



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
611 RYAN PLAZA DRIVE, SUITE 400  
ARLINGTON, TEXAS 76011-4005**

April 21, 2004

Jeffrey S. Forbes, Site Vice President,  
Arkansas Nuclear One  
Entergy Operations, Inc.  
1448 S.R. 333  
Russellville, AR 72801-0967

**SUBJECT: ARKANSAS NUCLEAR ONE - NRC INTEGRATED INSPECTION REPORT  
05000313/2004002 and 05000368/2004002**

Dear Mr. Forbes:

On March 24, 2004, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Arkansas Nuclear One, Units 1 and 2 facility. The enclosed integrated report documents the inspection findings, which were discussed on March 26, 2004, with you and other members of your staff.

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

This report documents one inspector identified finding and one self-revealing finding of very low safety significance (Green). These findings were determined to involve violations of NRC requirements; however, because of the very low safety significance and because they are entered into your corrective action program, the NRC is treating these findings as noncited violations consistent with Section VI.A of the NRC Enforcement Policy. Additionally, a licensee-identified violation which was determined to be of very low safety significance is listed in Section 4OA7 of this report. If you contest these noncited violations, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, U.S. Nuclear Regulatory Commission Region IV, 611 Ryan Plaza Drive, Suite 400, Arlington, Texas 76011-4005; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington DC 20555-001; and the NRC Resident Inspector at Arkansas Nuclear One, Units 1 and 2, facility.

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 made available electronically for public inspection

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Sincerely,

/RA/

Troy W. Pruett, Chief  
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Dockets: 50-313  
50-368  
Licenses: DPR-51  
NPF-6

Enclosure:  
NRC Inspection Report 05000313/2004002 and 05000368/2004002  
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**U.S. NUCLEAR REGULATORY COMMISSION  
REGION IV**

Dockets: 50-313, 50-368  
Licenses: DPR-51, NPF-6  
Report: 05000313/2004002 and 05000368/2004002  
Licensee: Entergy Operations, Inc.  
Facility: Arkansas Nuclear One, Units 1 and 2  
Location: Junction of Hwy. 64W and Hwy. 333 South  
Russellville, Arkansas  
Dates: January 1 through March 24, 2004  
Inspectors: B. Baca, Health Physicist, Plant Support Branch  
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R. Deese, Senior Resident Inspector  
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Enclosure

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## SUMMARY OF FINDINGS

IR 05000313/2004002 and 05000368/2004002; 1/1/04 - 3/24/04; Arkansas Nuclear One, Units 1 and 2; ALARA Planning and Controls, Event Followup, and Problem Identification and Resolution.

This report covered a 3-month period of inspection by resident inspectors and an announced inspection by a regional health physics inspector. Two Green noncited violations 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." Findings for which the significance determination process does not apply may be Green or be assigned a severity level after NRC management's review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

### A. NRC-Identified and Self-Revealing Findings

#### Cornerstone: Barrier Integrity

- Green. The inspectors identified a noncited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for the failure to implement effective corrective actions to prevent recurrences of pressure boundary leakage due to primary water stress corrosion cracking of Alloy 600 reactor coolant system nozzles associated with pressurizer heater sleeves.

This finding was greater than minor because it affected the reactor safety barrier integrity cornerstone objective for providing reasonable assurance that the physical design barriers protect the public from radionuclide releases caused by accidents or events. Using NRC Manual Chapter 0609 Significance Determination Process Phase 1 Screening Worksheet, this performance deficiency affected the reactor coolant system barrier function. The finding was determined to be of very low safety significance because no actual leakage from the remaining pressurizer heater sleeves has occurred (Section 4OA3).

