



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

April 30, 2018

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

SUBJECT: ARKANSAS NUCLEAR ONE – NRC INTEGRATED INSPECTION REPORT  
05000313/2018001 AND 05000368/2018001 AND INDEPENDENT SPENT  
FUEL STORAGE INSTALLATION INSPECTION REPORT 07200013/2017001

Dear Mr. Anderson:

On March 31, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Arkansas Nuclear One facility, Units 1 and 2. On April 5, 2018, the NRC inspectors discussed the results of this inspection with Mr. John Kirkpatrick, General Manager of Plant Operations, and other members of your staff. On April 18, 2018, the NRC inspectors exited to modify the characterization of one finding with Ms. Stephanie Pyle, Regulatory Assurance Manager. The results of this inspection are documented in the enclosed report.

NRC inspectors documented two findings of very low safety significance (Green) in this report. Both of these findings involved a violation of NRC requirements. Additionally, NRC inspectors documented a licensee-identified violation, which was determined to be of very low safety significance (Green), in this report. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest the violations or significance of the NCVs, 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.

If you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region IV; 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  
Branch E  
Division of Reactor Projects

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

Enclosure:

Inspection Report 05000313/2018001 and  
05000368/2018001 and 07200013/2017001  
w/ Attachments:

1. Documents Reviewed
2. Occupational Radiation Safety Inspection  
Request for Information

**U.S. NUCLEAR REGULATORY COMMISSION  
Inspection Report**

Docket Numbers: 05000313; 05000368; and 07200013

License Numbers: DPR-51; NPF-6

Report Numbers: 05000313/2018001; 05000368/2018001; and 07200013/2017001

Enterprise Identifier: I-2018-001-0005

Licensee: Entergy Operations, Inc.

Facility: Arkansas Nuclear One, Units 1 and 2, and Independent Spent Fuel Storage Installation

Location: Junction of Highway 64 West and Highway 333 South  
Russellville, Arkansas

Inspection Dates: January 1, 2018 to March 31, 2018

Inspectors: C. Henderson, Senior Resident Inspector  
P. Smagacz, Acting Senior Resident Inspector  
T. Sullivan, Resident Inspector  
M. Tobin, Resident Inspector  
L. Brookhart, Senior Inspector  
N. Greene, Ph.D., Senior Health Physicist  
J. O'Donnell, CHP, Health Physicist

Approved By: N. O'Keefe, Branch Chief

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. NRC-identified and self-revealed findings and violations, and additional items are summarized in the tables below. A licensee-identified, non-cited violation is documented in report Section 71124.01.

### List of Findings and Violations

Failure to Establish Adequate Criteria for Flood Seal Testing			
Cornerstone	Significance	Cross-cutting Aspect	Inspection Procedure
Mitigating Systems	Green Finding NCV 05000313/2018001-01 and 05000368/2018001-01 Closed	[H.12] – Avoid Complacency	71111.01 - External Flooding
The inspectors identified a Green finding and associated non-cited violation of Unit 1 Technical Specification 5.4.1.a and Unit 2 Technical Specification 6.4.1.a for the licensee’s failure to establish the criteria for ensuring the necessary conditions existed for a successful test of hatch flood seals. Specifically, Procedure OP 1402.240, “Inspection of Watertight Hatches,” Revision 1, did not contain adequate guidance to ensure that the auxiliary building was at a lower pressure than the turbine building such that puffing smoke on the turbine building side would allow a seal leak to be detectable.			

Failure to Preplan and Perform Service Water Pre-Screen Maintenance			
Cornerstone	Significance	Cross-cutting Aspect	Inspection Procedure
Mitigating Systems	Green Finding NCV 05000368/2018001-02 Closed	[H.12] – Avoid Complacency	71152 - Problem Identification and Resolution
The inspectors reviewed a self-revealed, non-cited violation and associated finding 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 properly preplan pre-screen cleaning maintenance, causing the train B service water system to become inoperable.			

### Additional Tracking Items

Type	Issue number	Title	Inspection Procedure	Status
URI	7200013/2012001-02	Validation of the ANO data collected during the thermal validation test and used in the Holtec analysis	60855.1	Closed

Type	Issue number	Title	Inspection Procedure	Status
URI	7200013/2012001-03	Applicability of the ANO thermal validation test results to other HI-STORM 100 overpack configurations	60855.1	Closed
LER	05000313/2016-002-00	Tornado Missile Vulnerability Resulting in Condition Prohibited By Technical Specifications	71153	Closed

## PLANT STATUS

Unit 1 began the inspection period at full power. On March 24, 2018, the unit was shut down to begin Refueling Outage 1R27.

Unit 2 began the inspection period at full power. On January 14, 2018, the unit reduced power to 83 percent to perform planned condenser water box cleaning. The unit was returned to rated thermal power on January 19, 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

### 71111.01 - Adverse Weather Protection

#### Seasonal Extreme Weather (1 Sample)

The inspectors evaluated readiness for seasonal extreme weather conditions prior to the onset of seasonal cold temperatures.

- Unit 1 and Unit 2 diesel fuel oil vault on January 30, 2018
- Unit 2 emergency diesel generator 2 on January 30, 2018
- Alternate ac diesel generator on January 30, 2018
- Unit 1 and Unit 2 emergency cooling pond on January 30, 2018

#### External Flooding (1 Sample)

The inspectors evaluated readiness to cope with external flooding on March 16, 2018.

A finding associated with this inspection is documented in the Inspection Results section below.

#### 71111.04 - Equipment Alignment

##### Partial Walkdown (4 Samples)

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

- (1) Unit 2 train A emergency feedwater system during planned maintenance of train B emergency feedwater system on February 7, 2018
- (2) Unit 2 swing service water pump B aligned to the emergency cooling pond during intake structure pre-screen cleaning and maintenance on February 22, 2018
- (3) Unit 2 emergency diesel generator 2 ventilation system on March 2, 2018
- (4) Unit 1 temporary reactor vessel level identification system on March 28, 2018

##### Complete Walkdown (1 Sample)

The inspectors evaluated system configurations during a complete walkdown of the Unit 2 service water system on March 14, 2018.

#### 71111.05 - Fire Protection Annual/Quarterly

##### Quarterly Inspection (4 Samples)

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

- (1) Unit 2 auxiliary building corridor 2109 temporary safety-related battery heating, Fire Area MM, Fire Zone 2103-V, on January 30, 2018
- (2) Unit 1 cable spreading room, Fire Area G, Fire Zone 97-R, on January 31, 2018
- (3) Unit 2 upper south piping penetration room, Fire Area EE-L , Fire Zone 2084-DD, on February 8, 2018
- (4) Unit 2 lower south piping penetration room, Fire Area EE-L, Fire Zone 2055-JJ, on February 8, 2018

##### Annual Inspection (1 Sample)

The inspectors evaluated fire brigade performance in the Unit 1 control room for a simulated fire emergency feedwater pump room and the Unit 2 turbine deck for a simulated fire in the turbine generator on January 4, 2018, and March 09, 2018.

## 71111.06 - Flood Protection Measures

### Internal Flooding (1 Sample)

The inspectors evaluated internal flooding mitigation protections in the Unit 2 emergency feedwater room floor drain system on March 16, 2018.

### Cables (1 Sample)

The inspectors evaluated cable submergence protection in Manhole 8 on March 1, 2018.

## 71111.11 - Licensed Operator Regualification Program and Licensed Operator Performance

### Operator Regualification (2 Samples)

- (1) The inspectors observed and evaluated Unit 1 simulator training for operating crews on reactor shutdown and decay heat removal on February 22, 2018.
- (2) The inspectors observed and evaluated Unit 2 simulator training for operating crews on reactor coolant pump motor fire and security related events on February 22, 2018.

### Operator Performance (2 Samples)

- (1) The inspectors observed and evaluated Unit 2 return to near 100 percent power following condenser cleaning on January 18, 2018.
- (2) The inspectors observed and evaluated Unit 1 reactor shutdown for commencing Refuel Outage 1R27 on March 23, 2018.

