Final Report ML13130A329

Melfi, Jim

From:	Azua, Ray
Sent:	Tuesday, May 07, 2013 10:06 PM
To:	Melfi, Jim
Cc:	Allen, Don
Subject:	FW: ANO 2013-002 Report
Attachments:	ANOIR2013002AS-G-rev1.docx

Release

Jim,

Please print out and begin your review. I will do the same. We will need to make quick work of this.

Thanks.

Ray

From: Sanchez, Alfred
Sent: Tuesday, May 07, 2013 7:56 PM
To: Azua, Ray
Cc: Allen, Don
Subject: ANO 2013-002 Report

B19

Release

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

[*Date of Report – Month Day, Year*]

Jeremy Browning, Site Vice President
Arkansas Nuclear One
Entergy Operations, Inc.
1448 SR 333
Russellville, AR 72802-0967

SUBJECT: ARKANSAS NUCLEAR ONE - NRC INTEGRATED INSPECTION REPORT 05000313/2013002 AND 05000368/2013002

Dear Mr. Browning:

On March 31, 2013, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the Arkansas Nuclear One, Units 1 and 2 facilities. The enclosed inspection report documents the inspection results which were discussed on April 25, 2013, with you and other members of your staff.

The inspections examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

No findings were identified during this inspection.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's Agency wide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

Donald B. Allen, Chief
Project Branch E
Division of Reactor Projects

Docket Nos.: 50-313, 50-368
License Nos: DRP-51, NPF-6

Enclosure: Inspection Report 05000313/2013002 and 05000368/2013002
w/ Attachment: Supplemental Information

cc w/ encl: Electronic Distribution

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U.S. NUCLEAR REGULATORY COMMISSION

REGION IV

Docket:	05000313; 05000368
License:	DPR-51; NPF-6
Report:	05000313/2013002; 05000368/2013002
Licensee:	Entergy Operations Inc.
Facility:	Arkansas Nuclear One, Units 1 and 2
Location:	Junction of Hwy. 64 West and Hwy. 333 South Russellville, Arkansas
Dates:	January 1 through March 31, 2013
Inspectors:	A. Sanchez, Senior Resident Inspector A. Fairbanks, Resident Inspector G. Guerra, Emergency Preparedness Inspector J. Laughlin, Emergency Preparedness Inspector, NSIR W. Schaup, Resident Inspector
Approved By:	Don Allen, Chief, Project Branch E Division of Reactor Projects

SUMMARY OF FINDINGS

IR 05000313/2013002; 05000368/2013002; 01/01/2013-03/31/2013, Arkansas Nuclear One, Units 1 and 2, Integrated Resident and Regional Report.

The report covered a 3-month period of inspection by resident inspectors and announced baseline inspections by region-based inspectors. No non-cited violations of significance were identified. The significance of most findings is indicated by their color (Green, White, Yellow, or Red) using Inspection Manual Chapter 0609, "Significance Determination Process." The cross-cutting aspect is determined using Inspection Manual Chapter 0310, "Components Within the Cross-Cutting Areas." Findings for which the significance determination process does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. NRC-Identified Findings and Self-Revealing Findings

None

B. Licensee-Identified Violations

None

REPORT DETAILS

Summary of Plant Status

Unit 1 began the period operating at 100 percent reactor power. On March 24, 2013, Unit 1 entered Mode 3 to begin refueling outage 1R24. On March 31, 2013, the collapse of the crane and main generator stator drop cause a loss of offsite electrical power. Both emergency diesel generators automatically started and supplied electrical power to Unit 1 safety-related components.

Unit 2 began the period operating at 100 percent reactor power. On March 31, 2013, the Unit 2 reactor automatically tripped, and entered Mode 3, after the collapse of the crane and main generator stator drop on the Unit 1 turbine deck caused the Unit 2 reactor coolant pump B to trip.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01)

.1 Readiness for Impending Adverse Weather Conditions

a. Inspection Scope

Since thunderstorms with potential tornados and high winds were forecast in the vicinity of the facility for January 29, 2013, the inspectors reviewed the plant personnel's overall preparations/protection for the expected weather conditions. On January 28 and 29, 2013, the inspectors walked down the transformer yard and service water intake structure because their safety-related functions could be affected, or required, as a result of high winds or tornado-generated missiles or the loss of offsite power. The inspectors evaluated the plant staff's preparations against the site's procedures and determined that the staff's actions were adequate. During the inspection, the inspectors focused on plant-specific design features and the licensee's procedures used to respond to specified adverse weather conditions. The inspectors also toured the plant grounds to look for any loose debris that could become missiles during a tornado. The inspectors evaluated operator staffing and accessibility of controls and indications for those systems required to control the plant. Additionally, the inspectors reviewed the SAR and performance requirements for the systems selected for inspection, and verified that operator actions were appropriate as specified by plant-specific procedures. The inspectors also reviewed a sample of corrective action program items to verify that the licensee-identified adverse weather issues at an appropriate threshold and dispositioned them through the corrective action program in accordance with station corrective action procedures. Specific documents reviewed during this inspection are listed in the attachment.

On February 20, 2013, a winter-weather advisory was issued for an expected ice storm. The inspectors observed the preparations and planning for the significant winter weather

potential. The inspectors reviewed licensee procedures and discussed potential compensatory measures with control room personnel. The inspectors focused on plant management's actions for implementing the station's procedures for ensuring adequate personnel for safe plant operation and emergency response would be available. The inspectors conducted a site inspection, including various plant structures and systems, to check for maintenance or other apparent deficiencies that could affect system operations during the predicted significant weather. The inspectors also reviewed corrective action program items to verify that plant personnel were identifying adverse weather issues at an appropriate threshold and entering them into their corrective action program in accordance with station corrective action procedures. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of two readiness for impending adverse weather condition samples as defined in Inspection Procedure 71111.01-05.

b. Findings

No findings were identified.

1R04 Equipment Alignment (71111.04)

.1 Partial Walkdown

a. Inspection Scope

The inspectors performed partial system walkdowns of the following risk-significant systems:

- February 11, 2013, Unit 1 emergency diesel generator 1 while the alternate AC diesel generator was unavailable due to emergent work
- February 11, 2013, Unit 2 emergency diesel generator 2 while the alternate AC diesel generator was unavailable due to emergent work
- February 22, 2013, Unit 2 low pressure safety injection train A with low pressure safety injection train B inoperable during planed maintenance
- February 27, 2013, Unit 2 high pressure safety injection train B with high pressure safety injection train A out of service due to excessive leakage

The inspectors selected the system based on their risk significance relative to the reactor safety cornerstones at the time they were inspected. The inspectors attempted to identify any discrepancies that could affect the function of the system, and, therefore, potentially increase risk. The inspectors reviewed applicable operating procedures, system diagrams, SAR, technical specification requirements, administrative technical specifications, outstanding work orders, condition reports, and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could

have rendered the systems incapable of performing their intended functions. The inspectors also inspected accessible portions of the systems to verify system components and support equipment were aligned correctly and operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no obvious deficiencies. The inspectors also verified that the licensee had properly identified and resolved equipment alignment problems that could cause initiating events or impact the capability of mitigating systems or barriers and entered them into the corrective action program with the appropriate significance characterization. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of four partial system walkdown samples as defined in Inspection Procedure 71111.04-05.

b. Findings

No findings were identified.

1R05 Fire Protection (71111.05)

.1 Quarterly Fire Inspection Tours

a. Inspection Scope

The inspectors conducted fire protection walkdowns that were focused on availability, accessibility, and the condition of firefighting equipment in the following risk-significant plant areas:

- March 20, 2013, Unit 1, Fire Zone 129-F, control room
- March 20, 2013, Unit 2, Fire Zone 2199-G, control room
- March 21, 2013, Unit 1, Fire Zone 197-X, turbine bldg (EL. 386'-0")
- March 21, 2013, Unit 2, Fire Zone 2200-MM, turbine bldg (EL. 386'-0")

The inspectors reviewed areas to assess if licensee personnel had implemented a fire protection program that adequately controlled combustibles and ignition sources within the plant; effectively maintained fire detection and suppression capability; maintained passive fire protection features in good material condition; and had implemented adequate compensatory measures for out of service, degraded or inoperable fire protection equipment, systems, or features, in accordance with the licensee's fire plan. The inspectors selected fire areas based on their overall contribution to internal fire risk as documented in the plant's Individual Plant Examination of External Events with later additional insights, their potential to affect equipment that could initiate or mitigate a plant transient, or their impact on the plant's ability to respond to a security event. Using the documents listed in the attachment, the inspectors verified that fire hoses and extinguishers were in their designated locations and available for immediate use; that

fire detectors and sprinklers were unobstructed; that transient material loading was within the analyzed limits; and fire doors, dampers, and penetration seals appeared to be in satisfactory condition. The inspectors also verified that minor issues identified during the inspection were entered into the licensee's corrective action program. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of four quarterly fire protection inspection samples as defined in Inspection Procedure 71111.05-05.

b. Findings

No findings were identified.

1R06 Flood Protection Measures (71111.06)

a. Inspection Scope

The inspectors reviewed the SAR, the flooding analysis, and plant procedures to assess susceptibilities involving internal flooding; reviewed the corrective action program to determine if licensee personnel identified and corrected flooding problems; and verified that operator actions for coping with flooding can reasonably achieve the desired outcomes. The inspectors also inspected the areas listed below to verify the adequacy of equipment seals located below the flood line, floor and wall penetration seals, watertight door seals, common drain lines and sumps, sump pumps, level alarms, and control circuits, and temporary or removable flood barriers. Specific documents reviewed during this inspection are listed in the attachment.

- March 27, 2013, Unit 1, 354-foot auxiliary building floor drains

These activities constitute completion of one flood protection measure inspection sample as defined in Inspection Procedure 71111.06-05.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program and Licensed Operator Performance (71111.11)

.1 Quarterly Review of Licensed Operator Requalification Program

a. Inspection Scope

On February 15, 2013, the inspectors observed a crew of licensed operators in the Unit 1 simulator during requalification testing and the Unit 2 simulator during training. The inspectors assessed the following areas:

- Licensed operator performance

- The ability of the licensee to administer the evaluations and the quality of the training provided
- The modeling and performance of the control room simulator
- The quality of post-scenario critiques
- Follow-up actions taken by the licensee for identified discrepancies

These activities constitute completion of one quarterly licensed operator requalification program sample as defined in Inspection Procedure 71111.11.

b. Findings

No findings were identified.

.2 Quarterly Observation of Licensed Operator Performance

a. Inspection Scope

The inspectors observed the performance of on-shift licensed operators in the plant's main control room. At the time of the observations, the plant was in a period of heightened activity or risk due to reactivity changes to the plant. The inspectors observed the operators' performance of the following activities:

- February 4, 2013, Unit 1 withdrawal of axial power shaping rods from 75 percent to 100 percent per station procedure OP-1105.009, "Control Rod Drive System Operating Procedure," Revision 42, for end of cycle
- March 24, 2013, Unit 1 power reduction and plant shutdown per station procedure OP-1102.016, "Power Reduction and Plant Shutdown," Revision 21

In addition, the inspectors assessed the operators' adherence to plant procedures, including OP-1015.001, "Conduct of Operations," and other operations department policies.

These activities constitute completion of one quarterly licensed operator performance sample as defined in Inspection Procedure 71111.11.

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13)

a. Inspection Scope

The inspectors reviewed licensee personnel's evaluation and management of plant risk for the maintenance and emergent work activities affecting risk-significant and safety-related equipment listed below to verify that the appropriate risk assessments were performed prior to removing equipment for work:

- February 27, 2013, Unit 2 with high pressure safety injection header inoperable due to excessive leakage from 2CV-5103-1 high pressure safety injection orifice bypass valve
- March 6, 2013, Unit 1 refueling outage 1R24 risk assessment
- March 8, 2013, Unit 1 reactor building crane risk evaluation
- March 8, 2013, Unit 2 channel C plant protection system work in conjunction with auxiliary feedwater work
- March 25, 2013, Unit 2 with startup transformer 2 in pull to lock to support Unit 1 outage

The inspectors selected these activities based on potential risk significance relative to the reactor safety cornerstones. As applicable for each activity, the inspectors verified that licensee personnel performed risk assessments as required by 10 CFR 50.65(a)(4) and that the assessments were accurate and complete. When licensee personnel performed emergent work, the inspectors verified that the licensee personnel promptly assessed and managed plant risk. The inspectors reviewed the scope of maintenance work, discussed the results of the assessment with the licensee's probabilistic risk analyst or shift technical advisor, and verified plant conditions were consistent with the risk assessment. The inspectors also reviewed the technical specification requirements and inspected portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of five maintenance risk assessments and emergent work control inspection samples as defined in Inspection Procedure 71111.13-05.

b. Findings

No findings were identified.

1R15 Operability Evaluations and Functionality Assessments (71111.15)

a. Inspection Scope

The inspectors reviewed the following assessments:

- January 28, 2013, Unit 1, VCH-4A emergency switchgear chiller failed surveillance test
- February 4, 2013, Unit 1, reactor protection system train A control rod drive breaker failed source interrupt test
- February 9, 2013, Unit 2, 2CV-1060-2 main steam isolation valve with main steam header B support snubber 2EBD-2-H16 degraded
- February 19, 2013, Unit 2, 2CV-5126-1 high pressure safety injection pump recirculation valve seismic restraint degraded
- February 27, 2013, Unit 2 high pressure safety injection header inoperable due to excessive leakage from 2CV-5103-1 high pressure safety injection orifice bypass valve
- March 25, 2013, Unit 1, P-34A decay heat removal pump outboard bearing oil level found below minimum operability limit

The inspectors selected these operability and functionality assessments based on the risk significance of the associated components and systems. The inspectors evaluated the technical adequacy of the evaluations to ensure technical specification operability was properly justified and to verify the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the technical specifications and SAR to the licensee's evaluations to determine whether the components or systems were operable. Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled. Additionally, the inspectors reviewed a sampling of corrective action documents to verify that the licensee was identifying and correcting any deficiencies associated with operability evaluations. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of six operability evaluations inspection samples as defined in Inspection Procedure 71111.15-05.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19)

a. Inspection Scope

The inspectors reviewed the following post-maintenance activities to verify that procedures and test activities were adequate to ensure system operability and functional capability:

- January 22, 2013, Unit 1, CV-7909 control room return isolation damper following solenoid replacement
- February 27, 2013, Unit 2, 2CV-5103-1 high pressure safety injection header bypass valve following packing adjustment
- March 10, 2013, Unit 2, 2CV-5103-1 high pressure safety injection header bypass valve following valve rebuild

The inspectors selected these activities based upon the structure, system, or component's ability to affect risk. The inspectors evaluated these activities for the following (as applicable):

- The effect of testing on the plant had been adequately addressed; testing was adequate for the maintenance performed
- Acceptance criteria were clear and demonstrated operational readiness; test instrumentation was appropriate

The inspectors evaluated the activities against the technical specifications, the SAR, 10 CFR Part 50 requirements, licensee procedures, and various NRC generic communications to ensure that the test results adequately ensured that the equipment met the licensing basis and design requirements. In addition, the inspectors reviewed corrective action documents associated with post-maintenance tests to determine whether the licensee was identifying problems and entering them in the corrective action program and that the problems were being corrected commensurate with their importance to safety. Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of two post-maintenance testing inspection samples as defined in Inspection Procedure 71111.19-05.