#### Cornerstone: Occupational Radiation Safety

- Green. A self-revealing noncited violation of 10 CFR 20.1501(a) was identified for the failure to perform a radiological survey. On September 25, 2003, while performing a resin efficiency comparison test, a chemistry specialist received an electronic dosimeter dose rate alarm. A physical survey by radiation protection indicated 500 millirem/hour on contact and approximately 80 millirem/hour at 30 centimeters. Radiation protection performed an evaluation before the test. The calculated dose rates were expected to be 41 millirem/hour on contact and approximately 2 millirem/hour at 30 centimeters. The actual dose rate differed from the calculated dose rates because of a miscommunication of the actual sample activity between radiation protection and chemistry personnel.

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The failure to perform a radiological survey associated with the use of a resin testing apparatus is a performance deficiency. This finding is greater than minor as it is associated with the Occupational Radiation Safety Program and Process attribute and affected the cornerstone objective to ensure adequate protection of the worker's health and safety from exposure to radiation. Since this occurrence involves workers unplanned, unintended dose or potential of such a dose which could have been significantly greater as a result of a single minor, reasonable alteration of circumstances, this finding was evaluated using the Occupational Radiation Safety Significance Determination Process. The finding was determined to be of very low safety significance because it was not associated with ALARA planning or work controls, there was no overexposure or a substantial Significance Determination Process potential for an overexposure, and the ability to assess dose was not compromised (Section 2OS2).

B. Licensee-Identified Violations

A violation of very low safety significance which 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 its corrective actions are listed in Section 4OA7 of this report.



## REPORT DETAILS

### Summary of Plant Status

Unit 1 began the inspection period at 100 percent rated thermal power and remained at or near 100 percent throughout the inspection period.

Unit 2 began the inspection period at 100 percent rated thermal power and remained at or near 100 percent until February 6, 2004, when the unit was shut down in response to increasing temperatures on Reactor Coolant Pump 2P-32C. Unit 2 was subsequently restarted and returned to 100 percent power on February 10, 2004, and remained at or near 100 percent for the remainder of the inspection period.

### 1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

#### 1R01 Adverse Weather Protection (71111.01)

##### a. Inspection Scope

On January 28, 2004, the inspectors reviewed the actions taken by the licensee to prepare for cold weather, specifically looking at precautions to ensure the operability, functionality, and availability of the alternate AC generator. The inspectors reviewed Procedure 2106.032, "Unit 2 Freeze Protection Guide," Revision 9, and its applicable attachments and performed a walkdown of the alternate AC generator building to ensure the prescribed measures were taken to protect the generator. Also, the inspectors reviewed the prescribed actions set forth in Condition Reports (CRs) ANO-C-1997-0165 and ANO-2-2001-1320 and Engineering Request (ER) ANO-2002-0145-001, "Justification for Temporary Electric Heaters in Alternate AC Building," Revision 0, to determine if past problems were adequately resolved.

##### b. Findings

No findings of significance were identified.

#### 1R04 Equipment Alignment (71111.04)

##### a. Inspection Scope

Partial System Walkdowns. The inspectors performed three partial system walkdowns of systems important to reactor safety during this inspection period in order to verify the operability of the systems. The inspectors reviewed system operating instructions and required system valve and breaker lineups and then compared them to operator logs, control room indications, valve positions, breaker positions, and control circuit indications to verify these components were in their required configuration for making

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their systems operable. The inspectors also examined component material condition. The following walkdown inspections were conducted:

- On February 18, 2004, the inspectors performed a partial system walkdown of accessible portions of the Unit 2 Emergency Diesel Generator 2K-4B and its support systems during an 18-month maintenance overhaul on the Unit 2 Emergency Diesel Generator 2K-4A.
- On February 26, 2004, the inspectors performed a partial system walkdown of Train B of the Unit 2 containment spray system when Train A of the containment spray system was removed from service during maintenance on containment spray Pump 2P-35A.
- On March 10, 2004, the inspectors performed a partial system walkdown of Train B of the Unit 2 emergency feedwater system when the Train A motor operated valve to Steam Generator B, Valve 2CV-1039-1, was removed from service for maintenance.