## 71111.12 - Maintenance Effectiveness

### Routine Maintenance Effectiveness (3 Samples)

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

- (1) Unit 1 rod control system on January 31, 2018
- (2) Unit 2 service water system on March 6, 2018
- (3) Internal and external flood seals on March 16, 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 system on January 31, 2018

## 71111.13 - Maintenance Risk Assessments and Emergent Work Control (6 Samples)

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

- (1) Unit 2 planned work activities for control element assembly 5 repair on January 5, 2018



- (2) Unit 2 emergent work activities for emergency diesel generator 2 on January 10, 2018
- (3) Unit 2 emergent work activities for service water pump A and C strainer cleaning following high differential pressure alarm during pre-screen cleaning on January 19, 2018
- (4) Unit 1 and Unit 2 planned work activities for startup transformer 1 and 3 outage for autotransformer insulator repair on February 2, 2018
- (5) Unit 2 planned work activities for service water bay pre-screen cleaning and maintenance on February 22, 2018
- (6) Unit 2 service water pre-screen cleaning on February 22, 2018

#### 71111.15 - Operability Determinations and Functionality Assessments (6 Samples)

The inspectors evaluated the following operability determinations and functionality assessments:

- (1) Unit 1 operability determination for auxiliary building tornado missile protection wall missing rebar on January 18, 2018
- (2) Unit 1 operability determination for emergency feedwater control valve, CV-2646, stroke time outside operability limits on January 22, 2018
- (3) Unit 2 operability determination for emergency diesel generator 2 relay failure and automatic start function for containment coolers on January 24, 2018
- (4) Unit 1 and Unit 2 operability determination for emergency cooling pond during cold weather impact of safety-related pumps operating oil temperature on January 31, 2018
- (5) Unit 1 and Unit 2 operability determination for 500 kV offsite circuit autotransformer damaged insulator on February 9, 2018
- (6) Unit 2 functional determination emergency feedwater system room floor drain system on March 16, 2018

#### 71111.18 - Plant Modifications (2 Samples)

The inspectors evaluated the following temporary or permanent modifications:

- (1) Unit 2 temporary modification for lifting leads for control element assembly 4 for degraded upper gripper coils on January 5, 2018
- (2) Unit 2 temporary battery room heating on January 30, 2018

#### 71111.19 - Post Maintenance Testing (4 Samples)

The inspectors evaluated the following post maintenance tests:

- (1) Unit 2 replacement of service water pump A and C strainers on January 20, 2018

- (2) Unit 1 auxiliary building hatch HTC-492 smoke testing following resin transfer on February 14, 2018
- (3) Unit 2 motor driven emergency feedwater pump flow transmitter calibration due to the transmitter reading low out of range on February 20, 2018
- (4) Unit 1 temporary reactor vessel level indication due valve, RC-1, repair on March 28, 2018

#### 71111.20 - Refueling and Other Outage Activities (Partial Sample)

The inspectors evaluated Unit 1 Refueling Outage 1R27 activities from March 24, 2018, to March 31, 2018. The inspectors completed inspection procedure Sections 03.01.a and 03.01.c.

#### 71111.22 - Surveillance Testing

The inspectors evaluated the following surveillance tests:

##### Routine (3 Samples)

- (1) Unit 1 emergency feedwater solenoid operated control valve, CV-2646, establishment of stroke time reference value and acceptance criteria on January 25, 2018
- (2) Unit 1 and Unit 2 verified correct breaker alignment and indicated power availability for the 161 kV offsite circuited with the 500 kV offsite inoperable during autotransformer insulator repair on February 2, 2018
- (3) Unit 1 train A reactor protection system and rod control system ac breaker surveillance trip testing on February 27, 2018

##### In-service (1 Sample)

- (1) Unit 2 service water motor operated valve, 2CV-1435-1, service water inlet to train A shutdown heat exchanger on March 15, 2018

##### Reactor Coolant System Leak Detection (1 Sample)

- (1) Unit 1 small increase of unidentified leakage on March 2, 2018

### **RADIATION SAFETY**

#### 71124.01 - Radiological Hazard Assessment and Exposure Controls

##### Radiological Hazard Assessment (1 Sample)

The inspectors evaluated radiological hazards assessments and controls.

##### Instructions to Workers (1 Sample)

The inspectors evaluated worker instructions.

Contamination and Radioactive Material Control (1 Sample)

The inspectors evaluated contamination and radioactive material controls.

Radiological Hazards Control and Work Coverage (1 Sample)

The inspectors evaluated radiological hazards control and work coverage.

High Radiation Area and Very High Radiation Area Controls (1 Sample)

The inspectors evaluated risk-significant high radiation area and very high radiation area controls.

Radiation Worker Performance and Radiation Protection Technician Proficiency (1 Sample)

The inspectors evaluated radiation worker performance and radiation protection technician proficiency.

71124.02 - Occupational As Low As Reasonably Achievable (ALARA) Planning and Controls

Implementation of ALARA and Radiological Work Controls (1 Sample)

The inspectors reviewed ALARA practices and radiological work controls by reviewing the following activities and/or work packages:

- (1) 2017-1070, core bore National Fire Protection Association (NFPA) 805 project and support activities
- (2) 2018-1414, as low as reasonable achievable (ALARA) activities during 1R27
- (3) 2018-1420, scaffold installation/removal non-Locked High Radiation Areas – 1R27
- (4) 2018-1430, reactor disassembly, reassembly, and support activities
- (5) 2018-1900, emergent maintenance activities during 1R27

Radiation Worker Performance (1 Sample)

The inspectors evaluated radiation worker and radiation protection technician performance.

**OTHER ACTIVITIES – BASELINE**

71151 - Performance Indicator Verification

The inspectors verified licensee performance indicators submittals listed below:  
(8 Samples)

- (1) IE01: Unplanned Scrams per 7000 Critical Hours Sample, Unit 1 and Unit 2, (January 1, 2017, through December 31, 2017)
- (2) IE03: Unplanned Power Changes per 7000 Critical Hours Sample, Unit 1 and Unit 2, (January 1, 2017, through December 31, 2017)

- (3) IE04: Unplanned Scrams with Complications Sample, Unit 1 and Unit 2, (January 1, 2017, through December 31, 2017)
- (4) OR01: Occupational Exposure Control Effectiveness Sample (April 1, 2017, through March 30, 2018)
- (5) PR01: Radiological Effluent Technical Specifications/Offsite Dose Calculation Manual (RETS/ODCM) Radiological Effluent Occurrences Sample (April 1, 2017, through March 30, 2018)

#### 71152 - Problem Identification and Resolution

##### 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 train B service water inoperable due to strainer high differential pressure during pre-screen cleaning following winter shad run on March 27, 2018

A finding associated with this inspection is documented in the Inspection Results section below.

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

##### Events (2 Samples)

- (1) The inspectors evaluated licensee's response to Unit 2 entry into loss of service water abnormal operating procedure due to service water pump A and C strainer high differential pressure alarm during pre-screen cleaning on January 19, 2018.
- (2) The inspectors evaluated licensee's response to Unit 1 and Unit 2 cyber security issues on the business network on February 6, 2018.

##### Licensee Event Reports (LERs) (1 Sample)

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

- (1) LER 05000313/2016-002-00, Tornado Missile Vulnerability Resulting in Condition Prohibited By Technical Specifications, on February 5, 2018

#### **OTHER ACTIVITIES – TEMPORARY INSTRUCTIONS, INFREQUENT AND ABNORMAL**

##### 60855.1 - Operation of an Independent Spent Fuel Storage Installation at Operating Plants

The inspectors evaluated the licensee's operation of the independent spent fuel storage installation (ISFSI) from October 30 to November 2, 2017, on-site at ANO, and conducted an in-office review of additional documentation related to licensee's maintenance of their cask handling crane until January 2018.

The ANO ISFSI consisted of four ISFSI pads. ANO had loaded 24 canisters of the Energy Solutions ventilated storage cask (VSC) VSC-24 design (Certificate of Compliance No. 1007) from 1996 to 2003. Since that time, ANO had been loading HI-STORM 100S Version C overpacks. ANO's ISFSI contained a total of 57 HI-STORM overpacks with 32 MPC-24 canisters and 25 MPC-32 canisters, at the time of the routine inspection. ANO was currently loading canisters to the Holtec Certificate of Compliance 1014, Amendment 5, and Final Safety Analysis Report (FSAR), Revision 7.

