of the swing service water pump 2P-4B to automatically start during surveillance testing on October 23, 2018.

Disposition: This violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the Enforcement Policy, because it was very low safety significance (Green) and was entered into the licensee’s corrective action program as Condition Reports CR-ANO-2-2018-03442, CR-ANO-2-2018-03454, and CR-ANO-2-2018-03750.

Observation	71152 – Problem Identification and Resolution

Semiannual Trend Review

The inspectors reviewed the licensee’s corrective action program, performance indicators, system health reports, and other documentation available to help identify performance trends that might indicate the existence of a more significant safety issue. The inspectors verified that the licensee was taking corrective actions to address identified adverse trends. The inspectors did not review any cross-cutting themes because none existed at the site.

The NRC inspectors identified a possible trend associated with the surveillance testing methodology and acceptance criteria. Examples included:

- CR-ANO-1-2018-03223 and CR-ANO-2-2018-01009. The inspectors identified a minor violation of Unit 1 Technical Specification (TS) 5.4.1.a and Unit 2 TS 6.4.1.a for the licensee’s failure to maintain Unit 1 and Unit 2 Procedure OP-1102.001, “Plant Pre-heat up and Pre-critical Checklist,” Revision 83, and OP-2102.001, “Plant Pre-heat up and Pre-critical Checklist,” Revision 87, respectively. Specifically, the licensee did not actually measure seat leakage for some of the reactor coolant system (RCS) primary isolation valves (PIV) included in this surveillance test in accordance with American Society of Mechanical Engineers (ASME) Subsection ISTC-3630(c), “Seat Leakage Measurement.” The inspectors identified that the procedure inappropriately allowed recording a value of zero for the leak rate of several valves based on the measurements taken from the upstream check valve. The licensee’s corrective actions where to initiate procedure improvement forms to establish procedural steps to actually measure seat leakage in accordance with ASME Subsection ISTC-3630(c).

- CR-ANO-1-2018-04304. The inspectors identified that Unit 1 Procedure OP-1104.036, “Emergency Diesel Generator Operation,” Revision 78, did not establish an acceptance criteria for check valve closure testing of diesel starting isolation check valves FO-54A1, FO-55A1, FO-54B1, and FO-55B1. Specifically, the licensee did not determine the maximum allowed check valve leakage to maintain diesel starting air system operability. The licensee’s corrective action was to determine the appropriate acceptance criteria to assure the valves are, in fact, closed. The licensee and the inspectors validated that the previous test results did not impact diesel starting air system operability.

- CR-ANO-C-2018-04296. The inspectors identified a minor violation of Unit 1 TS 5.4.1.a and Unit 2 TS 6.4.1.a for the licensee's failure to maintain Unit 1 and Unit 2 Procedure OP-1305.037, "Unit 1 Reactor Building Access and Ventilation Leak Rate Testing," Revision 9, and OP-2305.017, "Local Leak Rate Testing," Revision 36, respectively. Specifically, the licensee failed to translate Unit 1 TS 5.5.16 and Unit 2 TS 6.5.16 reactor building air lock operability limits as the acceptance criteria into procedures. The licensee's corrective actions where to initiate PIFs to translate the TS operability limits as acceptance criteria into the respective procedure.

- CR-ANO-2-2018-04357. The inspectors identified that Unit 2 Procedure OP-2106.006, "Emergency Feedwater System Operations," Revision 98, testing methodology was not in accordance ASME code requirements and did not contain appropriate acceptance criteria for auxiliary feedwater to loop A/B emergency feedwater check valves 2EFW-28, 29, 30, and 31. Specifically, the acceptance criteria for the check valves was if downstream pressure was less than 10 psig or pressure was decreasing, record leakage as zero. The licensee's corrective actions are:

    1. Determine the design basis allowed leakage for valves 2EFW-28, 29, 30, and 31 and update the procedure and design basis documents.

    2. Initiate a PIF to update the procedure to incorporate appropriate testing methods.

In response to the inspectors' observations, the licensee entered this trend into their corrective action program for resolution as Condition Report CR-ANO-C-2019-00033.