Complete System Walkdown. On February 5, 2004, the inspectors completed a system walkdown of accessible portions of the Unit 2 Emergency Diesel Generator 2K-4A and its support systems. During this walkdown, the inspectors verified correct valve alignment, electric power availability, and no adverse material condition of system components. Positions of valves and electrical power breakers were compared to Procedure 2104.036, "Emergency Diesel Generator Operations," Revision 47. The inspectors also reviewed CRs generated during the previous year.

b. Findings

No findings of significance were identified.

1R05 Fire Protection (71111.05)

a. Inspection Scope

The inspectors referenced the Fire Hazards Analysis Report, Revision 7, during the following inspections of six fire areas to ensure that conditions were consistent with the requirements of the licensee's fire protection program for system design, control of transient combustibles and ignition sources, fire detection and suppression capability, fire barriers, and any related compensatory measures:

- Fire Zone 97-R, Unit 1 cable spreading room and relay room, on January 23, 2004
- Fire Zone 1069, Unit 1 auxiliary building, 317-foot elevation general area, on January 26, 2004
- Fire Zone 197-X, Unit 1 turbine building, 372-foot elevation, on March 4, 2004

- Fire Zone 38-Y, Unit 1 emergency feedwater pump area, on March 9, 2004
- Fire Zone 20-Y, Unit 1 radwaste processing room, on March 23, 2004
- Fire Zone 47-Y, Unit 1 penetration ventilation room, on March 23, 2004

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures (71111.06)

a. Inspection Scope

Internal Flooding. On January 29, 2004, the inspectors completed a review of the licensee's internal flooding protection features associated with the general flood protection measures for the Unit 2 Train A Engineered Safety Features Room 2014. The inspectors performed a walkdown of the area reviewing internal flooding vulnerabilities. Also, the inspectors reviewed the protective features and procedures for mitigating the impact of flooding. In specific detail, the inspectors reviewed installed flood protection measures associated with watertight Door 203, which serves to isolate Room 2014 in the event of internal flooding.

b. Findings

No findings of significance were identified.

1R07 Heat Sink Performance (71111.07)

a. Inspection Scope

The inspectors performed the annual portion of the heat sink performance inspection by reviewing the most recent thermal performance test data on the Unit 2 Emergency Diesel Generator 2K-4A and the most recent service water system flow test data. Documents reviewed included: ER-ANO-2002-0960-000, "Review of 2002 / Cycle 16 Thermal Performance Testing of U2 EDG's," Revision 0; ER-ANO-2003-0737-003, "Evaluate capability of the ANO-2 EDG heat exchangers to meet load profile requirements with reduced SW flow," Revision 0; and Procedure 2311.002, "Service Water System Flow Test," Revision 14, performed on October 10, 2003. The inspectors reviewed the test data to verify the following items: test acceptance criteria and results appropriately considered differences between testing conditions and design conditions; inspection results were appropriately categorized against pre-established engineered acceptance criteria; the frequency of testing or inspection was sufficient to detect degradation prior to loss of heat removal capabilities below design-basis values; test results considered test instrument inaccuracies and differences; and the licensee had developed acceptance criteria for its bio-fouling controls.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification Program (71111.11)

a. Inspection Scope

The inspectors observed one session of licensed operator requalification training activities in the Unit 1 simulator to assess the licensee's effectiveness in conducting the requalification program and to verify that licensed individuals received the appropriate level of training required to maintain their licenses.

- On March 9, 2004, the inspectors observed the Unit 1 licensed operator simulator qualification training Scenario A1SPG040301, "Degraded Power EOP," conducted for Training Cycle 4.