The ISFSI activities specifically reviewed during the on-site inspection and the subsequent in-office review included:

- (1) Evaluated and observed fuel selection and fuel loading operations.
- (2) Reviewed the licensee's loading, processing, and heavy load procedures associated with their current dry fuel storage campaign.
- (3) Reviewed licensee's corrective action program implementation for ISFSI operations since the last routine ISFSI inspection which was completed in December 2015.
- (4) Reviewed quality assurance (QA) program implementation, including recent QA audits, surveillances, receipt inspection, and quality control activities.
- (5) Reviewed documentation related to technical specification (TS) required operational surveillance activities and Final Safety Analysis Report (FSAR) required annual maintenance activities.
- (6) Reviewed the licensee's radiological monitoring data for the calendar years 2014, 2015, and 2016.
- (7) Reviewed spent fuel documentation for the canisters loaded since the last routine ISFSI inspection (Holtec Canister 48-57) to confirm the fuel met all TS requirements for storage and transportation.
- (8) Reviewed annual maintenance activities for heavy lifting components which included special lifting devices and the site's cask handling crane (Auxiliary Building L-3 crane).
- (9) Reviewed all 72.48 safety evaluations/screenings for changes made to the licensee's ISFSI operations in accordance with Inspection Procedure 60857 since the last routine ISFSI inspection.
- (10) Reviewed all changes made to the licensee's 72.212 Report (Revision 10) in accordance with Inspection Procedure 60856.1 since the last routine ISFSI inspection.

Additionally, inspectors closed two unresolved items (URIs) from a routine ISFSI inspection conducted in 2012 (see Inspection Results).

## INSPECTION RESULTS

Failure to Establish Adequate Criteria for Flood Seal Testing			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000313/2018001-01 and 05000368/2018001-01 Closed	[H.1] – Resources	71111.01 - External Flooding
<p>The inspectors identified a Green finding and associated non-cited violation of Unit 1 Technical Specification 5.4.1.a and Unit 2 Technical Specification 6.4.1.a for the licensee's failure to establish the criteria for ensuring the necessary conditions existed for a successful test of hatch flood seals. Specifically, Procedure OP 1402.240, "Inspection of Watertight Hatches," Revision 01, did not contain adequate guidance to ensure that the auxiliary building was at a lower pressure than the turbine building such that puffing smoke on the turbine building side would allow a seal leak to be detectable.</p>			
<p><u>Description:</u> As part of corrective actions to prevent recurrence for Yellow finding 05000313/2014009-01 and 05000368/2014009-01, the licensee improved the preventive maintenance for flood seals on hatches that prevented flood waters from external sources from entering the auxiliary building, where safety-related accident mitigation equipment was located. These actions included a new testing protocol which established a pressure differential across the seal, then puffed chemical smoke around the seal and observed for leaks. Known as a smoke test, this method requires that air pressure inside the auxiliary building be lower than turbine building air pressure so that when smoke is puffed around the outside of the seal, the smoke would be pulled into the lower pressure area on the other side, and leaks would be detectable.</p> <p>On November 29, 2017, as part of a Confirmatory Action Letter Inspection, NRC inspectors reviewed corrective actions and observed a smoke test of hatch 492. The inspector noted that test personnel had checked that the auxiliary building ventilation was in a normal alignment, but had assumed that this meant that pressure was lower on the auxiliary building side of the hatch. When the licensee agreed to measure the pressure on each side of the hatch, pressure was actually higher on the auxiliary building side such that leakage would not have been detectable.</p> <p>Procedure OP 1402.240, "Inspection of Watertight Hatches," Revision 01, directed personnel to ensure negative ventilation in the auxiliary building prior to start. However, the procedure did not state how much pressure differential was needed or how this was to be measured.</p> <p>The inspector determined that all six hatches that serve as flood barriers were previously tested using the inadequate procedure. Upon discovery, the licensee took action to ensure that a negative ventilation in the auxiliary building would be established and verified as part of the procedure. When re-tested, all hatches passed the smoke test.</p> <p>Corrective Action(s): The corrective action was to make changes to the procedure to establish appropriate ventilation lineup and re-perform the smoke tests at all locations.</p> <p>Corrective Action Reference(s): Condition Report CR-ANO-C-2017-04759</p>			

**Performance Assessment:**

**Performance Deficiency:** The licensee's failure to establish adequate prerequisite criteria for smoke testing flood seals on hatches is a performance deficiency.

**Screening:** The performance deficiency is more than minor because, if left uncorrected, it has the potential to become a more significant safety concern. Specifically, because Procedure OP 1402.240 did not have adequate instructions to ensure the appropriate ventilation lineup, hatch flood seals would always pass the test regardless of whether the seal would allow water to pass or not. Therefore, any flooding or pipe rupture could lead to water ingress into the Unit 1 and Unit 2 auxiliary buildings affecting the availability of mitigating equipment needed to respond to flooding. This finding affects the Mitigating Systems Cornerstone.

**Significance:** The inspectors assessed the significance of the finding using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012. The inspectors determined that the finding had very low safety significance (Green) because the equipment or safety function was not completely failed or unavailable, and because the finding does not involve the total loss of any safety function, identified by the licensee through a probabilistic risk assessment (PRA), individual plant examination of external events (IPEEE), or similar analysis, that contributes to external event initiated core damage accident sequences. Specifically, since the hatches were confirmed to be leak tight after re-testing, no actual loss of function occurred.

**Cross-cutting Aspect:** This finding has a cross-cutting aspect in the area of human performance associated with avoiding complacency, because the individuals failed to verify that procedure prerequisites were met rather than assume they are met based on general plant conditions.

**Enforcement:**

**Violation:** Technical Specification 5.4.1.a for Unit 1 and Technical Specification 6.4.1.a for Unit 2 requires, in part, that written procedures be established, implemented, and maintained covering the applicable procedures recommended in Appendix A to Regulatory Guide 1.33, "Quality Assurance Program Requirements," Revision 2, February 1978. Regulatory Guide 1.33, Appendix A, Section 9.a, states 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, on November 29, 2017, the licensee failed to properly preplan and perform maintenance that can affect the performance of safety-related equipment in accordance with written procedures, document instructions, or drawings appropriate to the circumstances. Specifically, Procedure 1402.240, "Inspection of Watertight Hatches," Revision 01, failed to include adequate details needed to not verify that the auxiliary building was at a lower pressure than the turbine building prior to performing a smoke test of the flood seal of hatch 492. Under the existing conditions, the test would have passed even with a degraded seal. This condition had the potential to affect the performance of safety-related mitigating equipment needed to respond to a flooding event.

Disposition: This violation is being treated as a non-cited violation, consistent with Section 2.3.2.a of the Enforcement Policy, because it was very low safety significance (Green) and was entered into the licensee’s corrective action program as Condition Report CR-ANO-C-2017-04759.