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20)

a. Inspection Scope

The inspectors reviewed the outage safety plan and contingency plans for the portion of the Unit 1 refueling outage, beginning March 24, 2013 through March 31, 2013 to confirm that licensee personnel had appropriately considered risk, industry experience, and previous site-specific problems in developing and implementing a plan that assured maintenance of defense in depth. During this portion of the refueling outage, the inspectors observed portions of the shutdown and cooldown processes and monitored licensee controls over the outage activities listed below.

- Configuration management, including maintenance of defense in depth, is commensurate with the outage safety plan for key safety functions and compliance with the applicable technical specifications when taking equipment out of service.
- Installation and configuration of reactor coolant pressure, level, and temperature instruments to provide accurate indication, accounting for instrument error.
- Monitoring of decay heat removal processes, systems, and components.
- Reactor water inventory controls, including flow paths, configurations, and alternative means for inventory addition, and controls to prevent inventory loss.
- Controls over activities that could affect reactivity.
- Licensee identification and resolution of problems related to refueling outage activities.

Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of one refueling outage and other outage inspection sample as defined in Inspection Procedure 71111.20-05.

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors reviewed the SAR, procedure requirements, and technical specifications to ensure that the surveillance activities listed below demonstrated that the systems, structures, and/or components tested were capable of performing their intended safety

functions. The inspectors either witnessed or reviewed test data to verify that the significant surveillance test attributes were adequate to address the following:

- Preconditioning
- Evaluation of testing impact on the plant
- Acceptance criteria
- Test equipment
- Procedures
- Test data
- Testing frequency and method demonstrated technical specification operability
- Test equipment removal
- Restoration of plant systems
- Reference setting data
- Annunciators and alarms setpoints

The inspectors also verified that licensee personnel identified and implemented any needed corrective actions associated with the surveillance testing.

- January 30, 2013, Unit 1, emergency diesel generator 2 monthly surveillance
- March 19, 2013, Unit 1, reactor building electrical penetration, E-53, local leak rate test
- March 19, 2013, Unit 2, containment cooling system 14-day surveillance test

Specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of three surveillance testing inspection samples as defined in Inspection Procedure 71111.22-05.

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP2 Alert and Notification System Evaluation (71114.02)

a. Inspection Scope

The inspector discussed with licensee staff the operability of offsite emergency warning systems and backup alerting methods, to determine the adequacy of licensee methods for testing the alert and notification system in accordance with 10 CFR Part 50, Appendix E. The licensee's alert and notification system testing program was compared with criteria in NUREG-0654, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," Revision 1; FEMA Report REP-10, "Guide for the Evaluation of Alert and Notification Systems for Nuclear Power Plants"; and the licensee's current FEMA-approved alert and notification system design report, "Upgraded Public Alert and Notification System (ANS) Arkansas Nuclear One (ANO)," dated May 2009. The specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of one sample as defined in Inspection Procedure 71114.02-05.

b. Findings

No findings were identified.

1EP3 Emergency Response Organization Staffing and Augmentation (71114.03)

a. Inspection Scope

The inspector discussed with licensee staff the operability of primary and backup systems for augmenting the on-shift emergency response staff to determine the adequacy of licensee methods for staffing emergency response facilities in accordance with their emergency plan. The inspector reviewed the documents and references listed in the attachment to this report, to evaluate the licensee's ability to staff the emergency response facilities in accordance with the licensee's emergency plan and the requirements of 10 CFR Part 50, Appendix E. The specific documents reviewed during this inspection are listed in the attachment.

These activities constitute completion of one sample as defined in Inspection Procedure 71114.03-05.

b. Findings

No findings were identified.

1EP5 Correction of Emergency Preparedness Weaknesses and Deficiencies (71114.05)

a. Inspection Scope

The inspector reviewed the licensee's corrective action program requirements in the Arkansas Nuclear One's procedures. The inspector reviewed summaries of corrective action program documents assigned to the emergency preparedness department and emergency response organization between June 2011 and January 2013, and selected 27 for detailed review against the program requirements. The inspector evaluated the response to the corrective action requests to determine the licensee's ability to identify, evaluate, and correct problems in accordance with the licensee program requirements, planning standard 10 CFR 50.47(b)(14), and 10 CFR Part 50, Appendix E. The specific documents reviewed during this inspection are listed in the attachment.

The inspector also reviewed:

- Licensee audits, assessments, drill evaluations, and post-event after action reports conducted between June 2011 and January 2013;
- Memorandum of Understanding between the licensee and offsite agencies and organizations relied upon to support site emergency response efforts;
- Licensee procedures and training for the evaluation of changes to the site emergency plans; and
- Procedures for equipment relied upon to support site emergency response efforts.

These activities constitute completion of one sample as defined in Inspection Procedure 71114.05-05.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity, Emergency Preparedness, Public Radiation Safety, Occupational Radiation Safety, and Physical Protection

4OA1 Performance Indicator Verification (71151)

.1 Data Submission Issue

a. Inspection Scope

The inspector reviewed data submitted by the licensee for the Fourth Quarter 2012 performance indicators to identify any obvious inconsistencies prior to its public release in accordance with Inspection Manual 0608, "Performance Indicator Program."

This review was performed as part of the inspector's normal plant status activities and, as such, did not constitute a separate inspection sample.

b. Findings

No findings were identified.

.2 Unplanned Scrams per 7000 Critical Hours (IE01)

a. Inspection Scope

The inspectors sampled licensee submittals for the unplanned scrams per 7000 critical hours performance indicator for both Unit 1 and Unit 2 for the period from the first quarter 2012 through the fourth quarter 2012. To determine the accuracy of the performance indicator data reported during those periods, the inspectors used definitions and guidance contained in NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6. The inspectors reviewed the licensee's operator narrative logs, issue reports, event reports, and NRC integrated inspection reports for the period of January 2012 through December 2012, to validate the accuracy of the submittals. The inspectors also reviewed the licensee's issue report database to determine if any problems had been identified with the performance indicator data collected or transmitted for this indicator and none were identified. Specific documents reviewed are described in the attachment to this report.

These activities constitute completion of two unplanned scrams per 7000 critical hours samples as defined in Inspection Procedure 71151-05.

b. Findings

No findings were identified.

.3 Unplanned Power Changes per 7000 Critical Hours (IE03)

a. Inspection Scope

The inspectors sampled licensee submittals for the unplanned power changes per 7000 critical hours performance indicator for both Unit 1 and Unit 2 for the period from the first quarter 2012 through the fourth quarter 2012. To determine the accuracy of the performance indicator data reported during those periods, the inspectors used definitions and guidance contained in NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6. The inspectors reviewed the licensee's operator narrative logs, issue reports, maintenance rule records, event reports, and NRC integrated inspection reports for the period of January 2012 through December 2012 to validate the accuracy of the submittals. The inspectors also reviewed the licensee's issue report database to determine if any problems had been identified with the performance indicator data collected or transmitted for this indicator and [none were identified]. Specific documents reviewed are described in the attachment to this report.

These activities constitute completion of two unplanned transients per 7000 critical hours samples as defined in Inspection Procedure 71151-05.

b. Findings

No findings were identified.

.4 Unplanned Scrams with Complications (IE04)

a. Inspection Scope

The inspectors sampled licensee submittals for the unplanned scrams with complications performance indicator for both Unit 1 and Unit 2 for the period from the first quarter 2012 through the fourth quarter 2012. To determine the accuracy of the performance indicator data reported during those periods, the inspectors used definitions and guidance contained in NEI Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6. The inspectors reviewed the licensee's operator narrative logs, issue reports, event reports, and NRC integrated inspection reports for the period of January 2012 through December 2012 to validate the accuracy of the submittals. The inspectors also reviewed the licensee's issue report database to determine if any problems had been identified with the performance indicator data collected or transmitted for this indicator and none were identified. Specific documents reviewed are described in the attachment to this report.

These activities constitute completion of two unplanned scrams with complications samples as defined in Inspection Procedure 71151-05.

b. Findings

No findings were identified.

.5 Drill/Exercise Performance (EP01)

a. Inspection Scope

The inspectors sampled licensee submittals for the Drill and Exercise Performance, performance indicator for the period from the 1st quarter 2012 through the 4th quarter 2012. To determine the accuracy of the performance indicator data reported during those periods, performance indicator definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revisions 6, was used. The inspectors reviewed the licensee's records associated with the performance indicator to verify that the licensee accurately reported the indicator in accordance with relevant procedures and the Nuclear Energy Institute guidance. Specifically, the inspector reviewed licensee records and processes including procedural guidance on assessing opportunities for the performance indicator; assessments of performance indicator opportunities during predesignated control room simulator training sessions, performance during the 2012 biennial exercise, and performance during other drills. The specific documents reviewed are described in the attachment to this report.

These activities constitute completion of the drill/exercise performance sample as defined in Inspection Procedure 71151-05.

b. Findings

No findings were identified.

.6 Emergency Response Organization Drill Participation (EP02)

a. Inspection Scope

The inspectors sampled licensee submittals for the Emergency Response Organization Drill Participation performance indicator for the period from the first quarter 2012 through the fourth quarter 2012. To determine the accuracy of the performance indicator data reported during those periods, performance indicator definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6, was used. The inspectors reviewed the licensee's records associated with the performance indicator to verify that the licensee accurately reported the indicator in accordance with relevant procedures and the Nuclear Energy Institute guidance. Specifically, the inspector reviewed licensee records and processes including procedural guidance on assessing opportunities for the performance indicator, rosters of personnel assigned to key emergency response organization positions, and exercise participation records. The specific documents reviewed are described in the attachment to this report.

These activities constitute completion of the emergency response organization drill participation sample as defined in Inspection Procedure 71151-05.

b. Findings

No findings were identified.

.7 Alert and Notification System (EP03)

a. Inspection Scope

The inspectors sampled licensee submittals for the Alert and Notification System performance indicator for the period from the first quarter 2012 through the fourth quarter 2012. To determine the accuracy of the performance indicator data reported during those periods, performance indicator definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6, was used. The inspectors reviewed the licensee's records associated with the performance indicator to verify that the licensee accurately reported the indicator in accordance with relevant procedures and the Nuclear Energy Institute guidance. Specifically, the inspectors reviewed licensee records and processes including procedural guidance on assessing opportunities for the performance indicator and the results of periodic alert notification system operability tests. The specific documents reviewed are described in the attachment to this report.

These activities constitute completion of the alert and notification system sample as defined in Inspection Procedure 71151-05.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152)

.1 Routine Review of Identification and Resolution of Problems

a. Inspection Scope

As part of the various baseline inspection procedures discussed in previous sections of this report, the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that they were being entered into the licensee's corrective action program at an appropriate threshold, that adequate attention was being given to timely corrective actions, and that adverse trends were identified and addressed. The inspectors reviewed attributes that included the complete and accurate identification of the problem; the timely correction, commensurate with the safety significance; the evaluation and disposition of performance issues, generic implications, common causes, contributing factors, root causes, extent of condition reviews, and previous occurrences reviews; and the classification, prioritization, focus, and timeliness of corrective actions. Minor issues entered into the licensee's corrective action program because of the inspectors' observations are included in the attached list of documents reviewed.

These routine reviews for the identification and resolution of problems did not constitute any additional inspection samples. Instead, by procedure, they were considered an integral part of the inspections performed during the quarter and documented in Section 1 of this report.

b. Findings

No findings were identified.

.2 Daily Corrective Action Program Reviews

a. Inspection Scope

In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's corrective action program. The inspectors accomplished this through review of the station's daily corrective action documents.

The inspectors performed these daily reviews as part of their daily plant status monitoring activities and, as such, did not constitute any separate inspection samples.

b. Findings

No findings were identified.

4OA3 Follow-up of Events and Notices of Enforcement Discretion (71153)

.1 (Closed) LER 05000313/2011001 Violation of Technical Specification Due to the Failure to Enter the Appropriate Technical Specification or Complete the Associated Required Action Prior to the Appropriate Completion Time

From the period of January 22, 2008 through January 4, 2011, Arkansas Nuclear One periodically implemented compensatory measures during planned maintenance of emergency switchgear chillers, VCH-4A and VCH-4B. During some of these instances, compliance with technical specifications 3.8.4, "DC Sources-Operating," and technical specification 3.8.9 "Distribution Systems-Operating" were not met. Arkansas Nuclear One Unit 1 did not enter or remain in the appropriate technical specification for an inoperable system, subsystem, train or component when all the necessary attendant non-technical specification support equipment that are required for the system, subsystem, train, component or device to perform its specified safety function are also capable of performing their support function. VCH-4A or B individually have not been shown to be capable of supporting 100 percent of the room cooling requirements of both trains of vital switchgear when one of the chillers is out of service without implementing additional compensatory actions. Therefore, reliance on the opposite train chiller alone is not sufficient to maintain all cooling requirements of the affected train's vital switchgear. The licensee has ceased reliance on non-safety related unit 1 coolers and additional compensatory measures and technical specification compliance is being met. A misapplication of industry guidance resulted in the use of non-safety related unit

coolers and additional compensatory measures as an acceptable alternative. The issue was entered into the corrective action program as Condition Report CR-ANO-1-2011-0204. A NRC identified non-cited violation was documented in Inspection Report 05000313/2010005-01. This licensee event report is closed.

.2 (Closed) LER 05000313/2012001 Violation of Technical Specification Due to the Failure to Enter the Appropriate Technical Specifications or Complete the Associated Required Actions Due to Misapplication of Technical Specification Bases

On December 7, 2011, VCH-4A emergency switchgear room chiller was removed from service for planned maintenance for 27.3 hours and on December 19, 2011, VCH-4B emergency switchgear room chiller was removed from service for planned maintenance for 15.5 hours. During both maintenance periods, Arkansas Nuclear One did not enter technical specifications 3.8.4, "DC Sources-Operating," and technical specification 3.8.9 "Distribution Systems-Operating", but instead entered technical specification 3.7.7 Condition A for one loop of service water system being inoperable with a 72 hour completion time. The service water specification was applied as allowed by a recent technical specification bases change that incorporated an allowance to enter the 72 hour technical specification for service water and invoke technical specification 3.0.6 which requires a safety function determination for the emergency switchgear chiller. The licensee has ceased this practice and will enter all applicable technical specifications associated with the emergency switchgear as required. The issue was entered into the corrective action program as Condition Report CR-ANO-1-2012-0043. An NRC identified non-cited violation was documented in Inspection Report 05000313/2012005-01. This licensee event report is closed.