The inspectors compared their observations for this scenario to the applicable abnormal operating procedures, emergency plan procedures, and applicable Technical Specifications. In addition, the inspectors attended the critique following the scenario held by the Unit 1 training organization to assess individual performance.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness (71111.12)

a. Inspection Scope

The inspectors reviewed performance-based problems involving two selected inscope structure, system, or components (SSCs) to assess the effectiveness of the Maintenance Rule Program. The inspectors independently verified that licensee personnel properly implemented 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The following equipment performance problems were reviewed:

- Failures associated with the alternate AC generator
- Failures associated with the Unit 2 service water system

The inspectors focused the review on whether the SSCs that experienced problems were properly characterized in the scope of the program. They also reviewed whether the SSC failure or performance problem was properly characterized. The inspectors assessed the adequacy of the licensee's significance classification for the SSC. This included the appropriateness of the performance criteria established for the SSC (if applicable) and the adequacy of corrective actions for SSCs classified in accordance with 10 CFR 50.65 a(1) as applicable.

b. Findings

No findings of significance were identified.

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

a. Inspection Scope

The inspectors evaluated and discussed with the licensee the four risk assessments listed below to verify that they were performed when required. The inspectors reviewed these assessed risk configurations against actual plant conditions and inprogress evolutions or external events to verify that the assessments were accurate, complete, and appropriate for the conditions. In addition, the inspectors walked down the control room and plant areas to verify that compensatory measures identified by the risk assessments were appropriately performed.

- Planned preventative maintenance for the Unit 2 Train B emergency diesel generator outage between February 2-6, 2004
- Planned preventative maintenance for the Unit 2 Train A emergency diesel generator outage between February 16-20, 2004
- Planned preventative maintenance for the Unit 2 Train A containment spray pump on February 27, 2004
- Planned preventative maintenance for the alternate AC generator system outage between March 15-18, 2004

b. Findings

No findings of significance were identified.

1R14 Operator Performance During Nonroutine Evolutions and Events (71111.14)

a. Inspection Scope

For the nonroutine event described below, the inspectors reviewed operator logs, plant computer data, and strip charts to determine what occurred and how the operators responded, and to determine if the response was in accordance with plant procedures and Technical Specification requirements.

- On February 6, 2004, operators reduced Unit 2 power to approximately 20 percent and then tripped the reactor in response to increasing temperatures on the anti-rotation device for Reactor Coolant Pump 2P-32C. Once the reactor was shutdown, containment entries were made to gather data on Reactor Coolant Pump 2P-32C lubrication and cooling systems. The strainer in the lubrication system was replaced and the reactor coolant pump restarted. The

licensee believed that the cause of the increased temperature was due to the introduction of foreign material into the reactor coolant pump lubricating oil system during 2R16. The Unit 2 reactor returned to criticality on February 8. The unit remained at approximately 5 percent power on February 9, due to problems with the main generator anti-motoring relay. The unit reached 100 percent on February 10. The inspectors observed and reviewed operator response to verify that required actions of Technical Specifications and station procedures were taken.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations (71111.15)

a. Inspection Scope

The inspectors reviewed six operability determinations to assess the evaluations, the use of compensatory measures, if needed, and compliance with the Technical Specifications. The inspectors' review included a verification that operability determinations were made as specified by the licensee's Procedure LI-102, "Corrective Action Process," Revision 2, and Procedure 1015.047, "Condition Reporting Operability and Immediate Reportability Determinations," Revision 0. The technical adequacy of the determinations was reviewed and compared to the Technical Specifications, Technical Requirements Manual, Updated Final Safety Analysis Report, and the associated licensing-basis documentation, as appropriate. The operability determinations that were reviewed were documented in the following CRs:

- CR ANO-2-2004-0032 Broken Pipe Hanger 2DBD-2-H1 in the Unit 2 feed water system
- CR ANO-1-2004-0089 Main Turbine 4 throttle valve does not immediately close
- CR ANO-2-2004-0102 Reactor Coolant Pump 2P-32A elevated pump shaft vibrations
- CR ANO-2-2004-0242 Vital red train 125 volt DC Battery 2D-11 grounds
- CR ANO-1-2004-0303 Control rod drive nozzle repairs performed by Framatome during Refueling Outage 1R17
- CR ANO-2-2004-0396 Regenerative Heat Exchanger Fatigue Analysis

b. Findings

No findings of significance were identified.