Failure to Preplan and Perform Service Water Pre-Screen Maintenance			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000368/2018001-02 Closed	[H.12] – Avoid Complacency	71152 - Annual Follow-up of Selected Issues
<p>The inspectors reviewed a self-revealed, non-cited violation and associated finding 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 properly preplan pre-screen cleaning maintenance, causing the train B service water system to become inoperable.</p>			
<p><u>Description:</u> On January 19, 2018, ANO Unit 2 was operating in Mode 1 and making preparations to clean the intake structure service water pre-screens in accordance with Operating Procedure (OP) 2104.029, “Service Water System Operations,” Change 109. Two operable trains of service water are required per Unit 2 Technical Specification 3.7.3.1, Service Water System while in Mode 1.</p> <p>The ANO Unit 2 service water system has stationary pre-screens between the traveling screens and the pumps that must be manually hoisted out of the flow stream to be cleaned. The configuration is such that debris can be knocked loose and fall back into the flow stream during cleaning and enter both running pumps. The pre-screens are intended to catch small debris that was not removed by the traveling screen so that the strainer baskets located downstream of each pump do not get clogged. The discharge strainer basket design does not have a self-cleaning feature.</p> <p>Between January 16, 2018, through dayshift January 18, 2018, the licensee was aware that they were experiencing a shad (fish) run in the intake canal. The pre-screen differential pressure (D/P) had been exhibiting a rising trend due to debris buildup. During this timeframe, the pre-screen and traveling screen D/P went from 3.00 inches of water to 6.75 inches of water. At 8:52 pm on January 18, 2018, the licensee received the service water high differential pressure alarm and pre-screen D/P was 9.5 inches of water, with a procedural requirement to initiate action to clean the pre-screens at 8 inches of water. Prior to the licensee cleaning the pre-screens, D/P reached 18 inches of water. This rate of debris buildup was unusual considering most D/P effects on the screen are witnessed on ANO Unit 1 screens and not ANO Unit 2 screens. Based on past experience of slow build-up of debris, the licensee delayed pre-screen cleaning until 4:14 a.m. on January 19, 2018, to avoid having maintenance personnel exceed fatigue management limits.</p> <p>During the lifting and removal of the first pre-screen for cleaning, fish were observed to be falling off and entering the suction of the A (SW-P-A) and C (SW-P-C) service water pumps. As a result, the Unit 2 control room received SW-P-A and SW-P-C discharge strainer high differential pressure (D/P) annunciators. The SW-P-A discharge strainer D/P peaked at 12.8 psid, and the SW-P-C discharge strainer D/P peaked at 24.1 psid. The licensee entered</p>			



abnormal Operating Procedure 2203.022, "Loss of Service Water," Revision 14, and assessed the operability of train A and B service water systems. The swing pump suction was aligned to the emergency cooling pond and the pump started so that a second train of service water could be made available if needed.

Following an engineering evaluation, train B service water system was declared inoperable due to exceeding the 20 psid operability limit for the SW-P-C strainer; train A service water system remained operable throughout the event. Over the course of the rest of the day, the licensee manipulated the service water system to clean the rest of the pre-screens and the service water pump discharge strainers and reestablish train B service water system operability. The train B service water system was declared operable at 10:10 p.m. on January 19, 2018, at which time the "Loss of Service Water" procedure was exited. The licensee's short term corrective action was to implement a standing order for service water pre-screens and traveling screens that required operations personnel to log both pre-screen and traveling screen D/P and clean traveling screens at least weekly and pre-screens weekly. The licensee documented this issue in Condition Report CR-ANO-C-2018-00299.

The inspectors noted that a similar event occurred on August 19, 2016. The D/P on the train B service water pump strainer continued to rise until it reached the threshold at which the performance of an engineering evaluation was required to determine the operability of the B train of service water. This high D/P was attributed to fouling of the strainer caused by pre-screen cleaning activities and delaying the start of the cleaning. Despite this event, the same basic chain of events recurred on January 19, 2018. The inspectors pointed out that the pre-screen design created an inherent risk of spilling debris into the open hole created by lifting the pre-screens. With both trains in a normal alignment, most of the debris would enter both pumps and begin to clog the discharge strainer. The inspectors questioned why this risk was not avoided by proactively aligning one or both trains to the emergency cooling pond. The licensee agreed to study this alternative as a possible corrective action.

Corrective Action(s): The immediate corrective action was to restore operability of the train B service water system and institute a weekly pre-screen cleaning regiment.

Corrective Action Reference(s): Condition Report CR-ANO-C-2018-00299

Performance Assessment:

Performance Deficiency: The licensee's failure to properly preplan pre-screen cleaning maintenance that can affect the performance of safety-related equipment is a performance deficiency. As a result, the performance of both trains of the safety-related service water system were challenged, and train B was rendered inoperable.

Screening: The performance deficiency was more than minor because it adversely affected the human performance attribute of the Mitigating Systems Cornerstone and the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the licensee's failure to properly preplan pre-screen cleaning maintenance resulted in the train B service water system being rendered inoperable.

Significance: Using NRC 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 had very low safety significance (Green) because it: was not a design deficiency; did not

represent a loss of system and/or function; did not represent an actual loss of function of at least a single train for longer than its technical specification allowed outage time; and did not result in the loss of a high safety-significant, nontechnical specification train.

Cross-cutting Aspect: The finding had a cross-cutting aspect in the area of human performance associated with avoid complacency because the licensee did not plan for the inherent risk with cleaning the pre-screens although cleaning of debris has previously challenged the service water system. Specifically, the licensee did not effectively plan pre-screen cleaning maintenance to avoid system impacts, and did not consider the rate of increase in pre-screen differential pressure due to the winter fish runs in deciding when to start the cleaning.

Enforcement:

Violation: Technical Specification 6.4.1.a requires, in part, that written procedures be established, implemented, and maintained covering the applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2, February 1978. Section 9.a of Regulatory Guide 1.33, Appendix A, states 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, on January 19, 2018, the licensee failed to properly preplan and perform maintenance as prescribed in Regulatory Guide 1.33. Specifically, the licensee failed to preplan the cleaning of Unit 2 service water pre-screens prior to high debris loading of the screens, and failed to place the service water system into an alignment that would have avoided impacting the operability of this safety-related system.

Disposition: This violation is being treated as a non-cited violation, consistent with Section 2.3.2.a of the Enforcement Policy, because it was very low safety significance (Green) and was entered into the licensee’s corrective action program as Condition Report CR-ANO-C-2018-00299.

Licensee Identified Non-Cited Violation	71124.01_- Radiological Hazard Assessment and Exposure Controls
This violation of very low safety significant (Green) was identified by the licensee and has been entered into the licensee corrective action program and is being treated as a non-cited violation, consistent with Section 2.3.2.a of the Enforcement Policy.	
<p>Violation: Title 10 CFR 20.1501(a) requires that each licensee make or cause to be made surveys that may be necessary for the licensee to comply with the regulations in 10 CFR Part 20, and that are reasonable under the circumstances to evaluate the magnitude and extent of radiation levels, concentrations, or quantities of radioactive materials, and the potential radiological hazards that could be present.</p> <p>Contrary to the above, on August 7, 2017, the licensee failed to make necessary surveys of the Unit 2, 2T-15 tank room, that were reasonable to evaluate the magnitude and extent of radiation levels that could be present. Consequently, workers were allowed access to an area with dose rates up to 1000 millirem per hour at 30 cm without a proper briefing or oversight.</p>	

Significance: Using NRC Manual Chapter 0609, Appendix C, "Occupational Radiation Safety Significance Determination Process," the inspectors determined the finding to be of very low safety significance (Green) because: (1) it was not associated with as low as is reasonably achievable (ALARA) planning or work controls; (2) there was no overexposure; (3) there was no substantial potential for an overexposure; and (4) the ability to assess dose was not compromised.