.4 Unit 2 Inadvertent Safety Injection Actuation, Containment Isolation Actuation, and Containment Cooling Actuation

a. Inspection Scope

On January 2, 2013, Unit 2 experienced an inadvertent safety injection actuation, containment isolation actuation, and containment cooling actuation while technicians were performing plant protection system matrix testing. This resulted in an automatic start of the emergency diesel generators, high pressure safety injection pumps and low pressure safety injection pumps and the re-positioning of numerous safety-related components to their actuated state. The inspectors were present in the Unit 1 control room at the time of the event and immediately responded to the Unit 2 control room. Inspectors observed operator actions, procedure execution, communications, and command and control functions. The inspectors also performed a thorough and complete control room walkdown and reviewed plant data records to verify proper plant performance. The inspectors also reviewed the initial licensee notification to verify it met the requirements specified in NUREG-1022, "Event Reporting Guidelines," Revision 2.

b. Findings

No findings were identified.

.3 Unit 1 Stator Drop and Unit 2 Reactor Trip

a. Inspection Scope

On March 31, 2013, Unit 1 was in Mode 6 and preparing to offload the reactor and Unit 2 was at 100 percent power. While moving the Unit 1 main generator stator out of the turbine building, the crane collapsed. This resulted in dropping the stator onto the turbine deck, which then rolled and dropped approximately 30 feet into the train bay. The drop caused the Unit 2 reactor coolant pump B to trip (vibration induced), which then led to a plant protection reactor trip of the Unit 2 reactor. Inspectors responded to the site and the Unit 1 and Unit 2 control rooms.

The crane collapse resulted in an immediate loss of offsite power to Unit 1. Both emergency diesel generators immediately started and loaded the 4160 volt vital busses. The reactor and the spent fuel pool lost cooling for a short period of time and both experienced a minimal amount of heat up until cooling was re-established.

Unit 2 entered Mode 3 and was stable with all major equipment functioning as designed. At 9:23 am Unit 2 experienced a start-up transformer 3 lockout due to water intrusion into the 2A1 switchgear from a ruptured firewater header. The 2A1 bus fast transferred to start-up transformer 2 as designed, but the 2A2 bus did not transfer to start-up transformer 2 because the feeder breaker was in pull-to-lock to support Unit 1 outage work in the switchyard. Emergency diesel generator 2 automatically started and loaded the 4160 volt vital bus as designed. Unit 2 declared a Notification of Unusual Event at 10:33 am due to the catastrophic (explosion) failure of the start-up transformer 3 feeder breaker to the 2A1 bus.

The inspectors observed operator actions, procedure execution, communications, and command and control functions. The inspectors also performed a thorough and complete control room walkdown and reviewed plant data records to verify proper plant performance. The inspectors also reviewed the initial licensee notification to verify it met the requirements specified in NUREG-1022, "Event Reporting Guidelines," Revision 2.

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

Exit Meeting Summary

On February 15, 2013, the inspector presented the onsite emergency preparedness inspection results to Mr. Jeremy Browning, Site Vice President, and other members of the licensee's staff. The inspector asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

On April 25, 2013, the inspectors presented the inspection results to Mr. Jeremy Browning, Site Vice President, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspector asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

J. Browning, Site Vice President
P. Butler, Systems Engineering Supervisor
R. Byford, Manager, Training
M. Chisum, General Manager Plant Operations
D. Edgell, System Engineering Manager
R. Fuller, Nuclear Oversight Manager
W. Greeson, Engineering Programs Manager
M. Hall, Licensing Specialist
R. Harris, Manager, Emergency Preparedness
R. Holeyfield, Emergency Preparedness
D. James, Nuclear Safety Assurance Director
D. Marvel, Radiation Protection Manager
K. McCormick, Supervisor, Quality Assurance
J. McCoy, Engineering Director
N. Mosher, Licensing Specialist
C. O'Dell, Production Manager
D. Perkins, Maintenance Manager
S. Pyle, Licensing Manager
W. Renz, Director, Emergency Preparedness
T. Sherrill, Chemistry Manager
J. Tobin, Security Manager
D. White, Emergency Preparedness Planner
P. Williams, Operations Manager

NRC Personnel

D. Allen, Branch Chief

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

None

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

PROCEDURES

NUMBER	TITLE	REVISION
OP-1203.025	Unit 1 Natural Emergencies	37
OP-2203.008	Unit 2 Natural Emergencies	22
EN-EP-302	Severe Weather Response	0

CONDITION REPORTS (CR-ANO-)

1-2013-00203

Section 1R04: Equipment Alignment

PROCEDURES

NUMBER	TITLE	REVISION
OP-2104.037	Alternate AC Diesel Generator Operations	24
OP-2107.001	Electrical System Operations	99
OP-1104.036	Emergency Diesel Generator Operations	63
OP-2104.036	Emergency Diesel Generator Operations	83
OP-2104.040	LPSI System Operations	62

Section 1R05: Fire Protection

PROCEDURES

NUMBER	TITLE	REVISION
FHA	ANO Fire Hazard Analysis	13

Section 1R05: Fire Protection

PROCEDURES

NUMBER	TITLE	REVISION
PFP-U1	ANO Pre-Fire Plan Unit 1	15
PFP-U2	ANO Pre-Fire Plan Unit 2	11

Section 1R06: Flood Protection Measures

PROCEDURES

NUMBER	TITLE	REVISION
EN-DC-346	Cable Reliability Program	2

Section 1R11: Licensed Operator Requalification Program

PROCEDURES

NUMBER	TITLE	REVISION
COPD-030	ANO Reactivity Management Program	2
OP-1105.009	CRD System Operating Procedure	42
OP-1102.016	Power Reduction and Plant Shutdown	21
OP-1102.010	Plant Shutdown and Cooldown	69
EN-TQ-216	Training and Qualification Curriculum	3
EN-TQ-210	Conduct of Simulator Training	6

Section 1R13: Maintenance Risk Assessment and Emergent Work Controls

PROCEDURES

NUMBER	TITLE	REVISION
OP-1203.025	Natural Emergencies	35
COPD-024	Risk Assessment Guidelines	44

ENGINEERING CHANGE

EC-42235

Section 1R15: Operability Evaluations

PROCEDURES

NUMBER	TITLE	REVISION
EN-OP-104	Operability Evaluations	5
OP-1304.125	Unit 1 RPS-A / CRD Breaker Trip Test	025
EN-MA-118	Foreign Material Exclusion	9

CONDITION REPORTS

CR-ANO-1-2013-0183 CR-ANO-22-2013-0332 CR-ANO-1-2013-0599 CR-ANO-2-2013-0271 CR-ANO-1-2013-0134

WORK ORDERS

52398755-01 52326271-01 52397520-01

Section 1R19: Post-Maintenance Testing

PROCEDURES

NUMBER	TITLE	REVISION
EN-WM-107	Post Maintenance Testing	3
EN-WM-105	Planning	9
EN-MA-101	Fundamentals of Maintenance	9
EN-MA-125	Troubleshooting Control of Maintenance Activities	9
EN-WM-102	Work Implementation and Closeout	6
OP-2104.007	Control Room Emergency Air Conditioning and Ventilation	59

Section 1R19: Post-Maintenance Testing

PROCEDURES

NUMBER	TITLE	REVISION
OP-2305.005	Valve Stroke and Position Indication Verification	34
OP-2104.039	HPSI System Operation	72

WORK ORDERS

50236728 52335199 00332514 00101159

CONDITION REPORTS

ANO-CR-2-2013-0375

Section 1R20: Refueling and Other Outage Activities

PROCEDURES

NUMBER	TITLE	REVISION
OP-1104.004	Decay Heat Removal Operating Procedure	106
OP-1504.007	Unit 1 Reactor Vessel Closure Head Removal and Storage	024
OP-1102.016	Power Reduction and Plant Shutdown	21
OP-1102.010	Plant Shutdown and Cooldown	69
OP-1103.011	Draining and N_2 Blanketing the RCS	42

Section 1R22: Surveillance Testing

PROCEDURES

NUMBER	TITLE	REVISION
OP-1104.036	Emergency Diesel Generator Operation	062
OP-2104.33	Containment Atmosphere Control / Supplement 3 / Containment Cooler 14 Day Test	72
OP-1305.038	Unit 1 Local Leak Rate Testing of Electrical Penetrations	0

Section 1R22: Surveillance Testing

PROCEDURES

NUMBER	TITLE	REVISION

CORRECTIVE ACTION DOCUMENT NAME

CR-ANO-2-2001-0607

Section 1EP2: Alert Notification System Testing

DOCUMENT TYPE

NUMBER	TITLE	DATE
Form 4003	Arkansas Department of Health Siren Testing Procedure	June 2012
	Upgraded Public Alert and Notification System	May 2009
	Testing Records from Arkansas Department of Health, Nuclear Planning and Response Program	

Section 1EP3: Emergency Response Organization Augmentation Testing

PROCEDURES

NUMBER	TITLE	REVISION
EN-EP-306	Drills and Exercises	4

Section 1EP4: Emergency Action Level and Emergency Plan Changes

DOCUMENT TYPE

NUMBER	TITLE	REVISION / DATE
	Emergency Plan	36, 37
	Evacuation Time Estimate Study Update	

Section 1EP5: Maintenance of Emergency Preparedness

DRILLS

NUMBER	TITLE	REVISION / DATE
	Arkansas Nuclear One Emergency Plan	36
	ANO Development of Evacuation Time Estimates	September 2012
	ANO On-Shift Staffing Analysis Final Report	December 13, 2012
EP-2012-0015	2012 Radiological Emergency Preparedness Exercise (REX-2012)	April 11, 2012
EP-2012-0020	Radiological Emergency Preparedness – Full Scale Drill	February 22, 2012
EP-2011-0036	Radiological Emergency Preparedness – Full Scale Drill	September 14, 2011
EP-2011-0027	Radiological Emergency Preparedness – Full Scale Drill	June 1, 2011
EP-2009-0042	Off-site Monitoring Drill	December 4, 2009

PROCEDURES

NUMBER	TITLE	REVISION
1903.004	Administration and Maintenance of the Emergency Plan and Implementing Procedures	26
1903.0065	Emergency Response Facility - Technical Support Center	25
1903.0066	Emergency Response Facility – Operation Support Center	21
1903.0067	Emergency Response Facility – Emergency Operations Facility	30
1903.0069	Equipment Important to Emergency Preparedness	0
EN-QV-109	Audit Process	22
EN-EP-305	Emergency Planning 10CFR50.54(q) Review Program	3

PROCEDURES

NUMBER	TITLE	REVISION
EN-EP-306	Drills and Exercises	4

AUDITS

NUMBER	TITLE	REVISION / DATE
QA-7-2012-ANO-1	QA Audit Report – Emergency Preparedness Program	July 16, 2012
QA-7-2011-ANO-1	QA Audit Report – Emergency Preparedness Program	May 25, 2011
ALO-2012-023	Snapshot Assessment – Preparation for the 2012 EP NRC Graded Exercise Inspection	March 29, 2012
HQNLO-2011-190	Self Assessment – EP Communications – Everbridge Implementation	September 26, 2012
HQNLO-2011-195	EAL Site Comparison Focused Self Assessment	November 25, 2012
QS-2012-ANO-002	Second Follow-up to ANO 2011 Emergency Plan Audit QA-07-2011-ANO-1	January 10, 2012
QS-2011-ANO-010	Follow-up to ANO 2011 Emergency Plan Audit QA-07-2011-ANO-1	September 14, 2011
QS-2012-ANO-017	Follow-up to QAF CR-ANO-C-2012-00677 and CR-ANO-C-2012-00905	June 5, 2012
EN-QA-129	Vulnerability Review for QA-07-2012-ANO-1	June 28, 2011
	Entergy Nuclear Emergency Plan Master Audit Plan – Audit Number 7	16

CORRECTIVE ACTION DOCUMENTS

2011-02221	2011-02332	2011-02402	2011-02550	2011-02571
2011-02855	2011-03252	2011-03370	2012-00098	2012-00164
2012-00353	2012-00358	2012-00483	2012-00515	2012-00584
2012-00677	2012-00905	2012-00940	2012-00947	2012-00948
2012-00952	2012-01122	2012-01696	2012-01697	2012-01879
2012-03123	2012-03487	2013-00387		

Emergency Response Staffing Drills

March 27, 2012 June 22, 2012 September 11, 2012 November 27, 2012
December 8, 2012

Section 1EP6: Drill Evaluation

PROCEDURES

NUMBER	TITLE	REVISION
OP-1903.011	Emergency Response/ Notifications	42
SE-1-EN-3	Shift Engineer (STA) PI Drill Evaluation Session	1
EN-EP-311	Emergency Response Data System (ERDS) Activation via The Virtual Private Network (VPN)	0
EN-EP-310	Emergency Response Organization Notification System	1

Section 4OA1: Performance Indicator Verification

PROCEDURES

NUMBER	TITLE	REVISION
EN-FAP-EP-005	Fleet Administrative Procedure – Emergency Preparedness Indicators	0
EN-LI-114	Performance Indicator Process	6

Section 4OA2: Identification and Resolution of Problems

CONDITION REPORTS (CR-ANO-)

1-2013-00164

Miller, Geoffrey Release

From: Sanchez, Alfred
Sent: Monday, May 06, 2013 10:16 AM
To: Miller, Geoffrey
Subject: AIT Report Input
Attachments: ANO2013011-RP-DRAFT.docx

Geoff,

Here is what I have so far....It needs some documents reviewed and personnel contacted...my documentation is highlighted in BLUE

Since you are seeing all the inputs you would know where the holes might be...I modeled my input from you River Bend AIT for URI description...I will be here at ANO this week and I am willing to immediately assist, review, discuss, etc..

Thanks for your patience.

Fred

B20

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

[*Date of Report – Month Day, Year*]

Jeremy Browning, Site Vice President
Entergy Operations, Inc.
Arkansas Nuclear One
1448 SR 333
Russellville, AR 72802-0967

SUBJECT: ARKANSAS NUCLEAR ONE - NRC AUGMENTED INSPECTION TEAM REPORT 05000313/2013011 AND 05000368/2013011

Dear Mr. Browning:

On DATE, 2013, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Arkansas Nuclear One Units 1 and 2. The enclosed inspection report documents the inspection results, which were discussed on with you and other members of your staff during a public exit meeting conducted on DATE, 2013.