Observation	71152 – Problem Identification and Resolution

Semiannual Trend Review

The inspectors reviewed the licensee's corrective action program, performance indicators, system health reports, and other documentation available to help identify performance trends that might indicate the existence of a more significant safety issue. The inspectors verified that the licensee was taking corrective actions to address identified adverse trends. The inspectors did not review any cross-cutting themes because none existed at the site.

The inspectors reviewed the corrective action program documentation associated with the common cause analysis of the ANO Unit 1 Refueling Outage 1R27 performance issues, documented in Condition Report CR-ANO-C-2018-02728. The inspectors identified 12 documented human performance errors that caused events, rework, and delays. The licensee initiated the condition report following these events in an effort to document and discover how to prevent these issues from continuing to occur. The licensee identified five causal factors and developed a corrective action for each:

1. Insufficient ownership and accountability by licensee and supplemental personnel resulted in a tolerance of low standards in sustaining nuclear professional behaviors by individual contributors and leadership. Corrective Action (CA) included:

- Integrate the Own It Accountability Model in work preparation/execution activities into the licensees work preparation meetings to improve ownership and accountability in the pursuit of excellence for licensee work preparation and execution.

- Implement a licensee Organization Effectiveness Top Issues List and use the organization effectiveness model, administrative tools, and communications media forums to keep issues visible and track to resolution.

- Pursuit of Craftsmanship Excellence Committee. The pursuit of craftsmanship excellence through the engagement and ownership of supplemental personnel focused on improving craftsmanship, work quality, maintenance technical fundamentals, and sustaining nuclear professional behaviors.

- Senior leadership team to partner with the first line supervisors' leadership council to promote greater ownership, engagement and accountability to address licensee top first-line supervisory issues.

- Conduct a Unit 2 Refueling Outage 2R26 pre-outage leadership and alignment meeting with licensee and supplemental leaders to reset the standards and expectations for 2R26 work preparation and execution.

2. Management and peer coaching did not consistently correct unacceptable behaviors due to the tendency of some leaders to avoid conflict and difficult conversions. Corrective actions included:

    - Manager leadership by example and field presence. The intent of this action was to drive and set an example for management oversight of the preparation and execution of outage maintenance critical activities.

    - Reinforce the expectations for detailed pre-job briefs and perform observations focused on pre-job briefs to validate standards are met. The intent of this action was to verify monthly that licensee and supplemental leader observation quality was documented in accordance with the observation excellence model and to provide coaching to correct identified gaps.

    - Incorporate observation goals into the 2018 personnel performance reviews. The intent of this action was to ensure leaders are driving the right behavior changes in the organization.

    - Commence rapid trending of observation data.

3. Licensee personal became complacent to the requirements for strict adherence to procedures and work instructions due to the lack of immediate consequence for noncompliance. Corrective actions included:

    - Implement remediation model for procedure/work instruction adherence. The intent of this action was to provide clear management expectations and accountability at all levels of the organization for procedure and work instruction adherence.

- Incorporate Procedure EN-HU-106, “Procedure and Work Instructions Use and Adherence,” Revision 7, training into maintenance continuing training.

4. Risk was not always recognized or was inappropriately accepted by individuals without sufficient leadership engagement in real time decision-making. Corrective actions included:

    - 2R26 standards team focus on real-time decision-making (stop when unsure). The intent of this action was to ensure the 2R26 standards team plan included a focus area for field observations related to stop when unsure (real-time decision making) and pre-job briefs (work preparation, roles and responsibilities, and risk mitigation).

    - 2R26 personnel briefing on unknowingly accepting station risk. The intent of this action was to provide communication to 2R26 works to increase the awareness of unknowingly making decisions in the field that may increase station risk.

5. Licensee leadership did not consistently manage and control outage work scope which impacted the station’s ability to effectively prepare and execute scheduled work activities. Corrective actions included:

    - Validate effective change management when 2R26 major work was reassigned near the outage. The intent of this action was to provide effective change management for scoping transitions that occur within 60 days of schedule start date for 2R26.