1R16 Operator Workarounds (71111.16)

a. Inspection Scope

Individual Workarounds. The inspectors reviewed the Units 1 and 2 operations concerns database which includes licensee identified operator workarounds. The following operator workaround was reviewed for impact on mitigating systems, risk significance, documentation in the corrective action program, and ability to implement abnormal or emergency operation procedures:

- CR ANO-2-2004-0446 High Pressure Safety Injection (HPSI) Header 2 voiding issues for the HPSI B pump recirculation line and around the HPSI B injection motor-operated valve to Safety Injection Tank A

b. Findings

No findings of significance were identified.

1R19 Postmaintenance Testing (71111.19)

a. Inspection Scope

For the four maintenance activities identified below, the inspectors reviewed the test data obtained from the field, that the procedures' acceptance criteria were consistent with the Technical Specifications and the supporting license change application, and that the results recorded met the test acceptance criteria. In addition, the inspectors verified that startup test deficiencies were recorded and resolved. These activities included:

- On March 7, 2004, the inspectors reviewed Work Order Package 00070172, Revision 1, for replacement of the wet end components of the Unit 2 service water Pump 2P-4C
- On March 8, 2004, the inspectors reviewed Work Order Instruction 14617 for repairs to the Unit 2 feedwater regulating valve on Feed Header A Valve 2CV-0740
- On March 10, 2004, the inspectors reviewed Work Order Package 00039542, Revision 1, for repairs to the Unit 1 emergency feedwater turbine steam admission Valve CV-2613
- On March 23, 2004, the inspectors reviewed Work Order Package 00040143,

Revision 1, for repairs to the handswitch for Safety Injection System High Pressure Header 2 Shut-off Valve 2CV-5036-2

b. Findings

No findings of significance were identified.

1R20 Refueling and Other Outage Activities (71111.20)

a. Inspection Scope

On February 6, 2004, in response to problems with reactor coolant pump temperatures, the licensee shutdown Unit 2 to remove and inspect the Reactor Coolant Pump C motor lubrication system lube oil strainer. The licensee exited this forced outage on February 9. The inspectors reviewed the outage plan and contingency plans to confirm that the licensee 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 the outage, the inspectors reviewed computer trends for portions of the shutdown and cooldown, monitored licensee configuration management, reviewed controls over the status and configuration of mitigating systems, monitored controls over activities that could affect reactivity, and reviewed trends associated with startup and ascension to full power operation. Finally, the inspectors reviewed the licensee's identification and resolution of problems related to the outage activities.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing (71111.22)

a. Inspection Scope

The inspectors observed from either the control room or locally the performance of and/or reviewed the documentation for the following four surveillance tests. This was done to verify that the surveillance tests were performed in accordance with approved licensee procedures and met Technical Specification requirements. In addition, the applicable test data was also reviewed to verify whether they met Technical Specifications, Updated Final Safety Analysis Report, and licensee procedure requirements.

- Units 1 and 2 oil sampling and analysis program for large motors per Procedure 1025.029, "Oil Analysis Program," Revision 3
- Unit 2 Emergency Diesel Generator 2K-4B 24-hour run on December 17, 2003, per Procedure 2104.036, "Emergency Diesel Generator Operations," Revision 47, Supplement 2C



- Unit 1 Emergency Diesel Generator K-4B monthly test performed on February 11, 2004, per Procedure 1104.036, "Emergency Diesel Generator Operation," Revision 41, Supplement 2
- Unit 2 Containment Spray Pump 2P-35A on February 27, 2004, per Procedure 2104.005, "Containment Spray," Revision 41, Supplement 1

b. Findings

No findings of significance were identified.