Corrective Action Reference(s): CR-ANO-2-2017-04634 and CR-ANO-2-2017-05337

Unresolved Item (Closed)	Validation of the ANO data collected during the thermal validation test and used in the Holtec analysis. URI 7200013/2012001-02	60855.1
<p><u>Description:</u> During the routine ISFSI inspection conducted on October 29 – November 1, 2012, an unresolved item (URI) was identified and documented in the routine ISFSI NRC Inspection Report 05000313/20120008, 05000368/2012008, and 07200013/2012001 (ADAMS Accession No. ML13057A986).</p> <p>The Holtec International HI-STORM 100 Certificate of Compliance (CoC) No. 1014, Condition 9, required the performance of a one-time thermal validation test on the first cask that exceeded 20 kW to validate the analytical methods and thermal performance predicted by the licensing basis thermal model as described in Chapter 4 of the Holtec HI-STORM 100 FSAR. ANO was the first general licensee to load a canister exceeding 20 kW and, as such, was required to perform the thermal validation test in accordance with License Condition 9. During the NRC inspection in 2012, the inspectors identified that ANO had completed the test using instrumentation that had not been controlled or calibrated in accordance with ANO's quality assurance program. The NRC identified this failure to follow the ANO's quality assurance program for the thermal validation test instrumentation as a non-cited violation of 10 CFR 72.164 (NCV 07200013/2012001-01) consistent with Section 2.3.2 of the NRC Enforcement Policy. The validation of the data collected by the instrumentation used during the test was considered indeterminate until the licensee was able to demonstrate that the equipment was properly calibrated by a qualified vender on the licensee's approved vendor list. The resolution of this issue was tracked as an unresolved item (URI 07200013/2012001-02).</p> <p>ANO took corrective actions to verify that the data from the measuring instruments was acceptable by sending the equipment to a qualified lab to verify the equipment was properly calibrated. ANO was able to verify the calibration of the resistance temperature detectors used in the test. The other equipment used in the test were DANTEC LVFA wind tunnel 435-1010 anemometer probes which measured air velocities at very low rates of speed. ANO sent these anemometers to multiple labs including Exelon Labs and National Aeronautics and Space Administration (NASA) for calibration. Unfortunately, none of the labs were able to successfully test the equipment to verify they were properly calibrated, and upon return to ANO, the anemometers were broken in transit. ANO was unable to verify the validity of the data collected during their thermal validation test.</p>		
<p>Corrective Action Reference(s): CR-ANO-C-2013-00374, CR-ANO-C-2013-0575, and CR-ANO-C-2013-00576</p>		
<p>Closure Basis: Since the ANO staff were unable to validate the data collected for the thermal validation test, as required by CoC License Condition 9, the required test will still need to be</p>		

performed. However, the NRC has concluded that the wording from CoC License Condition 9 (Amendments 5-9) was not suitable to provide adequate test data to confirm the Holtec thermal analysis as described in the FSAR. The License Condition 9 required measuring air velocity within the annulus area between the canister and the overpack. The data provided in the ANO test was inconsistent and the test requirements listed in the CoC Amendments 5 through 9, License Condition 9, needed to be revised to provide more consistent data that could be utilized by the vendor and the NRC to verify the analytical models from the FSAR. On May 31, 2016, NRC issued CoC 1014, License Amendment 10, (ADAMS Accession No. ML17237B994) which modified the License Condition 9 thermal validation test to measure air velocity at the inlet vents and not the annulus area between the canister and the overpack.

The first general licensee to load a canister that exceeds 20 kW, under CoC 1014 License Amendment 10, is required to perform the thermal validation test using the new method as described in the license condition. This test will provide sufficient data for the vendor to perform the required analysis and allow the NRC more stable results to review and conclude on the validation of the thermal model as described in the FSAR. A licensee in another region has described their intention of performing the required thermal validation test in the 2018 timeframe.

Unresolved Item (Closed)	Applicability of the ANO thermal validation test results to other HI-STORM 100 overpack configurations. URI 07200013/2012001-03	60855.1
<p><u>Description:</u> On February 3, 2012, Entergy submitted a letter to the NRC informing the agency of the completion of the thermal validation test (discussed above) and the completion of the Holtec analysis (ADAMS Accession No. ML12038A177). On September 14, 2012, Holtec also informed the NRC of the completion of the ANO thermal validation test and provided a copy of Holtec Report HI-2114925 (ADAMS Accession No. ML12264A541) which evaluated the test data. The Holtec report indicated that the thermal model utilized in the licensing-based analysis methodology had predicted an air mass flow rate lower than the values measured in the ANO thermal test and, as such, demonstrated an overall conservatism of the licensing-based methodology, thereby confirming the suitability of the methodology for demonstrating the thermal-hydraulics safety of the HI-STORM 100 cask system and satisfying the requirement of Condition 9.</p> <p>Holtec issued a statement to the other HI-STORM 100 general licensee users concerning the ANO test on a HI-STORM 100S, Version C, overpack and whether the results could be applied to other cask models of the 100 series. Holtec Licensing Position Paper HL-2011-01 was distributed to Holtec cask users dated August 5, 2011. Holtec concluded that the ANO test data demonstrated the validity of the thermal models, and as such, the results of the ANO test could be applied to any of the HI-STORM 100 overpack configurations. During a meeting on December 18, 2012, between the NRC, ANO, and Holtec, the applicability of the ANO test to the other HI-STORM overpacks was discussed extensively. A number of questions remained as to the sensitivity of the test results to the various configurations of the overpack dimensions and vent sizes. As such, the NRC needed to perform an independent evaluation to confirm Holtec's position. The independent review performed by the NRC was tracked as an unresolved item (URI 07200013/2012001-03).</p>		
Corrective Action Reference(s): CR-ANO-C-2013-00374, CR-ANO-C-2013-0575, and CR-ANO-C-2013-00576		

Closure Basis: As described above in URI 07200013/2012001-01, the NRC concluded that the wording from CoC License Condition 9 (Amendments 5-9) was not suitable to provide adequate test data to confirm Holtec's thermal methodology. On May 31, 2016, NRC issued CoC 1014 License Amendment 10 (ADAMS Accession No. ML17237B994), which modified the License Condition 9 thermal validation test to measure air velocity at the inlets and not the annulus area between the canister and the overpack. The first general licensee to load a canister that exceeds 20 kW under CoC 1014 License Amendment 10, is required to perform the thermal validation test using the new method as described in the License Condition. Once the new data is collected and analyzed by the general licensee and the vendor, the information will be submitted to the NRC for an independent review.

A general licensee in another region has described their intention of performing the required thermal validation test in the 2018 timeframe.

## **EXIT MEETINGS AND DEBRIEFS**

The inspectors verified no proprietary information was retained or documented in this report.

On January 18, 2018, the inspector presented the results from the routine ISFSI inspection to Ms. S. Pyle, Licensing Manager, and other members of the licensee staff.

On March 30, 2018, the inspector presented the radiation protection inspection results to Mr. R. Anderson, Site Vice President, and other members of the licensee staff.

On April 4, 2018, 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.

On April 18, 2018, the inspectors presented the re-exit of the quarterly resident inspector inspection results to Ms. S. Pyle, Regulatory Assurance Manager, and other members of the licensee staff.

## DOCUMENTS REVIEWED

### 71111.01 – Adverse Weather Protection

#### Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Revision</u>
M-2204	Piping & Instrument Diagram, Emergency Feedwater, Sheet 4	72

#### Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
2104.036	Emergency Diesel Generator Operations	94
2106.006	Emergency Feedwater System Operations	97
2106.032	Unit Two Freeze Protection Guide	27
1402.240	Inspection of Watertight Hatches	2

#### Condition Reports (CR-ANO-)

C-2018-00050	1-2017-03673
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### 71111.04 - Equipment Alignment

#### Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Revision</u>
CALC-91-E-0090-02	ANO-2 EDG Room Ventilation	2
CALC-91-R-2013-01		28
EC-24964	U-2 Emergency Diesel Generator Cycle 20 Heat Exchanger Thermal Performance Evaluation	
EC-45962	2K-4A/B 2013 Emergency Diesel Heat Exchanger Thermal Performance Test	
EC-46332	U-2 Emergency Diesel Generator Thermal Performance Test Review 2011	
EC-52442	2014 2K-4A/B Thermal Performance Evaluation	
EC-66265	U-2 SW Strainer D/P Spike Op Input	0
ER-ANO-2006-0248-000		
GL-89-13	SW System Problems Affecting Safety-Related Equipment	

Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Revision</u>
M-2204	Piping & Instrument Diagram, Emergency Feedwater, Sheet 4	72
M-2210	Piping & Instrument Diagram, Service Water, Sheet 1 - 4	83
STM-2-42	SW and ACW Systems	38

Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
1403.191	Motor Testing Using "MCE/EMAX"	11, 12
2104.029	Service Water System Operations	109
2104.036	Emergency Diesel Generator Operations	94
2104.044	Ventilation System Operations	44
2106.006	Emergency Feedwater System Operations	97

Condition Reports (CR-ANO-)