    - Establish unit specific outage work scope priority lists. The intent of this action was clearly defined outage work scope priorities and to control the combined outage work scope within budgeted resources and margins to allow adequate time for work preparation and execution using the prevention model.

    - Perform an independent verification that major projects are ready for execution prior to 2R26. The intent of this action was clearly defined outage work scope priorities and control the combined outage work scope within budgeted resources and margins to allow adequate time for work preparation and execution using the prevention model.

The inspectors observed actions implemented during ANO Unit 2 Refueling Outage 2R26 and noted that the number of events, rework, and delays decreased dramatically during Refueling Outage 2R26 as a result. Although several performance issues still occurred, the inspectors determined that the ongoing actions to minimize these issues are being implemented successfully. For this trend, the inspectors determined that the licensee had identified the trend, completed an appropriate evaluation, and had taken actions to correct the identified trend.

EXIT MEETINGS AND DEBRIEFS

On December 14, 2018, the inspector presented the emergency action level revision review inspection results to Mr. A. Sherrill, Manager, Emergency Preparedness, and other members of the licensee staff. The inspectors verified no proprietary information was retained or documented in this report.

On January 3, 2019, the inspector presented the quarterly resident inspector inspection results to Mr. J. Kirkpatrick, General Manager of Plant Operations, and other members of the licensee staff. The inspectors verified no proprietary information was retained or documented in this report.

DOCUMENTS REVIEWED

71111.04 – Equipment Alignment

Condition Reports (CR-ANO-)			
1-2012-00362	1-2012-00363	1-2018-04976	C-2016-01706

Procedures Number	Title	Revision
OP-1104.002	Makeup and Purification System Operation	95
OP-1106.006	Emergency Feedwater Operations	101
OP-1107.001	Electrical System Operations	120
OP-2106.006	Emergency Feedwater Operations	99

Miscellaneous Documents Number	Title	Revision
EC-65360	CALC-82-D-2086-01 Mark Up to Account for Condensate Lost due to Pump Bearing and Correct Computation Error	0

Calculations Number	Title	Revision
CALC-82-D-2086-01	Volume of CST T-41B Requiring Tornado Missile Protection	4

71111.05 – Fire Protection

Condition Reports (CR-ANO-)
2-2018-04226

Miscellaneous Documents Number	Title
1A-372-86-G	Unit 1 Plant Fire Protection
1B-317-10-EE	Unit 1 Plant Fire Protection
1B-335-38-Y	Unit 1 Plant Fire Protection
2A-404-2151-A	Unit 2 Plant Fire Protection

71111.07 – Heat Sink Performance

Work Orders				
503112	52675121	52769910	52770785	52770786

Procedures Number	Title	Revision
OP-2305.062	Service Water System Flow Testing	2

Miscellaneous Documents Number	Title	Revision
EC-72776	Document the Results of the 2R25 As-Left Service Water Flow Test	0

Calculations Number	Title	Revision
CALC-88-E-0032-05	Unit 2 Containment Service Water Cooling Coils Thermal Performance	3
CALC-91-R-2013-01	Service Water Performance Testing Methodology	28
CALC-99-E-0033-03	ANO-2 Containment Cooler Fan Motor Horsepower during a DBA Under Uprate Conditions	0
CALC-991522E201-01	Determination of Error Associated with Air Flow Measurements of Reactor Building Containment Coolers	0

71111.11 – Licensed Operator Requalification Program

Miscellaneous Documents Number	Title	Revision
A1SXMLOR1902	Unit 1 Licensed Operation Requalification Scenario	0

71111.12 –Maintenance Effectiveness

Condition Reports (CR-ANO-)
C-2018-03631

Work Orders
00486027

Procedures Number	Title	Revision
EN-DC-207	Maintenance Rule Periodic Assessment	3

Drawings Number	Title
E-2258	Schematic Diagram Reactor Control Element Assembly
M-2001-L1-196	CEDMCS Schematic Diagram Subgroup Filter Panel