Based on inspection, the team concluded that: (1) [Conclusions]. The purpose of this inspection was to gather facts and identify issues requiring follow-up, and, as such, no findings were identified. Items requiring additional follow-up are documented as unresolved items in the enclosed report. NRC inspectors have verified that those equipment issues required to be resolved before plant startup were adequately resolved.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's Agencywide Document Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

Arthur T. Howell, III
Regional Administrator

Dockets: 50-313; 50-368
Licenses: DPR-51; NPF-6

Enclosure: Inspection Report 05000313; 05000368/2013011

Enclosure

w/ Attachments:
1. Supplemental Information
2. Sequence of Events
3. Augmented Inspection Team Charter

cc w/ encl: Electronic Distribution

Electronic distribution by RIV:
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ROPreports

DOCUMENT NAME: R:_REACTORS_ANO\2013\ANO2013011-RP-GBM.docx
ADAMS ACCESSION NUMBER: [*Accession Number*]

SUNSI Rev Compl.	☑Yes ☐ No	ADAMS	☑Yes ☐ No	Reviewer Initials	
Publicly Avail.	☑Yes ☐ No	Sensitive	☐Yes ☑ No	Sens. Type Initials	

AIT Member	AIT Member	AIT Member	AIT Lead	C:DRP/E	D:DRP
ASanchez	JWatkins	SJones	GBMiller	DBAllen	KMKennedy
RA					
ATHowell					

OFFICIAL RECORD COPY

U.S. NUCLEAR REGULATORY COMMISSION

REGION IV

Docket:	05000313; 05000368
License:	DPR-51; NPF-6
Report:	05000313/2013011; 05000368/2013011
Licensee:	Entergy Operations, Inc.
Facility:	Arkansas Nuclear One, Units 1 and 2
Location:	Junction of Hwy. 64 West and Hwy. 333 South Russellville, Arkansas
Dates:	April 5 through April XX, 2013
Inspectors:	G. Miller, Chief, Engineering Branch 2 A. Sanchez, Senior Resident Inspector, Project Branch E J. Watkins, Reactor Inspector, Engineering Branch 2 S. Jones, Senior Reactor Systems Engineer, NRR
Approved By:	Donald B. Allen, Chief, Project Branch E Division of Reactor Projects

SUMMARY OF FINDINGS

IR 05000313; 05000368/2013011; 04/05/2013 – 04/xx/2013; Arkansas Nuclear One; Augmented Inspection Team

An Augmented Inspection Team (AIT) was chartered on April 5, 2013, to assess the facts and circumstances surrounding the lifting rig failure event resulting in a loss of offsite power for Arkansas Nuclear One Unit 1, a partial loss of offsite power for Unit 2, and a Notification of Unusual Event declaration on March 31, 2013. The AIT was established in accordance with NRC Management Directive 8.3, "NRC Incident Investigation Program," and implemented using Inspection Procedure 93800, "Augmented Inspection Team." The inspection was conducted by a team of inspectors from the NRC's Region IV office the NRC Office of Nuclear Reactor Regulation (NRR). The team identified xx issues that will require additional NRC inspection. These issues are tracked as unresolved items in this report.

Narrative

A. NRC-Identified Findings and Self-Revealing Findings

No findings were identified.

B. Licensee-Identified Violations

None.

or

A violation of very low safety significance or severity level IV that was identified by the licensee has been reviewed by the inspectors. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program. This violation and associated corrective action tracking numbers are listed in Section 4OA7 of this report.

DRAFT - RELEASE

EXECUTIVE SUMMARY

[Summary of inspection results]

Draft - Release

REPORT DETAILS

1.0 Description of Event (Charter Item #1)

DRAFT RELEASE

1.1 **Summary of the Sequence of Events**

Prior to the event, Arkansas Nuclear One Unit 1 was shutdown in a refueling outage (conditions). Unit 2 was operating at 100 percent power with no plant evolutions in progress, no transmission switching events occurring, and no severe weather conditions. All plant systems were lined up and performing as designed except. . . Figure-1 shows a simplified schematic of . . . This figure, along with the Sequence of Events in Attachment 2 and systems descriptions below, will aid in understanding of the event.

2.0 Evaluation of Licensee Actions (Charter Item #2)

a. Inspection Scope

The team conducted an independent review of licensee operator actions taken in response to the event to determine if actions were appropriate. The inspectors reviewed the following areas, as applicable, to Unit 1 and Unit 2:

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- Immediate actions by the control room staff to stabilize the plant using abnormal and emergency operating procedures
- Unit 2 control room staff actions to cool the plant down to cold shutdown
- Other relevant operator actions

To assess the overall performance of the operating crew, the inspectors interviewed on-shift personnel and reviewed the post-trip report, which included control room logs, operator statements, and plant data trends. The team assessed operator awareness and decision-making by focusing on the resident inspectors' observations (who had observed Unit 1 and Unit 2 control room operating crews during the actual plant transient) concerning board awareness, procedure use and adherence, communications, and team work practices. With respect to command and control, the team again focused on resident inspectors' observations in this area and reviewed the operating crew's response to the events as well as their timeliness.

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b. Observations

The team concluded that the operator actions taken in response to the collapse of the Bigge Crane and dropped generator stator were appropriate in that all safety system functions were maintained and both reactors were maintained in a safe condition throughout the event. The team did identify on unresolved item for additional inspection involving the control of the temporary modification associated with the temporary fire pump.

1) Unit 1 Operator Response

On March 31, 2013, Unit 1 was in Mode 5, reactor coolant system level was approximately 23 feet above the reactor and was preparing to off load the fuel and begin Green train maintenance. Two trains of decay heat cooling were in service. Offsite power was being supplied for start-up transformer 1, through the A-1 bus to the A-3 bus (Red train). The A-3 bus was also cross-connected to the A-4 bus (Green train). Both emergency diesel generators were operable and in standby condition. At 7:49 am the Bigge crane failed and resulted in dropping the main generator stator. The drop of the stator damaged the turbine deck (the floor above the A-1 and A-2 busses), which also damaged the A-2 bus and resulted in an A-1 bus lockout. The event resulted in the following issues for Unit 1:

- Loss of Offsite Power Source to 4160 Volt Electrical Busses (Emergency Operating Procedure EOP-1202.007)
- Loss of Decay Heat Removal (Abnormal Operating Procedure OP-1203.028)
- Loss of Spent Fuel Pool Cooling (Abnormal Operating Procedure OP-1203.050)
- Loss of Instrument Air (Abnormal Operating Procedure OP-1203.024)
- Large Firewater Leak in the Train Bay

Loss of Offsite Power Source to the 4160 Volt Electrical Busses

The loss of offsite power initiated an automatic start of both emergency diesel generators, K-4A and K-4B, and an automatic load of the Class 1E 4160 busses, A-3 and A-4 as designed and expected. Operators entered the appropriate emergency operating procedure, ensured proper equipment operation, and placed non-vital switchgear feeder breakers in pull-to-lock.

Loss of Decay Heat Removal

The loss of offsite power resulted in the loss of the Class 1E 4160 volt busses, and resulted in the loss of decay heat removal trains. Following the emergency diesel generator starting and loading the Class 1E 4160 volt busses, operators manually restored both decay heat removal trains to regain reactor core cooling. This was

expected as the decay heat removal pumps are not sequenced onto the bus in this plant condition (Mode 5). Train A decay heat removal system was restored within six minutes and train B was restored within 16 minutes. Due to the volume in the reactor coolant system and the short duration without decay heat removal capability, there was virtually no change in reactor coolant temperature.

Loss of Spent Fuel Pool Cooling

Operators responded to the loss of spent fuel pool cooling by manually starting spent fuel pool cooling pump P-40B at 8:13 am. Although not safety-related, the spent fuel pool cooling pumps are powered from safety-related 480 volt busses that were restored when the A-3 and A-4 busses were re-energized from the emergency diesel generators. The intermediate cooling pump, P-33C, for the spent fuel pool was placed into service at 10:30 am via a pre-planned temporary modification that restored non- safety-related power to the pump. The spent fuel pool temperature rose approximately 3 degrees Fahrenheit over a three hour period, to a peak of 89.8 degrees Fahrenheit.

Loss of Instrument Air

The loss of instrument air was reviewed by operators and action was taken to mitigate the effects. Due to the plant being in Mode 5 at the time of the event, only equipment that was affected were the decay heat cooler bypass valves and the intermediate cooling water cross-connect valves, both of which would close on the loss of instrument air pressure. Operators aligned train A decay heat removal system with the cooler bypass valve fully closed and the intermediate cooling water pump P-33C was placed in service and flow path established prior to the loss of the cross-connect.

Large Firewater Leak

Introduction. The team identified an unresolved item associated with the Unit 1 operations staff failure to secure all firewater supply to the facility in a timely manner. Specifically, the failure to secure the temporary fire pump allowed thousands of gallons of water to be unnecessarily sprayed into the Unit 1 and Unit 2 turbine building and may have led to the loss of start-up transformer 3 to Unit 2.

Description. Following the initial collapse of the Bigge crane and the drop of the generator stator, an eight inch main firewater supply line was severely damaged. As designed, the diesel drive firewater pump started due to the line pressure dropping below 95 psi. The electric firewater pump was not available due to the loss of offsite power. Also, at the time of the event, the temporary electric firewater pump was in service. The power supply for this electric firewater pump was from the London 13.8kV line, which is a non-credited offsite power source and was not affected by the event.

At 8:03 am there was a control room log entry that all firewater pumps, including the temporary firewater pump were secured. At 8:07 am there was another control room log entry that firewater had been isolated to the train bay. At 9:02 am another control room log entry states that the temporary firewater pump was secured to aid in depressurizing

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the fire main. The team reviewed the event, interviewed several operators and control room personnel, walked down the operator's travel path, and reviewed video of the collapse, to the extent possible at the time, and determined that the temporary firewater pump was not secured at 8:03 am. Video evidence suggests that the temporary firewater pump was secured sometime after 8:30 am.

These items are important as the firewater was the likely cause of Unit 2 loss of start-up transformer 3, via the 2A-113 feeder breaker and bus bar catastrophic failure, which resulted in the partial loss of offsite power to Unit 2. The water from the firewater system also leaked past the flood hatches in the train bay and eventually accumulated into the Unit 1 auxiliary building 317 foot elevation and into the B decay heat pump vault. The accumulation was due to the failure of the auxiliary building sump pump to function without electric power.

Interviews with the operations staff revealed that the control room gave the order to secured firewater pumps. An auxiliary operator secured the diesel driven firewater pump and did not secure the temporary firewater pump. The auxiliary operator then went on to perform a few more tasks in other parts of the plant. He began assisting other operators to depressurize the firewater system because water continued to spray from the damaged piping. After noticing that pressure was not decreasing at firewater hydrant H-1, he then remembered that he had not secured the temporary firewater pump. He then went to the rear of the service water intake structure and secured the pump and reported it to the control room.

The team concluded that the Unit 1 operations staff failed to promptly secure the temporary firewater pump. The team concluded that the apparent failure of the Unit 1 operations staff to maintain control of temporary modification associated with the temporary firewater pump required additional inspection. Unresolved Item URI 05000313/201311-01, "Control of Temporary Modification Associated with the Temporary Firewater Pump."

2) Unit 2 Operator Response

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On March 31, 2013, Unit 2 was operating in Mode 1 at 100 percent power and no technical specification shutdown action statements were in effect. When the Bigge crane collapsed and stator dropped at 7:49 am, the vibration resulted in a relay actuation associated with the B reactor coolant pump breaker which tripped the breaker. The core protection calculator initiated a reactor protection trip due to loss of reactor coolant system flow. The reactor tripped with no issues except an apparent failure of the A main feedwater regulating valve to full close. At approximately 9:23 am, start-up transformer 3 locked out and resulted in the fast transfer of 2A-1 bus to start-up transformer 2, while the emergency diesel generator 2K-4B, automatically started and loaded the Class 1E 4160 volt bus. The event resulted in the following issues for Unit 2:

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- Reactor Trip and Reactor Trip Recovery (Emergency Operating Procedure OP-2202.001 and OP-2202.002)

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- Loss of Instrument Air (Abnormal Operating Procedure OP-2203.021)
- Spent Fuel Pool Emergencies (Abnormal Operating Procedure OP-2203.002)
- Fire or Explosion (Abnormal Operating Procedure OP-2203.034)
- Natural Circulation (Abnormal Operating Procedure OP-2203.013)

Reactor Trip and Reactor Trip Recovery

Unit 2 control room operators responded appropriately to the reactor trip. Operators responded to the apparent failure of the A main feedwater regulating control valve to fully close by tripping the A main feedwater pump and initiate emergency feedwater actuation system. Operators were later required to manually secure emergency feedwater (pull-to-lock) which made both emergency feedwater pumps inoperable (technical specification 3.0.3 in effect) to feed steam generators with auxiliary feedwater through the emergency feedwater injection motor operated valves. (See section 4.0 Plant Response for discussion on main feedwater flow control valve)

Lock Out of Start-Up Transformer 3

Firewater leaking into feeder breaker 2A-113 from start-up transformer 3 to 2A1 bus caused a phase-to-phase and phase-to-ground fault and resulted in a transformer lock out at approximately 9:23 am. The 2A1 bus fast transferred to start-up transformer 2, but because 2A2 bus was in pull-to-lock (due to loading concerns with start-up transformer 2) de-energized. The emergency diesel generator 2K-4B started and loaded the bus as designed. These events resulted in the loss of spent fuel pool cooling pump 2P-40B, loss of instrument air compressors, reactor coolant system pressure control issues, and natural circulation operations.

Spent Fuel Pool Emergencies

At the time of start-up transformer 3 lock out, spent fuel pool cooling pump 2P-40B was in service. Due to the loss of the 2A2 bus (and subsequent 2B2 bus), 2P-40B tripped. This was appropriately identified and at 10:15 am spent fuel pool cooling pump 2P-40A was placed into service without any documented temperature rise in the spent fuel pool.

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Loss of Instrument Air

Operators responded to the expected condition in an appropriate manner. Operators restarted instrument air compressor 2C27A following the loss of power to the 2B1 bus on the transfer to the start-up transformer 2. This provided approximately 45 psi. It was at this time that loud water hammer was experienced between the 2E-5B and 2E-B6 feedwater heaters. Operators then cross-tied the 2B1 bus to energize the 2B2 bus and restart instrument air compressor 2C27B and restored instrument air pressure to 90 psi. This was accomplished at approximately 11:40 am.

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Reactor Coolant System Pressure Control

The lock out of start-up transformer 3 resulted in the trip of the running charging pump, loss of all reactor coolant pumps, loss of instrument air, which caused letdown to be isolated, loss of normal pressurizer spray, and the loss of the steam dump bypass control system. This was a complicated issue and reactor coolant system pressure was quickly rising. Operators quickly recognized and took appropriate actions to establish auxiliary spray, secure pressurizer heaters to reduce reactor coolant system pressure and avoid lifting pressurizer code safety valves.