1R23 Temporary Modifications (71111.23)

a. Inspection Scope

The inspectors reviewed the two temporary alterations listed below to assess the following attributes: (1) the adequacy of the safety evaluation; (2) the consistency of the installation with the modification documentation; (3) the updating of drawings and procedures, as applicable; and (4) the adequacy of the post-installation testing.

- Temporary Alteration Package 04-2-001, evaluated under ER ANO-2004-0027-000 on January 22, 2004, which authorized the removal of an installed extra set of ground-referencing capacitors to Inverter 2Y-13, the normal source of power to the Reactor Protection and Engineered Safety Features Distribution Panel 2RS3 on Unit 2
- Emergency temporary alteration evaluated under ER ANO-2004-0213-000 on March 9, 2004, which authorized a temporary connection of control air to the service water throttle valve for the main generator cooler Valve CV-4018 on Unit 1

b. Findings

No findings of significance were identified.

Cornerstone: Occupational Radiation Safety (OS)

2. RADIATION SAFETY

2OS2 As Low As Is Reasonably Achievable (ALARA) Planning and Controls (71121.02)

a. Inspection Scope

This area was inspected to assess performance with respect to maintaining individual and collective radiation exposures ALARA. The inspector used the requirements in

10 CFR Part 20 and the licensee's procedures required by Technical Specifications as criteria for determining compliance. The inspector interviewed licensee personnel and reviewed the following:

- Current 3-year rolling average collective exposure
- Site specific trends in collective exposures, plant historical data, and source-term measurements
- Five work activities of highest exposure significance completed during the last outage
- ALARA work activity evaluations, exposure estimates, and exposure mitigation requirements
- Intended versus actual work activity doses and the reasons for any inconsistencies
- Postjob (work activity) reviews
- Method for adjusting exposure estimates, or replanning work, when unexpected changes in scope or emergent work were encountered
- Unit 2 Refueling 16 ALARA Report
- Assessment LO-ALO-2004-0011 and a Quality Assurance Audit QA-14-2004-ANO-1 related to the ALARA program since the last inspection
- Resolution through the corrective action process of problems identified through postjob reviews and postoutage ALARA report critiques
- Corrective action reports related to the ALARA program and followup activities such as initial problem identification, characterization, and tracking

The inspector completed 7 of the required 15 samples and 3 of the optional samples.

b. Findings

Introduction. A Green self-revealing noncited violation (NCV) of 10 CFR 20.1501(a) was identified for the failure to perform a radiological survey associated with the use of a resin testing apparatus.

Description. On September 25, 2003, while performing a resin efficiency comparison test, a chemistry specialist received an electronic dosimeter dose rate alarm. The chemistry specialist stopped the testing procedure, secured the testing apparatus, and contacted radiation protection. A physical survey by radiation protection indicated 500 millirem/hour on contact and approximately 80 millirem/hour at 30 centimeters.

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Radiation protection performed an evaluation before the test. The calculated dose rates were expected to be 41 millirem/hour on contact and approximately 2 millirem/hour at 30 centimeters. The actual dose rate differed from the calculated dose rates because of a miscommunication of the actual sample activity between radiation protection and chemistry personnel.

Analysis. The failure to perform a radiological survey associated with the use of a resin testing apparatus is a performance deficiency. This finding is greater than minor because it is associated with the occupational radiation safety program and process attribute and affected the cornerstone objective to ensure adequate protection of the worker's health and safety from exposure to radiation. Since this occurrence involves workers unplanned, unintended dose or potential of such a dose which could have been significantly greater as a result of a single minor, reasonable alteration of circumstances, this finding was evaluated with the Occupational Radiation Safety Significance Determination Process. The finding was determined to be of very low safety significance because it was not associated with ALARA planning or work controls issue, there was no overexposure or a substantial potential for an overexposure, and the ability to assess dose was not compromised.