Calculations Number	Title	Revision
CALC-ANOC-SE-17-00001	Maintenance Rule 10 CFR 50.65(a)(3) Periodic Assessment January 1, 2016, to June 30, 2017	0

71111.13 – Maintenance Risk Assessments and Emergent Work Control

Condition Reports (CR-ANO-)				
2-2018-02847	2-2018-02909			

Procedures Number	Title	Revision
2102.010	Plant Cooldown	57

Miscellaneous Documents Number	Title	Revision
NUREG 1022	Event Report Guidelines 10 CFR 50.72 and 50.73	3

71111.15 – Operability Determinations and Functionality Assessments

Condition Reports (CR-ANO-)				
1-2015-02718	1-2018-04619	1-2018-04636	1-2018-04668	1-2018-04671
1-2018-04674	2-2013-01190	2-2018-02976	2-2018-03127	2-2018-03252
2-2018-03304				

Procedures Number	Title	Revision
EN-OP-104	Operability Determination Process	16

Miscellaneous Documents Number	Title	Date
EC-79912	Engineering Change	
EC-80182	Engineering Change	
EC-79906	Engineering Change	
N-705	Evaluation Criteria for Temporary Acceptance of Degradation in Moderate Energy Class 2 or 3 Vessels and Tanks	October 12, 2006

Calculations Number	Title	Revision
CALC-ANO2-ME-18-00003	Evaluation of Safety Injection Nozzles and Thermal Sleeves Supporting Justification for Continued Operation at ANO2	0

Calculations Number	Title	Revision
CALC-ANO2-ME-18-00004	Operability Assessment for Primary Side Loose Parts from Migration of Safety Injection Nozzle Thermal Sleeve at Arkansas Nuclear One Unit 2	0

71111.18 – Plant Modifications

Condition Reports (CR-ANO-)
2-2018-04166

Work Orders		
471461	512940	52790774

Procedures Number	Title	Revision
OP-2302.046	CEA Drop Time Test	17
ULD-2-SYS-36	Control Element Drive Mechanism	2

Miscellaneous Documents Number	Title	Revision
EC-75702	Replace CEA Upper Gripper Coils with Westinghouse High Temp Coils	0
EC-78985	Amend Low Voltage Setting for HT Upper Gripper Coils	0
EC-80516	ANO-2 CEA Drop Time Uncertainty Relaxation	0

71111.19 – Post Maintenance Testing

Condition Reports (CR-ANO-)				
1-2018-05315	1-2018-05328	1-2018-05350	2-2018-02213	2-2018-03919
2-2018-04002	2-2018-04166	2-2018-04446		

Work Orders						
432399	486741	509778	512499	512940	52573102	52776588
52790774	52805699					

Procedures Number	Title	Revision
OP-2102.001	Plant Pre-heatup and Pre-critical Checklist	91
OP-2302.046	CEA Drop Time Test	17
OP-2305.001	Integrated Engineering Safeguards Test	32
OP-2305.017	Local Leak Rate Testing	36

71111.20 – Refueling and Other Outage Activities

Condition Reports (CR-ANO-)			
1-2018-05325	2-2018-02129	2-2018-02130	C-2018-04030

Work Orders
52770782

Procedure Number	Title	Revision
OP-2306.024	Unit 2 (IST) Relief Valve Setpoint Testing	25
OP-2505.004	Unit 2 Core Support Barrel Removal	11

71111.22 – Surveillance Testing

Condition Reports (CR-ANO-)				
1-2018-00963	1-2018-04790	1-2018-04795	1-2018-04975	2-2004-01688
2-2018-04357	C-2018-04296	C-2018-04339		

Work Orders						
486741	52573102	52719205	52764513	52770817	52771820	52780270
52815431						