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Natural Circulation Cool Down

Following the start-up transformer 3 lock out, operators entered the appropriate abnormal operating procedure and appropriately commenced a reactor cool down at 20 to 30 degrees per hour until the plant could be placed onto shutdown cooling. The reactor temperature was reduced to less than 300 degrees without incident. This was the first time Unit 2 had ever actually performed this evolution.

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Fire or Explosion

Unit 2 entered the appropriate emergency operating procedure for the catastrophic phase-to-phase, phase-to-ground failure of the bus bars and appropriately made the emergency declaration. (See Section 6.0 for further discussion)

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3.0 Assess Equipment Impact from Event (Charter Item #3)

a. Inspection Scope

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b. Observations

4.0 Plant Response (Charter Item #4)

a. Inspection Scope

b. Observations

1) Procedural Control Associated with Unit 1 Steam Generator Nozzle Dams

Introduction. The team identified an unresolved item associated with the procedural controls for the back–up air supply systems to the Unit 1 nozzle dams.

Description. On March 28, 2013, all Unit 1 steam generator nozzle dams were installed. These nozzle dams consist of one rigid plug and two inflatable dams. The inflatable dams are supplied by either air or nitrogen and normal operating pressure is 75 psi. The licensee normally regulates 90 psi primary supply with an 80 psi back-up source pressure. These supplies are procedurally controlled to be independent. At the time of the Bigge crane collapse and stator drop event, the primary supply for the nozzle dams was a local pancake compressor and a back-up supply provided by a second pancake compressor. A contingency plan should the two supplies fail would be instrument air.

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The event resulted in the loss of offsite electrical power. Most power to the containment building, both pancake compressors included, was lost. Without an air supply, the nozzle dams began to lose pressure. At approximately 9:30 am the contractor for the nozzle dams and the steam generator engineer entered containment and observed dam pressure at 50 psi and falling. The engineer requested a couple of nitrogen bottles be brought into containment. While waiting for the bottles, nozzle dam pressures were observed to be approaching 25 psi and were now subject to reactor coolant system leakage. The engineer attempted to connect to the local instrument air line and pressure increased to approximately 50 psi. At that time the nitrogen bottles arrived and were subsequently placed into service at normal operating system pressure.

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In conjunction with the nitrogen bottles, mechanics ran a line from a distribution air center which was supplied by the refueling air compressor. The refueling air compressor is located outside of containment and is powered by the 13.8 kV London line which was not affected by the stator drop event. The refueling air compressor was placed into service as the primary source of nozzle dam compressor and the nitrogen bottles as back-up. The licensee then established local nozzle dam checks on a two hour frequency.

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Inspectors interviewed the steam generator engineer and determined that procedure OP-5120.504, "OTSG Nozzle-Dam Training, Testing & Installation/Removal," Revision 6 controlled nozzle dam air supplies and included nitrogen bottles as a back-up, but that procedure was changed in 2010 to allow other combinations of air supplies. Nitrogen bottles were not used since then because of the operational convenience of not having to bring bottle into containment. The licensee is planning to change the procedure to include nitrogen bottles as a back-up pressure source for the nozzle dams.

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The team concluded that additional inspection is required to assess the loss of nozzle dam pressure and the procedure change that relaxed the requirement to have the nitrogen bottles as a back-up pressure source for the nozzle dams. This issue is

identified as Unresolved Item URI 05000313/2013011-03, "Procedural Control Issue Associated with Unit 1 Steam Generator Nozzle Dams."

2) Main Feedwater Regulating Valve Maintenance Practices

Introduction. The team identified an unresolved item associated with maintenance practices associated with the main feedwater regulating valves.

Description. On March 31, 2013, following the Unit 2 reactor trip, operators identified that the A main feedwater regulating valve failed to indicate closed. This indication caused the operators to trip the A main feedwater pump and manually initiate the emergency feedwater actuation system. Arkansas Nuclear One Unit 2, is a Combustion Engineering designed plant and emergency feedwater in not normally actuated on a non-complicated reactor trip. Main feedwater normally stays inservice to maintain steam generator levels and for a reactor cool down. Operations then had to place the auxiliary feedwater system in service, which caused operation to place the emergency feedwater system in a pull-to-lock condition which made the two trains inoperable and into technical specification 3.0.3 for a short period of time. This unnecessarily complicated operator response.

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Operations later determined that the regulating valve actually closed, and that it was just an indication (limit switch) issue. The condition was subsequently corrected by tightening loose adjustment screws.

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On August 8, 2012, Unit 2 tripped due to a loss of condenser vacuum. During operator response to this event, the A main feedwater regulating valve failed to close and was found to be approximately 8 percent open. It was determined that maintenance had left the jacking mechanism in the wrong position. Again, operator response was unnecessarily complicated. An NRC identified finding was documented as NRC FIN 05000368/201205-008.

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The team concluded that additional inspection is required to assess whether or not maintenance issues exist with the main feedwater regulating valves: Unresolved Item URI 05000368/2013011-04, "Main Feedwater Regulating Valve Maintenance Practices."

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5.0 Adequacy of Compensatory Measures (Charter Item #5)

a. Inspection Scope

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The team reviewed the impact of the Bigge crane collapse and stator drop on the fire detection and suppression systems and assed the licensee's compensatory measures following the event. The compensatory measures assessed included operation and security actions for damaged equipment.

The team reviewed control room log entries, condition reports to identify any equipment issues. The team also interviewed operations staff, system engineers and security

personnel to understand the compensatory measures taken and the timeliness of those actions commensurate with plant conditions.

b. Observations

The team determined that there were three main equipment issues that the units were forced to contend with: loss of offsite electrical power, reduced access to the control rooms, and a severely damaged section of firewater piping. The team determined that the licensee's compensatory actions were appropriate and preserved plant safety, however the team also identified one unresolved item for additional inspection involving the timeliness of the licensee's actions to restore the firewater system and the actual capability to fight fires if necessary.

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Loss of Offsite Electrical Power

The loss of electrical power for Unit 1 resulted in loss of most non safety-related loads that supplied power to air conditioning, power to sump and transfer pumps, intermediate cooling water pumps, loss of instrument air, air compressors for nozzle dams, loss of Appendix R lighting due to loss of battery chargers, and the loss of non-vital air compressors that charge emergency diesel generator starting air bank pressures. Most items have been discussed in other sections of this report and will not be discussed again.

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The licensee deployed temporary air driven pumps to the 317 foot elevation of the auxiliary building due to excessive water accumulation stemming from the firewater damage. The normal sump pumps had no electrical power due to the event.

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The loss of normal air cooling chillers and fans led to compensatory measures involving opening fire doors and then further compensating for the degraded fire barriers via continuous fire watches. Of particular interest were the temperature increases in the emergency switchgear areas, A-3 and A-4. These busses were being supplied from the emergency diesel generators.

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Emergency diesel generators were in operation for approximately six days. During this time the air compressor for the air start system were not available. The licensee recognized that if the diesels were to trip or have to be secured for some reason, they would not have any air to attempt to restart the diesel. The licensee implemented a compensatory measure to pressurize the air start system via nitrogen bottles and maintain air start capability.

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Reduced Control Room Access

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The Bigge crane collapse damaged the normal ingress and egress point to the control rooms. Alternate ingress and egress was available via one door on Unit 1 and one door on the Unit 2 control rooms. These doors had not seen much use and experienced some minor issues which were promptly dealt with considering evacuation and control room envelope parameters.

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Severely Damaged Section of Firewater Piping

Introduction. The team identified an unresolved item associated with the compensatory measure for and the timeliness of the restoration of the damaged firewater system. The compensatory measure for this firewater system was inadequate and not capable of providing meaningful assistance in fighting a fire.

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Description. The Bigge crane collapse and the stator drop in the train bay severely damaged an eight inch diameter firewater main that released thousands of gallons of water into the train bay and into the Unit 1 and Unit 2 turbine buildings. Operations eventually secured all firewater pumps to stop the water flow into the plant. The licensee compensated for the complete unavailability of the firewater system by having a London fire pumper truck positioned on the west side of the plant and the staging of the three diesel-driven B.5.b pumps inside the protected area. This gave the illusion that firewater and fire fighting capability was present. While conducting interviews with fire protection engineers and fire brigade trainers, the team discovered that the London pumper truck carried approximately one thousand gallons of water, and two of the three diesel-driven firewater pumps had no suction and were not capable of any function. The third diesel-drive firewater pumps could only act as relay pump from the only water source inside the protected area, which was a domestic water hydrant 2H-1. There was not enough hose readily available to fight a fire in the Unit 1 turbine building, much less any fire fighting inside the auxiliary buildings.

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From interviews, it appeared that, although the site was trying to restore the firewater system, the licensee was not acting with the knowledge that the site was extremely vulnerable to a fire and that there was very little in the way to fight a fire. This lack of knowledge was further proved via interviews with the assistant operations managers (AOM) that did not know the firewater pumps had no viable suction sources. The firewater system was restored the morning of April 1, 2013 after the firewater system was unavailable for over 24 hours. The team concluded that additional inspection was needed to fully assess the compensatory measures and the timeliness of the firewater system restoration: Unresolved Item URI 05000313;368/2013011-05, "Compensatory Measure for and Timely Restoration of the Severely Damaged Firewater System."

6.0 Event Classification and Reporting (Charter Item #6)

a. Inspection Scope

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The team conducted an independent review of licensee actions regarding emergency event classification and reporting. To assess licensee's actions in this area, the team performed a detailed review of operator logs, computerized sequence of events, condition reports, and conducted interviews of the pertinent operations staff and the manager of emergency preparedness.

b. Observations

The team identified one unresolved item requiring additional inspection to determine whether or not the emergency classification (declaration) was timely given the reported information.

Introduction. The team concluded that Unit 2 operations staff made the correct emergency classification of Notification of Unusual Event for an explosion inside the protected area, however the team determined that there may have been adequate information to have made the classification earlier than if was actually declared.

Description. At approximately 9:23 am Unit 2 experienced a start-up transformer 3 lock out due to the apparent failure of the 2A-113 feeder breaker. Initial reports from the field indicated that the door of the feeder breaker appeared to be blown open, and light smoke was also observed. This was documented in the control room logs at 9:25 am. From interviews with two of the three known responding operators, the team also discovered that one of the operators could see black, spatter on the open cabinet door that appeared to have been molten metal. The operator reported his observations to the control room. Further investigation was hampered by the fact that water was accumulated all around the energized busses. At some time later another operator actually looked into the panel and reported that some of the bus bars were damaged. Although this was not initially documented in the control room logs, this report was made around 10:20 am and the Notification of Unusual Event was declared at 10:33 am.

The team concluded that additional inspection is required to fully determine the timeliness of the emergency classification given that there may have been several communications to the control room reporting damage without any classification determined by the operations staff: Unresolved Item URI 05000368/2013011-06, "Timeliness of Emergency Action Level Determination."

7.0 Heavy Lift Preparations and Associated Risk Assessment (Charter Item #7)

a. Inspection Scope

The team evaluated the licensee oversight of contractors employed to perform the stator movement, the risk management activities associated with ANO Unit 1 during its refueling outage, and risk management associated with ANO Unit 2 during operation at full power. The team evaluated the risk management administrative controls applicable to operating and shutdown units.

b. Observations

.1 Shutdown Risk Management

The team reviewed procedure EN-OU-108, "Shutdown Safety Management Program," Revision 5, which provided a process to assess the overall impact of plant maintenance on plant risk to satisfy the requirements of 10 CFR 50.65(a)(4) during the cold shutdown and refueling modes of reactor operation. Step 5.4, "Conducting the Shutdown Safety

Assessment," specified that the Outage Risk Management Team (ORAT) be assembled and evaluate the outage schedule, including identification of higher risk evolutions.

The team reviewed Condition Report (CR) ANO-1-2013-00132, initiated on January 28, 2013, which documented the ORAT review of Revision 0 of the Unit 1 Outage schedule. This review identified a table of specific outage items and included an additional comment questioning whether contingency plans were needed for three planned outage activities, including "flying the stator on the turbine deck." The CR originator recommended assignment of these issues to the outage management organization for resolution. The resolution of the additional comment identified that the outage management organization determined no contingency plans were necessary for the stator movement.

The team discussed the resolution of the comment with the CR Originator (Robert Clark), the Unit 1 Outage Manager (Joe Randall Walters), and the Senior Outage Scheduler (Emil McCormic). The Unit 1 Outage Manager stated that the outage management organization considered the likelihood of a problem with the stator movement to be very low. The Unit 1 Outage Manager also stated that no practical contingency measures were necessary beyond a temporary modification to provide alternate power to one non-safety intermediate cooling water (ICW) pump because Unit 1 was scheduled to be in the refueling mode of operation with water level high above the reactor vessel flange. The ICW pump normally receives power from the non-safety A2 bus, and the ICW system provides cooling water to the spent fuel pool cooling heat exchangers. The temporary modification to repower one ICW pump from alternate offsite source allowed operation of adequate ICW pump capacity throughout the planned outage of the Green train equipment, including the outage of nonsafety-related bus A2.

For identified higher risk evolutions or conditions, procedure EN-OU-108 specified the use of guidance in procedure Attachment 9.1, "Qualitative Risk Evaluation and Risk Mitigation Plan," to assess the impact of higher risk evolutions or conditions on key safety functions. Sheet 4 of 5 in Attachment 9.1 provided a checklist of contingency measures for heavy load lifts. A note contained on the heavy load lift checklist identified that specific compensatory risk management actions were contained in EN-MA-119, "Material Handling Program," Revision 16. In addition, the checklist included additional contingency measures for heavy load lifts when equipment under the load path is protected. In the plant state at the time of the event (Shutdown Condition 2: reactor vessel head removed, reactor cavity flooded to greater than 23 feet above the core elevation, fuel in the reactor vessel, and no fuel movement in progress), the Shutdown Operations Protection Plan (Procedure 1015.048, Change No. 9) specified that at least one of the offsite power sources be operable. However, all available offsite power sources passed beneath the load path. Furthermore, Technical Specification (TS) Limiting Condition for Operation 3.8.2, "AC Sources – Shutdown," required one offsite source of power be operable in operating modes 5 and 6, and during movement of irradiated fuel assemblies. Therefore, the team concluded that at least one offsite power source must be protected in that mode of operation. As discussed in the event sequence, at the time of the stator movement the non-safety A2 bus was removed from

service and the safety-related A3 and A4 busses were cross-tied and receiving power from the Unit 1 startup transformer offsite source via the non-safety A1 bus.