Enforcement. 10 CFR 20.1501(a) requires that each licensee make or cause to be made surveys that may be necessary for the licensee to comply with the regulations in 10 CFR Part 20 and that are reasonable under the circumstances to evaluate the extent of radiation levels, concentrations or quantities of radioactive materials, and the potential radiological hazards that could be present. Pursuant to 10 CFR 20.1003, a "survey" means an evaluation of the radiological conditions and potential hazards incident to the production, use, transfer, release, disposal, or presence of radioactive material or other sources of radiation. 10 CFR 20.1201(a) states, in part, that the licensee shall control the occupational dose to individual adults. The licensee failed to perform an adequate survey because of a miscommunication between radiation protection and chemistry personnel. Because the failure to perform a radiological survey is of very low safety significance and has been entered into the licensee's corrective action program (CR ANO-2-2003-1324), this violation is being treated as a NCV, consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000368/2004002-01, "Failure to Perform a Radiological Survey."

4. OTHER ACTIVITIES (OA)

4OA1 Performance Indicator Verification (71151)

a. Inspection Scope

The inspectors sampled licensee submittals for the three performance indicators on both units listed below for the period from January through December 2003. The inspectors verified: (1) the accuracy of the performance indicator data reported during that period and (2) used the performance indicator definitions and guidance contained in Nuclear Energy Institute Document 99-02, "Regulatory Assessment Indicator Guideline," Revision 2, to verify the basis in reporting for each data element.

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Reactor Safety Cornerstone

- Unplanned scrams per 7,000 critical hours, Units 1 and 2
- Unplanned scrams with loss of normal heat removal, Units 1 and 2
- Unplanned power changes per 7,000 critical hours, Units 1 and 2

The inspectors reviewed operator log entries, daily shift manager reports, plant computer data, CRs, maintenance action item paperwork, maintenance rule data, and performance indicator data sheets to determine whether the licensee adequately verified the performance indicators listed above. This number was compared to the number reported for the performance indicator during the past 3 quarters. Also, the inspectors interviewed licensee personnel responsible for compiling the information.

b. Findings

No findings of significance were identified.

4OA2 Identification and Resolution of Problems (71152)

1. Annual Sample Review

a. Inspection Scope

The inspectors chose two issues for more in depth review to verify that licensee personnel had taken corrective actions commensurate with the significance of the issues. The issues and their bases for their selection is described below:

- The Unit 2 feedwater system had an ongoing condition with vibrating piping. Instances of broken pipe hangers and pipe supports increased in January and February of 2004. Feedwater piping vibrations had been reported as increasing since Refueling Outage 2R14, when the licensee replaced steam generators. The inspectors chose this issue to determine the potential for initiating either a loss of feedwater or feedwater rupture event, as well as exploring the vulnerability of combatting events without the main feedwater system.
- The inspectors reviewed a number of performance issues for the alternate AC generator. In the last half of Calendar Year 2003, several network failures occurred which led licensee personnel to generate a CR to explore the causes of the failures. CR ANO-2-2003-1332 detailed over 20 previously identified issues including a number of issues dealing with the loss of the communications network.

When evaluating the effectiveness of the licensee's corrective actions for these issues, the following attributes were considered:

- Complete and accurate identification of the problem in a timely manner commensurate with its significance and ease of discovery

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- Evaluation and disposition of operability and reportability issues
- Consideration of extent of condition, generic implications, common cause, and previous occurrences
- Classification and prioritization of the resolution of the problem commensurate with its safety significance
- Identification of root and contributing causes of the problem for significant conditions adverse to quality
- Identification of corrective actions which are appropriately focused to correct the problem
- Completion of corrective actions in a timely manner commensurate with the safety significance of the issue

b. Findings and Observations

No findings of significance were identified. The inspectors did identify two additional examples of instances above and beyond the licensee's identification efforts where vibrations in the Unit 2 feedwater system had affected the designed configuration of pipe supports in the system. The inspectors also discovered a situation in the feedwater system where a rod in a pipe support had worn through insulation due to vibration of the system. All of the inspector identified instances were determined to be minor in nature.