Procedures Number	Title	Revision
ER-ANO-2006-0389-000	U2 EFW Alignment to QCST Evaluation	0
OP-1305.037	Unit 1 Reactor Building Access and Ventilation Leak Rate Testing	9 (8)
OP-2106.006	Emergency Feedwater System Operation	98
OP-2305.001	Integrated Engineering Safeguards Test	32
OP-2305.017	Local Leak Rate Testing	36
SEP-ANO-2-IST-1	Inservice Testing Bases Document	4
SEP-APJ-002	Arkansas Nuclear One Containment Leakage Rate Testing (Appendix J)	7
ULD-2-SYS-12	Emergency Feedwater System	11

Miscellaneous Documents Number	Title	Revision
M-2204, Sheet P&ID	Emergency Feedwater	74

Calculations Number	Title	Revision
CALC-00-E-0010-01	Appendix J Containment Maximum Allowable Leakage Rate (La)	0
CALC-00-E-0023-01	Unit 1 Appendix J Containment Maximum Allowable Leakage Rate (La)	0
CALC-89-D-2043-05	Failure Modes Effect Analysis for the Addition of the Auxiliary Feedwater Pump	0

71114.04 – Emergency Action Level and Emergency Plan Changes

Procedures Number	Title	Revision
1903.010	Emergency Action Level Classification	44, 56

Miscellaneous Documents Number	Title	Date
0CAN101801	Emergency Plan Implementing Procedure, Arkansas Nuclear One, Units 1 and 2, Docket Nos. 50-313, 50-368, and 72-13; License Nos. DPR-51 and NPF-6	October 4, 2018

71151 – Performance Indicator Verification

Condition Reports (CR-ANO-)	
1-2017-03024	1-2018-03729

Procedures Number	Title	Revision
EN-LI-114	Regulatory Performance Indicator Process	12

Calculations Number	Title	Revision
CALC-ANO1-SA-16-00001	ANO-1 Mitigating System Performance Index Basis	1
CALC-ANO2-SA-06-00001	ANO-2 Mitigating System Performance Index Basis	3

71152 – Problem Identification and Resolution

Condition Reports (CR-ANO-)				
1-2018-00963	1-2018-04296	1-2018-04790	1-2018-04975	C-2018-04339
2-2018-03442	2-2018-03442	2-2018-03454	2-2018-03750	2-2009-02997
1-2018-03223	2-2018-01009	1-2018-04304	C-2018-04296	2-2018-04357
C-2019-00033				

Work Orders

411600	511409	52775094

Procedures Number	Title	Revision
OP-1305.037	Unit 1 Reactor Building Access and Ventilation Leak Rate Testing	9 (8)
OP-2416.007	Unit 2 – 2A3 Bus Switchgear Inspection	17

Miscellaneous Documents Number	Title
PIF 1-18-0125	Procedure Improvement Form for OP-1305.037

71153 – Follow-up of Events and Notices of Enforcement Discretion

Condition Reports (CR-ANO-)

1-2017-00241	1-2018-05311	1-2018-05312	1-2018-05326	1-2018-05332
1-2018-05340	1-2018-05360	2-2017-01555	2-2018-04225	2-2018-04226
2-2018-04227	2-2018-04230	2-2018-04241	2-2018-04244	2-2018-04336
C-2018-04699				

Procedures Number	Title	Revision
2203.012B	Annunciator 2K02 Corrective Action	45
EN-OP-126	Post Transient Response and Review	1

Drawings Number	Title	Revision
2HBD-300-1	Small Pipe Isometric Auxiliary Building	7
2HBD-300-2	Small Pipe Isometric Turbine Building	5
A-2103	Architectural Floor Plan at el 368’, 372’, and 374’ 6”	35
A-2104	Architectural Floor Plan at el 386’	36
A-2114	Architectural Exterior Elevations and Sections	14
E-34	Schematic Meter and Relay Diagram 4160V System, Main Supply	12
M-2112	Plumbing and Drainage Aux Bldg	16
M-2116	Plumbing and Drainage Aux Bldg	25

Miscellaneous Documents Number	Title	Revision
STM 2-15	Steam Generators and Main Steam System	20
STM 2-23	Steam Dump and Bypass Control System	14

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