The heavy load handling checklist in Attachment 9.1 to EN-MA-108 included the following possible risk mitigation actions for the protected equipment:

- Enhance communication to improve awareness of the load lift and its relation to maintenance activities.
- Revise load path.
- Add compensatory actions or back-up safety functions to enhance safety function redundancy.
- Assume safety function is impacted by potential load drop and adjust the key safety function assessment accordingly.

Of these actions, the heavy lift of the stator was treated as an infrequent plant test or evolution (IPTE), which entailed enhanced communication of the lift, and the plant staff implemented the temporary modification to provide an alternate power source to one of the ICW pumps, which was discussed above.

The team evaluated the effectiveness of the implemented measures in managing the effect of a potential heavy load drop on protected electrical equipment. The team reviewed the IPTE briefing materials and the outage schedule to assess how the relationship between the stator movement and other outage activities was controlled. The team found that the IPTE briefing materials provided direction related to industrial safety, but the materials did not provide documented restrictions during the heavy load lift related to reactor plant conditions or the availability of equipment for maintenance of key safety functions, such as reactor decay heat removal, reactor makeup water, and electrical power for that equipment. Interviews with outage management and operating staff personnel indicated that no firm relationships had been established between the stator movement and other refueling outage activities. Through review of the outage schedule, the team determined that the planned sequence of stator movements called for positioning of the replacement stator in the turbine building at a time when the entire Green Train electrical distribution was scheduled to be out of service, including the ability to use one of the two installed safety-related emergency diesel generators and one of two safety-related station batteries. In addition, the outage schedule indicated fuel transfer to the spent fuel pool would be in progress with fuel still in the reactor vessel.

Based on the absence of administrative controls addressing the relationship between the stator replacement activities and other outage activities related to reactor key safety functions, the team concluded that additional inspection was needed to assess the effectiveness of the IPTE and temporary modification in mitigating risk associated with the stator movement activities. **Unresolved Item URI 05000313/2013011-007, "Effectiveness of Shutdown Risk Management Program during Stator Movement."**

.2 Material Handling Risk Management

The team also evaluated the effectiveness of contingency measures to reduce the potential for a load drop. The team determined through interviews that the project

management organization considered the temporary overhead crane to be a temporary hoisting assembly. Section 5.2, "Load Handling Equipment Requirements," of EN-MA-119, Item [7], "Temporary Hoisting Assemblies," specified the following measures to establish hoist integrity:

- Licensee engineering support personnel shall approve the design of vendor-supplied temporary overhead cranes.
- The temporary overhead crane shall be designed for 125 percent of the projected hook load and shall be load tested in all configurations for which it will be used.
- Load bearing welds shall be inspected before and after the load test.

However, Item [7] also included a note specifying that specially designed lifting devices may be designed and tested to other approved standards.

The team interviewed members of the project management organization regarding implementation of the material handling program for the stator lift. The project management staff stated that the focus of engineering support personnel was ensuring the temporary overhead crane did not overload the existing plant structures. The project management staff also stated that the temporary crane was not load tested. Although the project management staff pointed out the note in EN-MA-119 to the inspection team, the project management staff did not identify to the team an alternate approved standard for design and testing of the temporary overhead crane assembly.

The team reviewed Calculation 27619-C1, "Heavy Lift Gantry Calculation – ANO Stator Replacement Project," Revision 0, which evaluated the structure of the temporary overhead crane. This calculation was completed by a contractor performing the stator replacement for the licensee. The calculation identified the American Institute of Steel Construction (AISC) Steel Construction Manual, 14th Edition, and the American Society of Mechanical Engineers (ASME) NQA-1, "Quality Assurance Requirements for Nuclear Facility Applications, [2012], as references. The AISC Steel Construction Manual provided standard methods of evaluating acceptable loadings for beams and columns constructed from standard steel shapes. The ASME NQA-1 standard provided guidance for implementing an acceptable quality assurance program at nuclear power plants during siting, design, construction, operation, and decommissioning. Subpart 2.15 of NQA-1, "Quality Assurance Requirements for Hoisting, Rigging, and Transporting of Items for Nuclear Power Plants," provided standards for the design, manufacture, acceptance, testing, and use of hoisting, rigging, and transporting equipment to maintain the quality of designated nuclear power plant items that require special handling.

The inspection team reviewed the conformance of the design and testing of the temporary overhead crane to criteria contained in Subpart 2.15 of NQA-1. The standard recognized that control over the handling of an item is dependent on the importance of the item to safe, reliable operation of the plant and the complexity of the operation. Subpart 2.15 of NQA-1 established the following three categories of items to establish criteria for handling of these items:

- Category A items need specially selected handling equipment and detailed handling procedures because of large size and weight.
- Category B items may be handled with conventional equipment but need detailed handling procedures because of the item's susceptibility to damage

- Category C items may be handled with conventional equipment using sound rigging practices (i.e., the item is neither large in size and weight nor susceptible to damage).

The team determined that the stator corresponded to a Category A item because it was large in size and weight and comparable in these parameters to examples of Category A items provided in the standard such as a reactor vessel. For Category A items, the standard provided specific design, acceptance, and testing criteria applicable to special design handling equipment, including items such as special crane support runways, columns, and frames, which were the subject of Calculation 27619-C1.

The team reviewed implementation of the design, acceptance criteria, and testing specified in Subpart 2.15 of NQA-1 in the design of the temporary overhead crane. The team identified discrepancies between the design criteria specified in Section 400 of Subpart 2.15 of NQA-1 and the design evaluation completed in Calculation 27619-C1, including an assumption of transverse frame loading that was less than 2 percent of the handled load and the absence of evaluations considering the design of column end fittings. Also, as noted above, the temporary overhead crane structure was not subjected to a load test as specified in Section 601 of Subpart 2.15 of NQA-1. The team noted that recognition of adequate capability by a qualified engineer was identified in Section 503.2(e) of Subpart 2.15 of NQA-1 as an acceptable alternative to these design and test acceptance criteria for equipment used to handle only Category C items. However, the adverse effects of the stator drop on safe operation of the ANO reactors confirmed that consideration of the stator as a Category A item was appropriate. The team did not have access to the contractor staff that completed the calculation to discuss the application of the standard.

The team determined that the design and test process applied to the crane did not conform to applicable procedures and standards. However, the root cause of the stator temporary overhead crane failure had not been established at the time of this team inspection (URI 05000313/2013011-09 in Section 8.0 of this report) and alternate acceptable standards with different acceptance criteria may be identified. Therefore, the team concluded that additional inspection was needed to assess the effectiveness of the material handling program implementation in mitigating risk associated with the stator movement activities: **Unresolved Item URI 05000313/2013011-008 "Effectiveness of Material Handling Program during Stator Movement."**

.3 Operating Reactor Risk Management

The team reviewed procedure COPD-024, "Risk Management Guidelines," Revision 44, effective January 22, 2013, which provided administrative controls for risk management in operational modes 1 through 4 (i.e., power operation through hot shutdown). Through interviews with the Unit 2 Operations staff, the team determined that the operations staff was aware of the timing of the proposed stator move and had determined the stator movement was unlikely to affect Unit 2 operations because plant equipment was not directly under the proposed stator movement path. Although the crane collapse affected Unit 2 systems, particularly the availability of offsite power and the normal heat sink, the actual consequences had a relatively small effect on the redundancy and availability of

key safety functions. Unit 2 safety-related systems were maintained operable throughout the stator movement. Therefore, the team concluded that the plant staff appropriately implemented the guidelines for risk management for Unit 2 operation at power.

8.0 Root Cause Analysis (Charter Item #8)

a. Inspection Scope

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b. Observations

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9.0 Applicability of Operating Experience (Charter Item #9)

a. Inspection Scope

The team evaluated the application of operating experience related to contractor oversight and material handling.

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b. Findings

.1 Contractor Oversight

The team reviewed operating experience related to contractor oversight. The team identified NRC operating experience discussed in Information Notice (IN) 97-74 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML031050083), "Inadequate Oversight of Contractors during Sealant Injection Activities," and industry operating experience documents. The NRC described in IN 97-74 that adequate understanding of the potential consequences and the exercise of adequate control of vendor activities were important to avoid adverse impact on safety-related systems as a result of sealant injection processes. Industry operating experience addressed the same issues with a broader consideration of vendor activities.

The team evaluated incorporation of the related operating experience in administrative procedures. The team reviewed procedure EN-MA-126, "Control of Supplemental Personnel," Rev. 15, and found that the procedure contained appropriate measures to exercise oversight of contractor activities. However, the degree of oversight was related to the perceived safety significance of the contractor activities.

The team discussed implementation of procedure EN-MA-126 with licensee project management staff. The project management staff indicated a focus on industrial safety

based on the perception of very low risk of a handling system failure and the level of expertise of the contractors. The team reviewed the licensee plan for contractor oversight and determined that the plan was appropriate for the perceived risks. The appropriateness of risk management activities is address in Section 7 of this report, which includes discussion of contractor oversight activities related to the reliability and integrity of the temporary overhead crane.

.2 Control of Heavy Loads

The team reviewed recent operating experience related to heavy load movements. The NRC staff reemphasized guidelines for control of heavy load handling activities in Regulatory Issue Summary (RIS) 2005-25 (ADAMS Accession No. ML052340485), "Clarification of NRC Guidelines for Control of Heavy Loads," October 31, 2005, including managing the risk of heavy load activities beyond the scope of existing heavy load handling programs under the requirements of 10 CFR 50.65(a)(4). In addition, the NRC discussed the industry initiative on control of heavy loads in NRC RIS 2008-28 (ADAMS Accession No. ML082460291), "Endorsement of Nuclear Energy Institute Guidance for Reactor Vessel Head Heavy Load Lifts," and endorsed Nuclear Energy Institute (NEI) 08-05, "Industry Initiative on Control of Heavy Loads," Revision 0 (ADAMS Accession No. ML082180684).

The team reviewed implementation of the operating experience and guidance included in the above documents. Section 1, "Maintenance Rule 10 CFR 50.65(a)(4) Considerations," of NEI 08-05 provided guidelines for implementation of the risk management requirements of 10 CFR 50.65(a)(4) to heavy load movements. These guidelines specified the following risk management activities when components performing a protected safety function could be impacted by a potential load drop:

- Revising the load path to preclude movement over the operating train, or conducting the heavy load lift at a different time, e.g., after redundant equipment has been restored to service.
- Providing additional compensatory actions or backup safety functions to enhance redundancy of safety function performance during the heavy load lift.
- Providing additional communication and awareness to operations and maintenance personnel of the load lift and its relation to maintenance activities.
- Obtaining approval of plant management of the heavy load lift.

The team determined that the licensee appropriately incorporated these risk management activities into the material handling program implementing procedure (EN-MA-119).

10.0 Independent Risk Assessment (Charter Item #10)

a. Inspection Scope

The team reviewed the sequence of events and equipment problems to support an independent assessment of the risk of the event.

b. Observations

11.0 Exit Meeting Summary

On DATE, 2013, the NRC held a public meeting and presented the inspection results to NAME and other members of the staff, who acknowledged the observations. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was identified.

DRAFT - RELEASE

DRAFT - RELEASE

SUPPLEMENTAL INFORMATION

DRAWINGS

Number	Title	Revision
11405-E-1	MAIN ONELINE DIAGRAM P & ID	49
27619-001	Isometric Drawing – Stator Gantry Lift and Stator Exchange Project, Unit 1	

PROCEDURES

Number	Title	Revision
COPD-024	Risk Assessment Guidelines	7
EN-MA-119	Material Handling Program	16
EN-MA-126	Control of Supplemental Personnel	15
EN-OP-116	Infrequently Performed Tests or Evolutions	11
EN-OU-108	Shutdown Safety Management Program	5
OP 1015.048	Shutdown Operations Protection Plan	9

CALCULATIONS

Number	Title	Revision
27619-C1	Heavy Lift Gantry Calculation – ANO Stator Replacement Project	0

DESIGN BASIS DOCUMENTS (DBD)

Number	Title	Revision

MISCELLANEOUS DOCUMENTS

Number	Title	Revision/Date
1R24	ANO Unit 1 Outage Schedule (Green Train and Stator)	April 9, 2013
	AIS Manual of Steel Construction	14th Ed.
ASME NQA-1	Quality Assurance Requirements for Nuclear Facility Applications	2012

VENDOR MATERIALS

Number	Title	Revision
101	Procedure - Erection/Dismantle, Siemens ANO Power Station – Unit 1	4

MODIFICATIONS

Number	Title	Revision

DRAFT - RELEASE

EVALUATIONS

Number	Title	Revision

WORK ORDERS (WO)

CONDITION REPORTS (CR)

ANO-1-2013-00132

*CR's issued as a result of inspection activities.

KEY POINTS OF CONTACT

RELEASE

S. PYLE	LICENSING MANAGER
G. SULLINS	ASSISTANT OPERATIONS SUPERVISOR
M. FARMER	WORK WEEK MANAGER
D. BAUMAN	MANAGER PROJECT MANAGEMENT
J. McMAHAN	SENIOR PROJECT MANAGER
C. TUCKER	FIELD IMPLEMENTING SUPERVISOR
J. HATCHCOTE	UNIT 2 ASSISTANT OPERATIONS MANAGER
D. PEHRSON	UNIT 1 SHIFT MANAGER
M. GOHMAN	UNIT 1 SHIFT MANAGER
C. SHIVELY	SYSTEMS ENGINEER
T. WOODSON	SYTEMS ENGINEERING SUPERVISOR
C. JOHNSON	CIVIL ENGINEER
B. BUSER	SENIOR ELECTRICAL DESIGN ENGINEER
G. DOBBS	DESIGN ENGINEERING ELECTRICAL SUPERVISOR
E. MCCORMIC	SENIOR OUTAGE SCHEDULER
J. SCROGGINS	CONTRACT ENGINEER
L. SCHWARTZ	DESIGN ENGINEERING

DRAFT - RELEASE

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000xxx/2013011-01	URI	TITLE
05000xxx/2013011-02	URI	
05000xxx/2013011-03	URI	
05000xxx/2013011-04	URI	
05000xxx/2013011-05	URI	
05000xxx/2013011-06	URI	
05000313/2013011-07	URI	Effectiveness of Shutdown Risk Management Program
05000313/2013011-08	URI	Effectiveness of Material Handling Program
05000xxx/2013011-09	URI	

Closed

05000xxx/???	??	TITLE

Melfi, Jim Release

From: Maier, Bill
Sent: Tuesday, April 30, 2013 4:43 PM
To: Allen, Don; Melfi, Jim; Lackey, Dana
Subject: FW: ANO PN13-002B update Rev4.docx
Attachments: ANO PN13-002B update Rev4 (2).docx

Don, et. al.,

I concur with one request. Please make the deletion shown in the attached mark-up.