1-2013-03239	1-2016-05663	1-2016-05675	1-2016-05676
1-2017-00186	1-2018-00132	2-2012-00762	2-2015-02748
2-2015-02879	2-2015-05329	2-2016-00035	2-2016-00550
2-2016-02987	2-2016-03206	2-2016-03918	2-2016-04462
2-2017-05291	2-2017-05919	2-2018-00157	2-2018-00165
2-2018-00168	C-2013-03165	C-2016-05226	C-2016-05445
C-2017-04059	C-2017-04069	C-2017-04775	C-2018-00277
C-2018-00441			

Work Orders

52537116	52728726	497922-01
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**71111.05 - Fire Protection**

Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Revision/Date</u>
	Pre-Drill Brief – ASOTH-FP-FBDRLS	9
EC-52999	Justification for Additional Non-Q Battery Room Heating	00



Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Revision/Date</u>
ER-ANO-2002-0145-00	Justification for Temporary Non-Q Battery Room Heating	January 30, 2002
FBDRL-2018-03	Fire Drill	March 9, 2018

Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
2106.032	Unit Two Freeze Protection Guide	27

**71111.06 - Flood Protection Measures**

Drawings

<u>Number</u>	<u>Title</u>	<u>Revision</u>
E-601	Electrical Plot Plan Outdoor Area, Sheet 1	
1402.240	Inspection of Watertight Hatches	2

Work Orders

52747174

**71111.11 - Licensed Operator Requalification Program and Licensed Operator Performance**

Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
OP-2202.001	Standard Post Trip Actions	16
OP-2202.002	Reactor Trip Recovery	11
OP-2203.009	Fire Protection System Annunciator Corrective Actions	32
OP-2203.025	RCP Emergencies	18
OP-2203.034	Fire or Explosion	21

**71111.12 - Maintenance Effectiveness**

Drawings

<u>Number</u>	<u>Title</u>
234C7880F	Induction Motor

Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Revision</u>
117	Engineering Evaluation, SW Pumps	6
2015	U-2 SW System Health Report Q1, Q2, Q3, Q4	
2016	U-2 SW System Health Report Q1, Q2, Q4	
2017	U-2 SW System Health Report Q2	
EC-28463	SW System	0
N 1000.006-P	E-Doc, SW System Ops	53
TDG080 1710	Triclad Vertical Induction Motors	3

Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
1304.125	Unit 1 RPS-A/CRD Breaker Trip Test	26
1309.013	Flow Rate Data	
2104.029	SW System Ops	109
2203.022	Loss of SW Tech Guidelines	14
2311.002	Flow Rate Data	
2411.102	U-2 Slide Gate and SW Bay Cleaning/Inspection	
EN-DC-204	Maintenance Rule Scope and Basis	4
EN-DC-205	Maintenance Rule Monitoring	6
EN-FAP-OM-012	Prompt Investigation and Notifications, Attn. 7.4	9
EN-LI-118	ANO Response to Cold Weather Shad Runs	25
1402.240	Inspection of Watertight Hatches	2

Condition Reports (CR-ANO-)

1-2017-00965	2-2014-02814	2-2015-00083	2-2015-00129
2-2015-00268	2-2016-01808	2-2016-02351	2-2016-02611
2-2017-01162	2-2017-05280	2-2017-05281	2-2017-05329
2-2017-05759	2-2018-00044	2-2018-00045	2-2018-00157
2-2018-00300	2-2018-00445	2-2018-00797	C-2017-00287
C-2018-00299	C-2018-01623	1-2017-03673	

Work Orders

189034	435369	453805	468095	486027
489032	51803722	52652306	52711156	52713201
52715932	52728009	52766896	52784316	

**71111.13 - Maintenance Risk Assessments and Emergent Work Control**

Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Revision</u>
COPD-024	Risk Assessment Actions	64

Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
1107.001	Electrical System Operations	115
2104.029	Service Water System Operations	109
2203.003	CEA Malfunction	24
EN-FAP-OM-021	Critical Decision Procedure	5
EN-OP-119	Protected Equipment Postings	9
EN-WM-104	On Line Risk Assessment	16

Condition Reports (CR-ANO-)

C-2018-00474	C-2018-00475
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Work Orders

490410

**71111.15 - Operability Determinations and Functionality Assessments**

Drawings

<u>Number</u>	<u>Title</u>
A2001S01	ANO 500/161KV SW STA Station One-Line In-Service Diagram
E-2100	Schematic Diagram Diesel Generator 2K4A ACB 152-308
E-2276	Schematic Diagram Service Water Pump 2P4B
E-2361	Schematic Diagram Containment Cooling 2VSF1A
E-2361	Schematic Diagram Containment Cooling 2VSF1B

Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Date</u>
00-R-2011-01	Calculation	
OPS-152A	SU1 Outage Checklist – Unit 1 – 72-Hour TC	August 29, 2013
OPS-152B	SU3 Outage Checklist – Unit 2 – 72-Hour TC	August 29, 2013

Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
1106.006	Emergency Feedwater Pump Operation	100, 101, 102

Condition Reports (CR-ANO-)

1-2000-00068	1-2017-01820	1-2018-00086	2-2000-00074
2-2018-00055	2-2018-00065	2-2018-00088	C-2018-00389
C-2018-00474	C-2018-00475		

Work Orders

490410-16

**71111.18 - Plant Modifications**

Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Revision/Date</u>
CALC-86E-0020-01	1E Station Battery 2D11 Duty Cycle and Sizing Calculation	18
EC-52999	Justification for Additional Non-Q Battery Room Heating	00
ER-ANO-2002-0145-00	Justification for Temporary Non-Q Battery Room Heating	January 30, 2002
STM 2-32-5	125 VDC Electrical Distribution	25

Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
2106.032	Unit Two Freeze Protection Guide	27

Condition Reports (CR-ANO-)

2-2003-00041                    2-2014-00345

Work Orders

490646

**71111.19 - Post-Maintenance Testing**

Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
2304.237	Post Maintenance Verification	16

Condition Reports (CR-ANO-)

1-2018-01107                    2-2018-00356

Work Orders

494916

**71111.22 - Surveillance Testing**

Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Revision/Date</u>
CALC-95-R-0014-02-01		
MWO50235000		
MWO50235239		
MWO50235641		
OPS-152A	SU1 Outage Checklist – Unit 1 – 72-Hour TC	August 29, 2013
OPS-152B	SU3 Outage Checklist – Unit 2 – 72-Hour TC	August 29, 2013
SEP-ANO-1-IST-1	ANO-1 Inservice Testing Basis Document	3

Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
1104.209	SW Pump Performance Curves	

Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
1106.006	Emergency Feedwater Pump Operation	100, 101, 102
1107.001A	Unit 1 XFMR Outage Checklist	115
1304.125	Unit 1 RPS-A/CRD Breaker Trip Test	26
2104.029	SW Pump Performance Curves	

Condition Reports (CR-ANO-)

1-2009-01820	1-2017-00965	1-2018-00086	1-2018-00631
2-2017-05885	C-2018-00474		

Work Orders

52747144

**71124.01 - Radiological Hazard Assessment and Exposure Controls**

Air Sample Surveys

<u>Number</u>	<u>Title</u>	<u>Date</u>
AS-ANO-2018-04648	RAB 10 – P36 A Makeup Pump Tear Down	March 2, 2018
AS-ANO-2018-04660	RAB 11 – AMS-4 Alarm	March 7, 2018
AS-ANO-2018-04665	RAB 121 – Replace 2RE – 8221-2 Blower Pump UNPR	March 9, 2018

Audits and Self-Assessments

<u>Number</u>	<u>Title</u>	<u>Date</u>
LO-ALO-2017-00025	Self-Assessment: Radiation Safety – Hazard Assessment and Airborne Controls	March 22, 2017
QA-14/15-2017-ANO-01	Combined Radiation Protection and Radwaste	November 6, 2017

Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Date</u>
	NSTS Annual Inventory Reconciliation Report	January 11, 2018
	ANO Alpha Hazard Evaluation	May 3, 2017

### Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Date</u>
ANO-2017-0067	Spent Fuel Pool Inventory – Non-Fuel Items	August 22, 2017
ANO-2017-0093	2017 Radiation Energy Distribution Evaluation	December 7, 2017
52742701	Annual Inventory of Non-Installed Radioactive Sources	February 20, 2018
52745968	Semi Annual Leak Test of Sealed Sources	February 15, 2018

### Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
EN-RP-100	Radiation Worker Expectations	12
EN-RP-101	Access Control for Radiologically Controlled Areas	14
EN-RP-102	Radiological Control	5
EN-RP-104	Personnel Contamination Events	10
EN-RP-105	Radiological Work Permits	18
EN-RP-106	Radiological Survey Documentation	7
EN-RP-108	Radiation Protection Posting	20
EN-RP-109	Hot Spot Program	5
EN-RP-121	Radioactive Material Control	14
EN-RP-123	Radiological Controls for Highly Radioactive Objects	1
EN-RP-143	Source Control	13
EN-RP-152	Conduct of Radiation Protection	3

### Radiation Surveys

<u>Number</u>	<u>Title</u>	<u>Date</u>
1609-0457	U1 AUX 335' EL – F3A/F3B Filter Rooms	September 19, 2016
1703-0336	U1 AUX Bldg – T-15 Tank Room	March 14, 2017
1801-0490	U1 AUX 335' EL F2 Seal Injection Filter Room	January 31, 2018
1802-0204	Semi Annual Source Leak Test	February 14, 2018

Radiation Work Permits

<u>Number</u>	<u>Title</u>	<u>Revision</u>
20181401	Radiation Protection Activities During 1R27	00
20181407	Decontamination Activities During 1R27 (Bulk Work)	00
20181412	1R27 Locked High Radiation Area Activities (Bulk Work)	01
20181425	RCP Motor Maintenance During 1R27	00
20181430	Reactor Disassembly/Re-Assembly, and Support Activities	00
20181432	De-Fuel & Re-Fuel the Reactor	00
20182053	Spent Fuel Activities – Unit 2	00

Condition Reports (CR-ANO-)

1-2018-00585	1-2018-00997	1-2018-01273	2-2017-01634
2-2017-04273	2-2017-04634	2-2017-05337	2-2017-06115
C-2017-00890	C-2017-00946	C-2017-01105	C-2017-03822
C-2017-03929	C-2018-01264		

Fleet Condition Reports (CR-HQN-)

2017-00179	2017-00848	2017-00974
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**71124.02 - Occupational ALARA Planning and Controls**

ALARA Planning, In-Progress Reviews, and Post-Job Reviews

<u>Number</u>	<u>Title</u>	<u>Date</u>
20171070	Core Bore NFPA 805 Project and Support Activities	March 6, 2018
20181070	Core Bore NFPA 805 Project and Support Activities	March 5, 2018
20181430	Reactor Disassembly, Reassembly, and Support Activities	June 17, 2017

Audits and Self-Assessments

<u>Number</u>	<u>Title</u>	<u>Date</u>
LO-ALO-2017-00023	Self-Assessment: Radiation Safety – ALARA & Dose Assessment	September 11, 2017
QA-14/15-2017-ANO-01	Quality Assurance Audit: Combined Radiation Protection and Radwaste	November 6, 2017



Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Date</u>
	Letdown Heat Exchanger (E-29A/B) Flush Plan	March 28, 2018
TSR 18-1-063	Letdown Heat Exchangers, E-29A and E-29B	December 7, 2017
TSR 18-1-064	RBD-11A & RBD-12A / Makeup System	December 7, 2017
TSR 18-1-123	Letdown Cooler E-29A&B Inlet/Outlet Isolation	December 7, 2017

Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
EN-RP-105	Radiological Work Permits	18
EN-RP-110	ALARA Program	14
EN-RP-110-03	Collective Radiation Exposure Guidelines	4
EN-RP-110-04	Radiation Protection Risk Assessment Process	7
EN-RP-110-06	Outage Dose Estimating and Tracking	1

Radiation Work Permits

<u>Number</u>	<u>Title</u>	<u>Revision</u>
20171070	Core Bore NFPA 805 Project and Support Activities	03
20181070	Core Bore NFPA 805 Project and Support Activities	03
20181401	Radiation Protection Activities During 1R27	00
20181414	ALARA Activities During 1R27	00
20181420	Scaffold Installation / Removal Non-LHRAs – 1R27	00
20181430	Reactor Disassembly, Reassembly, and Support Activities	00
20181900	Emergent Maintenance Activities During 1R27	00

Condition Reports (CR-ANO-)

1-2018-00336	1-2018-00508	1-2018-00849	2-2017-05526
C-2017-04230	C-2017-04551	C-2017-04692	C-2018-00851

Fleet Condition Reports (CR-HQN-)

2017-01791

**71151 - Performance Indicator Verification**

Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
EN-LI-114	Regulatory Performance Indicator Process	7, 8

**71152 – Problem Identification and Resolution**

Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Revision</u>
EC-66265	U-2 SW Strainer D/P Spike Op Input	0
ER-ANO-2006-0248-000		
GL-89-13	SW System Problems Affecting Safety-Related Equipment	

Condition Reports (CR-ANO-)

1-2013-03239	1-2016-05663	1-2016-05675	1-2016-05676
1-2017-00186	1-2018-00132	2-2012-00762	2-2015-02748
2-2015-02879	2-2015-05329	2-2016-00035	2-2016-00550
2-2016-02987	2-2016-03206	2-2016-03918	2-2016-04462
2-2017-05291	2-2017-05919	2-2018-00157	2-2018-00165
2-2018-00168	C-2013-03165	C-2016-05226	C-2016-05445
C-2017-04059	C-2017-04069	C-2017-04775	C-2018-00277
C-2018-00441	C-2018-0299		

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

Miscellaneous Documents

<u>Number</u>	<u>Title</u>
CALC-16-E-0017-01	Tornado Missile Shield for Door 77, Room 144
EC 67019	Door 77, room 144 Tornado Generated Missile Barrier
ECN 73255	Resolution of Rebar Interferences for DR-77 Missile Barrier

Miscellaneous Documents

<u>Number</u>	<u>Title</u>
LER 05000313/2016- 002-00	Tornado Missile Vulnerability Resulting in Condition Prohibited By Technical Specifications

Condition Reports (CR-ANO-)

1-2016-01788

**Other Activities**

Design Basis Documents

<u>Number</u>	<u>Title</u>	<u>Revision/Date</u>
72.212	72.212 Report for ANO ISFSI	10
Area-TLD Report	Review of 2014 Area Monitoring Results (1 <sup>st</sup> /2 <sup>nd</sup> half)	February 2015
Area-TLD Report	Review of 2015 Area Monitoring Results (1 <sup>st</sup> /2 <sup>nd</sup> half)	February 2016
Area-TLD Report	Review of 2016 Area Monitoring Results (1 <sup>st</sup> /2 <sup>nd</sup> half)	February 2017
CoC 1014	CoC and Technical Specifications for HI-STORM 100	Amendment 5
ISFSI FSAR	HI-STORM 100 ISFSI Final Safety Analysis Report	7
LTR-PAR-17-081	Evaluation of XSAM Periodic Test ANO, Two Block	November 20, 2017
WTHQN-2015- 277	Surveillance Activity Report	April 15, 2015
WTHQN-2015- 605	Surveillance Activity Report	April 15, 2015
WTHQN-2016- 774	Surveillance Activity Report	December 9, 2016

Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Date</u>
ANO-1708-0273	Survey of Dry Fuel Pad	August 16, 2017
ANO-1708-0279	Survey of CTF Dry Fuel Storage Pad	August 16, 2017

### Miscellaneous Documents

<u>Number</u>	<u>Title</u>	<u>Date</u>
WTHQN-2016-775	Surveillance Activity Report	December 9, 2016
WTHQN-2016-776	Surveillance Activity Report	February 16, 2016
WTHQN-2016-777	Surveillance Activity Report	December 15, 2016
WTHQN-2017-111	Surveillance Activity Report	January 25, 2017
WTHQN-2017-372	Surveillance Activity Report	April 27, 2017
WTHQN-2017-453	Surveillance Activity Report	June 9, 2017

### Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
1015.003B	Unit Two Operations Logs	80
EDR-1	Generic Licensing Topical Report for L-3 Crane	3
EN-DC-215	Fuel Selection for Holtec Dry Cask Storage for Canisters 48 through 57	6
EN-LI-100	Process Applicability Determination	20
EN-LI-101	10 CFR 50.59 Evaluations	15
EN-LI-112	10 CFR 72.48 Evaluations	12
EN-LI-115	HI-STORM 100 ISFSI Licensing Document Preparation and Control	7
EN-RP-210	Area Monitoring Program	1
OP-3403.004	HI-STORM 100 System Equipment Preparation	18
OP-3403.005	HI-STORM 100 System Loading Operations	40
OP-3403.008	HI-TRAC and MPC Preparations for Fuel Loading	1
OP-3403.009	MPC Receipt Inspections	1
OP-3403.010	HI-STORM Overpack Receipt Inspections	1
OP-3406.005	Hi-STORM and HI-TRAC Transport Operations	14
OP-3406.006	Forced Helium Dehydration System Operations	9
OP-3406.007	Supplemental Cooling System Operations	8

72.48 Evaluations

<u>Number</u>	<u>Title</u>	<u>Date</u>
DFS-15-001	72.48 Evaluation, Foreign Material	December 22, 2015
DFS-16-001	72.48 Evaluation, Application of Concrete Sealant	January 21, 2016

Condition Reports (CR-ANO-)

1-2017-3441	1-2017-3445	1-2017-3447	1-2017-3448
1.2017-3449	1.2017-3450	1-2017-3451	1-2017-3538
1-2017-3540	1-2017-3541	1-2017-3555	1-2016-0403
2-2015-2420	2-2016-0359	2-2016-2071	C-2015-0849
C-2015-0918	C-2015-0969	C-2015-1185	C-2015-2297
C-2015-2765	C-2015-3387	C-2015-4664	C-2015-4693
C-2015-4905	C-2015-4971	C-2016-0038	C-2016-0834
C-2016-0848	C-2016-1344	C-2016-2844	C-2016-3647
C-2016-4458	C-2017-2506	C-2017-2850	

Engineering Changes

EC-15295	EC-37094	EC-42379	EC-45077	EC-48646
EC-48806	EC-52044	EC-52619	EC-54103	EC-59072
EC-63881	EC-73641			

Work Orders

00065585	00408695	00419603	00439666	00479654
00488244	00489244	52393253	52576506	52629825
52629826	52638961	52663017	52667631	52687172
52687173	52701892	52707684	52719037	

**The following items are requested for the  
Occupational Radiation Safety Inspection  
Arkansas Nuclear One  
March 26 thru 30, 2018  
Integrated Report 2018001**

Inspection areas are listed in the attachments below.

Please provide the requested information on or before **March 9, 2018**.

Please submit this information using the same lettering system as below. For example, all contacts and phone numbers for Inspection Procedure 71124.01 should be in a file/folder titled "1- A," applicable organization charts in file/folder "1- B," etc.

If information is placed on *ims.certrec.com*, please ensure the inspection exit date entered is at least 30 days later than the on-site inspection dates, so the inspectors will have access to the information while writing the report.

In addition to the corrective action document lists provided for each inspection procedure listed below, please provide updated lists of corrective action documents at the entrance meeting. The dates for these lists should range from the end dates of the original lists to the day of the entrance meeting.

If more than one inspection procedure is to be conducted and the information requests appear to be redundant, there is no need to provide duplicate copies. Enter a note explaining in which file the information can be found.

If you have any questions or comments, please contact Natasha Greene at (817) 200-1154 or [natasha.greene@nrc.gov](mailto:natasha.greene@nrc.gov).

**PAPERWORK REDUCTION ACT STATEMENT**

This letter does not contain new or amended information collection requirements subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). Existing information collection requirements were approved by the Office of Management and Budget, control number 3150-0011.

**1. Radiological Hazard Assessment and Exposure Controls (71124.01) and Performance Indicator Verification (71151)**

Date of Last Inspection: **April 10, 2017**

- A. List of contacts and telephone numbers for the Radiation Protection Organization Staff and Technicians
- B. Applicable organization charts
- C. Audits, self-assessments, and LERs written since date of last inspection, related to this inspection area
- D. Procedure indexes for the radiation protection procedures
- E. Please provide specific procedures related to the following areas noted below. Additional Specific Procedures may be requested by number after the inspector reviews the procedure indexes.
  - 1. Radiation Protection Program Description
  - 2. Radiation Protection Conduct of Operations
  - 3. Personnel Dosimetry Program
  - 4. Posting of Radiological Areas
  - 5. High Radiation Area Controls
  - 6. RCA Access Controls and Radiation Worker Instructions
  - 7. Conduct of Radiological Surveys
  - 8. Radioactive Source Inventory and Control
  - 9. Declared Pregnant Worker Program
- F. List of corrective action documents (including corporate and sub-tiered systems) since date of last inspection
  - a. Initiated by the radiation protection organization
  - b. Assigned to the radiation protection organization

NOTE: The lists should indicate the significance level of each issue and the search criteria used. Please provide in document formats which are “searchable” so that the inspector can perform word searches.

If not covered above, a summary of corrective action documents since date of last inspection involving unmonitored releases, unplanned releases, or releases in which any dose limit or administrative dose limit was exceeded (for Public Radiation Safety Performance Indicator verification in accordance with IP 71151)

- G. List of radiologically significant work activities scheduled to be conducted during the inspection period (If the inspection is scheduled during an outage, please also include a list of work activities greater than 1 rem, scheduled during the outage with the dose estimate for the work activity.)
- H. List of active radiation work permits

- I. Radioactive source inventory list
  - a. All radioactive sources that are required to be leak tested
  - b. All radioactive sources that meet the 10 CFR Part 20, Appendix E, Category 2 and above threshold. Please indicate the radioisotope, initial and current activity (w/assay date), and storage location for each applicable source.
- J. The last two leak test results for the radioactive sources inventoried and required to be leak tested. If applicable, specifically provide a list of all radioactive source(s) that have failed its leak test within the last two years
- K. A current listing of any non-fuel items stored within your pools, and if available, their appropriate dose rates (Contact / @ 30cm)
- L. Computer printout of radiological controlled area entries greater than 100 millirem since the previous inspection to the current inspection entrance date. The printout should include the date of entry, some form of worker identification, the radiation work permit used by the worker, dose accrued by the worker, and the electronic dosimeter dose alarm set-point used during the entry (for Occupational Radiation Safety Performance Indicator verification in accordance with IP 71151).



## 2. Occupational ALARA Planning and Controls (71124.02)

Date of Last Inspection: **November 6, 2017**

- A. List of contacts and telephone numbers for ALARA program personnel
- B. Applicable organization charts
- C. Copies of audits, self-assessments, and LERs, written since date of last inspection, focusing on ALARA
- D. Procedure index for ALARA Program
- E. Please provide specific procedures related to the following areas noted below. Additional Specific Procedures may be requested by number after the inspector reviews the procedure indexes.
  - 1. ALARA Program
  - 2. ALARA Committee
  - 3. Radiation Work Permit Preparation
- F. A summary list of corrective action documents (including corporate and sub-tiered systems) written since date of last inspection, related to the ALARA program. In addition to ALARA, the summary should also address Radiation Work Permit violations, Electronic Dosimeter Alarms, and RWP Dose Estimates  

NOTE: The lists should indicate the significance level of each issue and the search criteria used. Please provide in document formats which are “searchable” so that the inspector can perform word searches.
- G. List of work activities greater than 1 rem, since date of last inspection, Include original dose estimate and actual dose.
- H. Site dose totals and 3-year rolling averages for the past 3 years (based on dose of record)
- I. Outline of source term reduction strategy
- J. If available, provide a copy of the ALARA outage report for the most recently completed outages for each unit
- K. Please provide your most recent Annual ALARA Report.

ARKANSAS NUCLEAR ONE – NRC INTEGRATED INSPECTION REPORT  
 05000313/2018001 AND 05000368/2018001 AND INDEPENDENT SPENT FUEL STORAGE  
 INSTALLATION INSPECTION REPORT 07200013/2017001 DATED APRIL 30, 2018

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