Thank You,

Bill

-----Original Message-----
From: Lackey, Dana
Sent: Tuesday, April 30, 2013 12:03 PM
To: Maier, Bill
Cc: Mather, Allen
Subject: ANO PN13-002B update Rev4.docx

Bill,
Please concur with Don via phone or email. Thanks!

321

Release

Melfi, Jim

From:	Melfi, Jim
Sent:	Tuesday, April 30, 2013 8:12 AM
To:	Lusk, Rustin
Subject:	FW: ANO PN13-002B update Rev3.docx
Attachments:	ANO PN13-002B update Rev3.docx

From: Melfi, Jim
Sent: Tuesday, April 30, 2013 7:33 AM
To: Lackey, Dana
Subject: ANO PN13-002B update Rev3.docx

Dana

Surprise

Another revision to the PN. I'll bring the PN package back to you for encorporation.

JIM

JIM MELFI

B22

Release

SUNSI Review Completed: YES ADAMS: ☒Yes ☐No Initials: DA
☒ Publicly Available ☐Non-Publicly Available ☐Sensitive ☒ Non-Sensitive

RIV:C:	D:DRP	PAO	RSLO	DRA	RA
DAllen	KKennedy	VLDricks	WMaier	RLewis	ATHowell
/RA/					
4/29/13	4/ /13	4/ /13	4/ /13	4/ /13	4/ /13

April 30, 2013

PRELIMINARY NOTIFICATION OF EVENT OR UNUSUAL OCCURRENCE -- PNO-IV-13-002B

This preliminary notification constitutes early notice of events of possible safety or public interest significance. The information is as initially received without verification or evaluation, and is basically all that is known by the Region IV, Arlington, Texas, staff on this date.

Facility
Arkansas Nuclear One, Units 1 and 2
Entergy
Russellville, Arkansas
Dockets: 05000313; 05000368
License Nos. DPR-51; NPF-6

Licensee Emergency Classification
___ Notification of Unusual Event
___ Alert
___ Site Area Emergency
___ General Emergency
_X_ Not Applicable

SUBJECT: UPDATE: ARKANSAS NUCLEAR ONE UNIT 2 REACTOR TRIP AND NOTIFICATION OF UNUSUAL EVENT

DESCRIPTION:

This preliminary notification supplements information in PNO-IV-13-002A, issued to describe the event that occurred at Arkansas Nuclear One (ANO), Units 1 and 2 on March 31, 2013 (ADAMS ML13092A024 and ML13099A244). During transfer of the 500 ton ANO Unit 1 main generator stator, the lifting rig failed. The main generator stator fell approximately 30 feet into the train bay and caused structural damage to the Unit 1 turbine building. For ANO Unit 1, which was in a refueling outage, this drop caused a loss of offsite power. This resulted in the Unit 1 Emergency Diesel Generators (EDGs) operating to provide power to vital electrical loads. ANO Unit 2 experienced a reactor trip from 100 percent power after the falling stator and crane components caused a reactor coolant pump electrical breaker to open. About 1.5 hours later, water from a damaged fire suppression system piping resulted in loss of power to one vital electrical bus and a Notification of Unusual Event. The associated EDG for Unit 2 started and supplied vital electrical loads.

On April 8, 2013, the Nuclear Regulatory Commission commenced an Augmented Inspection Team (AIT) assessment of the circumstances surrounding the March 31, 2013, loss of offsite power for ANO Unit 1, and the reactor trip and subsequent Notification of Unusual Event for ANO Unit 2. The AIT plans to hold a public exit meeting to discuss its findings. That meeting is currently scheduled for May 9, 2013.

Update: The licensee's actions for Unit 1 have focused on assessing damage to the plant and restoring the electrical distribution system. The licensee has restored offsite power to the vital busses with a temporary modification from startup transformer 1, and has offloaded the core to the spent fuel pool. This will permit additional needed repairs to the electrical distribution system.

The licensee inspected Unit 2 for damage incidental to the Unit 1 stator drop, and evaluated the cause of and plant response to the reactor trip. Minor equipment damage was repaired, and the licensee concluded that the plant responded as expected during the event. On April 28, 2013, the licensee restarted Unit 2.

The NRC assessed the repairs to the electrical busses on ANO Unit 2, reviewed the Unit 2 post-transient trip report and walked down containment. The inspectors also assessed the adequacy of the Unit 2 turbine building structure and selected support systems for power operation, as well as the scope of the licensee's pre-restart work plans. The inspectors observed portions of Unit 2 restart.

Unit 1 remains shutdown, in a refueling outage. The NRC continues to monitor the outage, stator and crane component removal efforts, and activities for fully recovering offsite power.

State ~~and local~~ officials have been informed.

This preliminary notification is issued for information only, and will be updated again as necessary as more information becomes available.

This information presented herein has been discussed with the licensee and is current as of ?;?? a.m. CDT on April 30, 2013.

ADAMS ACCESSION NUMBER

CONTACTS:
Don Allen, Branch Chief, 817-528-3439
Fred Sanchez, Senior Resident Inspector ANO, 479-857-9199

Release

SUNSI Review Completed: YES ADAMS: ☒Yes ☐No Initials: DA
☒ Publicly Available ☐Non-Publicly Available ☐Sensitive ☒ Non-Sensitive

RIV:C:	D:DRP	PAO	RSLO	DRA	RA
DAllen	KKennedy	VLDricks	WMaier	RLewis	ATHowell
/RA/					
4/29/13	4/ /13	4/ /13	4/ /13	4/ /13	4/ /13

April 30, 2013

PRELIMINARY NOTIFICATION OF EVENT OR UNUSUAL OCCURRENCE -- PNO-IV-13-002B

This preliminary notification constitutes EARLY notice of events of POSSIBLE safety or public interest significance. The information is as initially received without verification or evaluation, and is basically all that is known by the Region IV, Arlington, Texas, staff on this date.

Facility
Arkansas Nuclear One, Units 1 and 2
Entergy
Russellville, Arkansas
Dockets: 05000313; 05000368
License Nos. DPR-51; NPF-6

Licensee Emergency Classification
___ Notification of Unusual Event
___ Alert
___ Site Area Emergency
___ General Emergency
_X_ Not Applicable

SUBJECT: UPDATE: ARKANSAS NUCLEAR ONE UNIT 2 REACTOR TRIP AND NOTIFICATION OF UNUSUAL EVENT

DESCRIPTION:

This preliminary notification supplements information in PNO-IV-13-002A, issued to describe the event that occurred at Arkansas Nuclear One (ANO), Units 1 and 2 on March 31, 2013 (ADAMS ML13092A024 and ML13099A244). During transfer of the 500 ton ANO Unit 1 main generator stator, the lifting rig failed. The main generator stator fell approximately 30 feet into the train bay and caused structural damage to the Unit 1 turbine building. For ANO Unit 1, which was in a refueling outage, this drop caused a loss of offsite power. This resulted in the Unit 1 Emergency Diesel Generators (EDGs) operating to provide power to vital electrical loads. ANO Unit 2 experienced a reactor trip from 100 percent power after the falling stator and crane components caused a reactor coolant pump electrical breaker to open. About 1.5 hours later, water from a damaged fire suppression system piping resulted in loss of power to one vital electrical bus and a Notification of Unusual Event. The associated EDG for Unit 2 started and supplied vital electrical loads.

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Update: The licensee's actions for Unit 1 have focused on assessing damage to the plant and restoring the electrical distribution system. As of April 28th, the licensee has restored power to the vital busses with a temporary modification from startup transformer 1, and has offloaded the core to the spent fuel pool. This will permit additional needed repairs to the electrical distribution system.

For Unit 2 the licensee inspected the plant for damage incidental to the Unit 1 stator drop, and evaluated the cause of and plant response to the reactor trip. Minor equipment damage was repaired, and the licensee concluded that the plant responded as expected during the event. On April 27, 2013, Arkansas Nuclear One commenced restart of Unit 2. The NRC assessed the repairs to the electrical busses on ANO Unit 2, reviewed the ANO Unit 2 post-transient trip report and walked down containment. The inspectors also assessed the adequacy of the ANO Unit 2 turbine building structure and selected support systems for power operation, as well as the scope of the licensee's pre-restart work plans. The inspectors observed portions of ANO Unit 2 restart.

ANO Unit 1 remains shutdown, in a refueling outage. The NRC continues to monitor the ANO Unit 1 refueling outage, stator and crane component removal efforts, and activities for recovering offsite power.

State and local officials have been informed.

This preliminary notification is issued for information only, and will be updated again as necessary as more information becomes available.

This information presented herein has been discussed with the licensee and is current as of ?;?? a.m. CDT on April 30, 2013.

ADAMS ACCESSION NUMBER

CONTACTS:
Don Allen, Branch Chief, 817-528-3439
Fred Sanchez, Senior Resident Inspector, ANO, 479-857-9199

Melfi, Jim Release

From: Melfi, Jim
Sent: Monday, April 29, 2013 8:07 AM
To: Lackey, Dana; Lusk, Rustin
Cc: Allen, Don; Azua, Ray
Subject: ANO.PN13-002B.update.Rev1.docx
Attachments: ANO.PN13-002B.update.Rev1.docx

Dana, Russ

Attached is a PN update for ANO. Please put it in a form for routing.

Thank you
JIM MELFI

323

Release

SUNSI Review Completed: ____ ADAMS: ☒Yes G No Initials:
☒ Publicly Available G Non-Publicly Available G Sensitive ☒ Non-Sensitive

RIV:C:	D:DRP	PAO	RSLO	DRA	RA
DAllen	KKennedy	VLDricks	WMaier	RLewis	ATHowell
4/ /13	/ /13	4/ /13	4/ /13	4/ /13	4/ /13

April 29, 2013

PRELIMINARY NOTIFICATION OF EVENT OR UNUSUAL OCCURRENCE -- PNO-IV-13-002B

This preliminary notification constitutes EARLY notice of events of POSSIBLE safety or public interest significance. The information is as initially received without verification or evaluation, and is basically all that is known by the Region IV, Arlington, Texas, staff on this date.

Facility
Arkansas Nuclear One, Units 1 and 2
Entergy
Russellville, Arkansas
Dockets: 05000313; 05000368
License Nos. DPR-51; NPF-6

Licensee Emergency Classification
___ Notification of Unusual Event
___ Alert
___ Site Area Emergency
___ General Emergency
_X_ Not Applicable

SUBJECT: UPDATE: ARKANSAS NUCLEAR ONE UNIT 2 REACTOR TRIP AND NOTIFICATION OF UNUSUAL EVENT

DESCRIPTION:

This preliminary notification supplements information in PNO-IV-13-002A, issued to describe the event that occurred at Arkansas Nuclear One, Units 1 and 2 on March 31, 2013 (ADAMS ML13092A024 and ML13099A244). A main stator drop in Unit 1 resulted in structural damage to the Unit 1 side of the Turbine Building and an automatic trip of ANO Unit 2 due to the Reactor Coolant Pump 2B tripping. Damage from the stator drop caused a loss of offsite power to ANO Unit 1 and damaged the fire suppression system. Water from the fire suppression system subsequently affected the offsite power feed to ANO Unit 2, and caused a partial loss of offsite power to ANO unit 2 and a notification of unusual event. On April 8, 2013, the Nuclear Regulatory Commission commenced an Augmented Inspection Team (AIT) assessment of the circumstances surrounding the March 31, 2013, loss of offsite power for ANO Unit 1, and the reactor trip and subsequent Notification of Unusual Event for ANO Unit 2.

Update: On April 27, 2013, Arkansas Nuclear One commenced restart of Unit 2. The event resulted in an forced outage to complete repairs to the offsite power feeds to ANO Unit 2 and inspection of the Unit 2 portions of the turbine building to assess impacts of the stator drop. ANO Unit 1 remains shutdown, in a refueling outage. The AIT inspection team is currently drafting the AIT inspections report, and a public exit meeting is currently scheduled for May 9th, 2013.

The NRC resident inspectors monitored the licensee's actions during repair activities, corrective actions and performed a review of the root cause determination for the trip.

State and local officials have been informed.

This preliminary notification is issued for information only, and will be updated again as necessary as more information becomes available.

This information presented herein has been discussed with the licensee and is current as of ?;?? a.m. (CDT) on April 29, 2013.

ADAMS ACCESSION NUMBER: ML13114A084

CONTACTS:
Don Allen, Branch Chief, 817-528-3439
Fred Sanchez, Senior Resident Inspector, ANO

Release

4.0 Plant Response (Charter Item #4)

a. Inspection Scope

b. Observations

3) Flood Barrier Effectiveness

Introduction. The team identified an unresolved item associated with flood barrier effectiveness.

Description. On March 31, 2013, a significant fire water leak was created from the stator crane collapse in the train bay. A significant amount of water sprayed into the train bay from a severely damaged eight-inch fire header. At 8:30 a.m. Unit 1 operations staff documented auxiliary building sump water level rise due to firewater leaking into the auxiliary building from the train bay. The accumulation occurred due to the loss of offsite power, which rendered the auxiliary building sump pump non-functional, and fire water in-leakage through the flood hatches. At approximately 11:42 a.m., Unit 1 operations staff noted that approximately one inch of water had accumulated in the B decay heat vault located at the 317-foot elevation in the auxiliary building. Water entered the decay heat vault from room drain isolation valve, ABS-13, located in the auxiliary sump area. This valve was closed, but leaked. Water accumulation in the decay heat vault remained at approximately one-inch and did not affect any emergency core cooling equipment in that room. The water rise in the auxiliary building was stopped when operations completely secured the fire water system.

The team concluded that additional inspection was required to determine the exact causes and impact of the failed flood hatches and the B decay heat vault room drain isolation valve: Unresolved Item URI 05000313/2013011-05, "Flood Barrier Effectiveness."

RELEASE IN ENTIRETY

ANO AIT Script for Miller
SUMMARY

A. Opening Remarks

1. Why we're here
2. Why an AIT warranted
3. What is an AIT?
4. Logistics of the CAT-1 Meeting (agenda, feedback forms, public participation)

B. Summary of Inspection Results

1. SYNOPSIS OF EVENT

2. AIT ACCOMPLISHED ITS PURPOSE

3. REACTOR PLANT SAFETY SYSTEMS RESPONDED AS DESIGNED TO THE LOSS OF OFFSITE POWER AND UNIT 2 REACTOR TRIP

4. LICENSEE TOOK APPROPRIATE ACTIONS TO RECOVER PLANT EQUIPMENT ON UNITS 1 AND 2 AND HAS INITIATED AN EXTENSIVE CAUSE EVALUATION EFFORT

5. NRC RESPONDED PROMPTLY AND CONTINUES TO INSPECT

6. SUMMARY OF INSPECTION AND TEN UNRESOLVED ITEMS

7. FOLLOW-UP INSPECTION TEAM WILL REVIEW THE SIGNIFICANCE OF THESE URIs AND DETERMINE ANY ENFORCEMENT ACTION WARRANTED

C. Questions/Remarks from Arkansas Nuclear One

D. Concluding Remarks by Kennedy

Release in Entirety

B. Summary of Inspection Results
DETAILS

OPENING REMARKS

GOOD AFTERNOON. MY NAME IS GEOFFREY MILLER. I'M WITH THE NUCLEAR REGULATORY COMMISSION, AND I AM THE TEAM LEAD FOR THE RECENTLY COMPLETED AUGMENTED INSPECTION AT ARKANSAS NUCLEAR ONE. I'D LIKE TO START BY OFFERING SINCERE CONDOLENCES TO THE FAMILY AND FRIENDS OF THOSE WHO INJURED OR KILLED BY THE EVENT ON MARCH 31. WE RECOGNIZE THAT THIS EVENT HAD A SIGNIFICANT EMOTIONAL IMPACT ON THE PLANT AND SURROUNDING COMMUNITY, AND THAT THERE IS UNDERSTANDABLY A GREAT DEAL OF INTEREST IN THE CAUSES THAT LED TO THE EVENT. THE CAUSES OF THE INDUSTRIAL ACCIDENT ARE THE SUBJECT OF AN ONGOING INVESTIGATION BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA). OUR MEETING TODAY WILL NOT INCLUDE A DISCUSSION OF THE CAUSES. OUR INSPECTION FOCUSED ON THE EFFECTS THE EVENT HAD ON THE NUCLEAR PLANTS AT THE STATION AND THE STEPS TAKEN BY OPERATORS IN RESPONSE TO PROTECT THE PUBLIC HEALTH AND SAFETY.

WE'RE MEETING TODAY WITH ENTERGY OPERATIONS TO PROVIDE A STATUS REPORT OF OUR ONGOING INSPECTION ACTIONS. FOR MEMBERS OF THE PUBLIC WHO ARE IN ATTENDANCE AT THIS MEETING, NRC STAFF WILL BE AVAILABLE TO ANSWER QUESTIONS AND RECEIVE COMMENTS AFTER THE BUSINESS PORTION OF THE MEETING.

WITH ME HERE TODAY . . . . [*INTRODUCE THOSE IN ATTENDANCE INCLUDE VICTOR*]
NOW, MR. BROWNING, WOULD YOU LIKE TO INTRODUCE YOUR STAFF?

ONE OTHER ADMINISTRATIVE ITEM: THERE ARE FEEDBACK FORMS AVAILABLE AT THE BACK TABLE. IN OUR CONTINUING EFFORT TO PROVIDE MORE MEANINGFUL MEETINGS WITH OUR STAKEHOLDERS, WE WOULD APPRECIATE YOU TAKING THE TIME TO COMPLETE ONE OF THE FORMS AND RETURN IT TO US. WE WILL USE YOUR FEEDBACK IN OUR CONTINUING PROCESS TO IMPROVE THE QUALITY OF OUR INTERACTIONS WITH OUR STAKEHOLDERS.

[REVIEW AGENDA]

SUMMARY OF THE INSPECTION RESULTS

1. AIT ACCOMPLISHED ITS PURPOSE

AUGMENTED INSPECTION TEAMS ARE USED BY THE NRC TO REVIEW MORE SIGNIFICANT EVENTS OR ISSUES AT NRC-LICENSED FACILITIES. AN AUGMENTED INSPECTION TEAM IS USED WHEN THE NRC WANTS TO PROMPTLY DIG DEEPLY INTO THE CIRCUMSTANCES SURROUNDING AN OPERATIONAL EVENT TO MAKE SURE THAT ALL OF THE CIRCUMSTANCES THAT CONTRIBUTED TO THIS EVENT ARE WELL UNDERSTOOD IN ORDER TO PREVENT A RECURRENCE.

SINCE THIS EVENT INVOLVED MULTIPLE SYSTEM FAILURES, AND BASED ON OUR ESTIMATE OF THE RISK INCREASE TO THE PLANT CAUSED BY THE EVENT, REGION IV CONCLUDED THAT THE NRC RESPONSE

SHOULD BE AN AUGMENTED INSPECTION TEAM. THE PURPOSE OF TODAY'S MEETING WILL BE TO PUBLICLY PRESENT THE ITEMS IDENTIFIED BY THE INSPECTION TEAM AS POTENTIAL ISSUES REQUIRING ADDITIONAL FOLLOW UP INSPECTION.

The NRC assigns full-time inspectors, called "resident inspectors," to each operating reactor facility (ID Fred, Abin, William). The resident inspectors conduct daily inspections at ANO and live in the surrounding community. Should an event occur at the plant, the resident inspectors provide immediate response capability for the NRC to assess plant conditions and licensee actions. For this particular event, within one hour of the crane collapse, Fred and Abin were on site monitoring operator actions and the safety of the reactors.

As I mentioned earlier, the purpose of an augmented inspection for NRC to promptly assess more significant events and their causes; to gather the facts and identify issues that may be either performance deficiencies or generic safety issues for the industry. This event resulted in widespread equipment damage, including a loss of offsite power to a unit in a refueling outage and a trip and emergency declaration on the operating unit. Considering the equipment impacts and associated risk to the nuclear plants, an Augmented Inspection Team response was appropriate.

The five-person inspection team consisted of experts in electrical, fire protection and operations, and a risk expert, with decades of experience in their disciplines.

The team spent more than a week on site with additional in-office inspection, conducted interviews and physical inspections in the field, and reviewed system data and event records to independently identify and understand all the issues that would warrant follow-up inspection.

THIS EVENT IS ALSO THE SUBJECT OF AN ONGOING INVESTIGATION BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION. BOTH NRC AND OSHA HAVE JURISDICTION OVER OCCUPATIONAL SAFETY AND HEALTH AT NRC-LICENSED FACILITIES. NRC AND OSHA HAVE A MEMORANDUM OF UNDERSTANDING IN PLACE TO ENSURE A COORDINATED AGENCY EFFORT IN THE PROTECTION OF WORKERS AND TO AVOID DUPLICATION OF EFFORT. THE OSHA INVESTIGATION IS STILL ONGOING, WITH THE PRIMARY FOCUS BEING THE SAFETY AND HEALTH OF THE EMPLOYEES AND EMPLOYERS AT THE FACILITY. THE NRC INSPECTION THAT IS THE SUBJECT OF TODAY'S MEETING FOCUSED ON THE IMPACT OF THE MARCH 31 EVENT ON THE EQUIPMENT AND SAFETY SYSTEMS ASSOCIATED WITH THE TWO NUCLEAR REACTORS AT THE SITE TO ENSURE THE HEALTH AND SAFETY OF THE PUBLIC AND THE ENVIRONMENT REMAINED PROTECTED FROM RADIOLOGICAL HAZARDS.

2. SYNOPSIS OF EVENT

THE EVENT THAT WAS THE SUBJECT OF THIS AUGMENTED INSPECTION OCCURRED ON MARCH 31 WHEN A TEMPORARY LIFTING RIG BEING USED TO MOVE THE GENERATOR STATOR FROM UNIT 1 COLLAPSED, KILLING ONE PERSON AND INJURING EIGHT OTHERS. UNIT 1 WAS IN A REFUELING OUTAGE AT THE TIME AND LOST ELECTRICAL POWER FROM OFFSITE DUE TO DAMAGE CAUSED BY THE

DROPPED STATOR. UNIT 2 WAS OPERATING AT FULL POWER AND AUTOMATICALLY SHUTDOWN WHEN THE IMPACT OF THE STATOR ON THE TURBINE DECK CAUSED ELECTRICAL BREAKERS TO OPEN, REMOVING POWER FROM ONE OF FOUR OPERATING REACTOR COOLANT PUMPS. WATER FROM A RUPTURED FIRE MAIN LATER CAUSED A SHORT CIRCUIT AND SMALL EXPLOSION INSIDE AN ELECTRICAL BREAKER ON UNIT 2, AND OPERATORS SUBSEQUENTLY DECLARED A NOTICE OF UNUSUAL EVENT (LOWEST OF FOUR EMERGENCY CLASSIFICATIONS), TERMINATING IT AFTER TAKING CORRECTIVE ACTIONS TO STABILIZE THE PLANT'S POWER SUPPLIES

Before we get into the specific details of the issues the team identified, I'd like to make a couple general observations.

3. REACTOR PLANT SAFETY SYSTEMS RESPONDED AS DESIGNED TO THE EVENT

The team determined that after the event occurred, the plant safety systems responded as designed, that all assumptions in the accident analysis appropriately bounded the event, and no unanalyzed condition existed. As such, there was no danger to the public health and safety from radiological hazards.

4. ENTERGY HAS TAKEN APPROPRIATE ACTIONS TO RESTORE PLANT EQUIPMENT AND HAS INITIATED AN EXTENSIVE ROOT CAUSE EFFORT

To date, the Entergy response following the March 31 event appears appropriate. ANO installed temporary modifications to restore offsite power to both units, and implemented compensatory measures for security/fire protection; extensive RCE effort underway. They are treating this event seriously as they determine causes and establish corrective actions. The NRC will conduct additional inspection of the cause evaluation effort and the approach ANO will use in prioritizing and implementing corrective actions. Lots completed, more work to come.

5. SUMMARY OF INSPECTION AND TEN UNRESOLVED ITEMS

The team was chartered by the Region IV Administrator to focus on several specific inspection areas. I'll summarize the results of each inspection area:

1. Chronology of Significant Events.

   We established a detailed Sequence of Events for the dropped stator event through the restoration of offsite power via temporary modifications. We did not identify any issues requiring follow-up in this area

B. Summary of Inspection Results
DETAILS

2. Operator Response.

Multiple challenges: personnel emergency, reactor trip, LOOP, fire water header break, loss of spent fuel pool cooling, breaker fault which led to the declaration of an UE. Operator response appropriately protected the public health and safety.

URI #1: ANO's Control of a Modification Associated with Temporary Fire Pump

- *Temporary fire pump installed to augment the fire system during the outage.*
- Stator drop ruptured fire system piping in train bay and vicinity, causing significant leakage into the train bay. DD pump started as designed to raise system pressure. Operators shut down the DD pump to stop the leakage, but did not shut down the temporary pump until some time later. Additional inspection to

3. Unit 1 and 2 Equipment Impact.

The team confirmed widespread damage to components within the turbine building [including fire barriers, fire doors, fire penetrations, fire piping, cardox piping, instrument air piping, hydrogen piping, flood barriers, electrical cabinets and buswork, ventilation ducting, structural members.] Licensee assessment of damage is still in progress. A full assessment will not be possible until debris removal activities are completed. Additional follow up inspection as debris removal completed and areas become accessible. *(URI #2: Structural Impact to Units 1 and Unit 2)*

4. Plant Response during the Event.

As I stated earlier, the team concluded the safety-related systems in Units 1 and 2 responded as designed to the loss of offsite power and reactor trip, and that no unanalyzed conditions occurred as a result of this event. The team identified three items for further follow up inspection:

URI #3: Control of Steam Generator Nozzle Dams

The nozzle dams are essentially inflatable plugs that are used to allow access to the inside of the steam generators for inspection during outages. At ANO, air pressure to maintain the dams in place was provided by two separate electric air compressors. During the event, both air compressors lost power when offsite power was lost. Additional follow up inspection needed to review the methods used to provide air pressure to the nozzle dams.

URI #4: Main Feedwater Regulating Valve Maintenance Practices

- MFRV stuck partially open during the last U2 scram due to a maintenance error. During this event, the valve closed, but indicated open due to an indication problem from a separate maintenance error, complicating operator response to the event. Additional

follow up inspection to review the valve maintenance. (ref NRC FIN 05000368/2012005, CR-2-2012-1432)

URI #5: Inadequate Flood Barriers
As discussed earlier, a considerable amount of water leaked into the train bay from a broken fire main. The water leaked past flood barriers (gaskets in floor plugs) in the turbine building to the safety related auxiliary building and flowed to the aux building sump. Additional inspection is needed to determine circumstances that allowed water to get from the turbine building into the safety-related auxiliary building.

5. Compensatory Measures.

The team reviewed the adequacy of the licensee's compensatory measures for damaged equipment, including security barriers, support systems (equipment cooling) and fire protection systems. The team concluded the licensee's compensatory measures were appropriate and preserved plant safety. One item identified for further inspection associated with the timeliness of actions to restore water to the fire suppression system: (*URI #5: Compensatory Measures for Fire Water System Rupture*)

6. Event Classification and Reporting.

The team conducted an independent review of the licensee's actions for event classification and reporting. The electrical fault on Unit 2 occurred at 9:23 in the morning, and an entry in the station logs a short time later confirmed water intrusion and the failure of a breaker on the associated electrical bus. Individuals from the field made several reports to the control room over the next hour (though none were logged), and operators declared a Notice of Unusual Event at 10:33 a.m. The Emergency Action Level declaration was based on a verbal report at approximately 10:20 a.m. of damage to the breaker consistent with a small explosion. The team concluded the identified Emergency Action Level (HU-4) was appropriate. However, the team concluded additional inspection was required associated with whether the emergency declaration was timely based on the information available to the control room. *(URI #6: Timeliness of Emergency Action Level Determination)*

7. Heavy Lift Preparations.

The team reviewed the licensee's plans and preparations for the movement of the stator, including their assessment of risk to the plant and identified an issue for further follow up inspection associated with the documentation of plant risk management administrative controls for the move. We identified a second issue for further follow up inspection associated with the evaluation of the vendor supplied crane per the licensee's material handling program. This issue will be examined as part of the licensee's root cause evaluation. NRC follow up inspection will be incorporated with the next charter item

B. Summary of Inspection Results
DETAILS

8. Status of Cause Evaluation Efforts.

The team reviewed the licensee's initial efforts in establishing a cause evaluation team and the beginning of the cause evaluation process. The root cause evaluation is still in progress at this time. We will conduct additional follow up inspection to assess the adequacy of the licensee's identified causes and corrective actions when completed. *(URI #9: Causes and Corrective Actions Associated with March 31, 2013, Dropped Heavy Load Event)*

9. Operating Experience.

The team reviewed the licensee's application of operating experience, with specific focus on control of heavy loads, contractor oversight, and seismic instrumentation. We expect plants to review events from industry and incorporate lessons learned into their processes. The team concluded the licensee had appropriately incorporated the insights from industry operating experience into their corporate programs and implementing procedures. The team did not identify any issues requiring follow-up in this area

6. FOLLOW-UP INSPECTION TEAM

That amounts to ten items requiring follow-up inspection that will be documented in this report as Unresolved Items. The follow-up team will be assembled and dispatched after the details of the causes and corrective actions for these issues are identified. Their job will be to assess the significance of these issues and determine if any enforcement actions are appropriate.

[BROWNING]
[KENNEDY]
Closed – Q&A