2. ALARA Review

a. Inspection Scope

Section 2OS2 evaluated the effectiveness of the licensee's problem identification and resolution processes regarding exposure tracking, higher than planned exposure levels, and radiation worker practices. The inspector reviewed the following corrective action documents for root cause/apparent cause analysis against the licensee's problem identification and resolution process: ANO-2-2003-1324, ANO-2-2003-1855, and ANO-2-2004-0262.

b. Findings

No findings of significance were identified.

3. Cross-References to Problem Identification and Resolution Findings Documented Elsewhere

Section 4OA3 documents a condition where licensee personnel did not implement corrective actions to prevent recurrence of reactor coolant pressure boundary leakage caused by primary water stress corrosion cracking (PWSCC) of Alloy 600 material.

4OA3 Event Followup (71153)

1. (Closed) Licensee Event Report (LER) 05000313/2002004-00, Reactor Coolant System Pressure Boundary Leakage from a Fatigue Stress Crack of a Weld Connecting a Drain Line to a High Pressure Injection Line

On October 5, 2002, at the beginning of the Refueling Outage 1R17, the licensee identified leakage emanating from a drain line on the high pressure injection header. Licensee personnel repaired the leak and returned the high pressure injection system to service. This licensee event report (LER) was reviewed by the inspectors and no findings of significance were identified. The licensee documented the leak in CR ANO-1-2002-1147. The inspectors determined that the location of the leak was not part of the reactor coolant system pressure boundary; therefore, this issue did not constitute a violation of NRC requirements. This LER is closed.

2. (Discussed) LER 05000368/2002001-00, Reactor Coolant System Pressure Boundary Leakage Due to PWSCC of Pressurizer Heater Sleeves

- a. Inspection Scope

On April 15, 2002, at the beginning of the Unit 2 Refueling Outage 2R15, the licensee identified pressure boundary leakage emanating from five Alloy 600 reactor coolant system nozzles associated with pressurizer heater sleeves. The inspectors reviewed this LER and the licensee's corrective actions associated with the multiple nozzle failures. Additionally, the inspectors reviewed the corrective and preventive maintenance history of the reactor coolant system Alloy 600 nozzles. The inspectors also reviewed previous corrective actions addressing pressure boundary leakage to evaluate their effectiveness in preventing recurrence.

- b. Findings

Ineffective Corrective Actions to Prevent Recurrence of PWSCC of Alloy 600 material

Introduction. The inspectors identified a NCV of 10 CFR Part 50, Appendix B, Criterion XVI for the failure to implement effective corrective actions to prevent recurrences of pressure boundary leakage in Unit 2 due to PWSCC of Alloy 600 reactor coolant system nozzles associated with pressurizer heater sleeves.

Discussion. Entergy identified five reactor coolant system leaks at the beginning of Refueling Outage 2R15. The areas affected were Pressurizer Heater Sleeves C-2, E-1, E-2, F-4, and G-1. Additionally, Pressurizer Heater Sleeve N-2 was discovered to be leaking during a visual inspection on April 30, 2002, during plant startup from Refueling Outage 2R15. Each leak was determined by the licensee to be the result of PWSCC. Heater Sleeves C-2, E-1, E-2, F-4, G-1, and N-2 were each fitted with a second generation mechanical nozzle seal assembly prior to the end of the refueling outage to prevent further leakage.

The inspectors reviewed the history of the Alloy 600 leaks on Unit 2 and noted that failures had previously occurred due to PWSCC. In August 1987, two pressurizer heater sleeves were found leaking. In July 2000, 12 pressurizer heater sleeves were found leaking. The inspectors reviewed the root cause analysis contained in CR ANO-2-2000-0292 which listed the root causes of the previous pressurizer heater sleeve failures as PWSCC. The inspectors review of this corrective action document revealed that no replacement plans had been established by the licensee to repair or replace the Alloy 600 nozzles throughout the reactor coolant system that were susceptible to PWSCC. The inspectors noted that CR ANO-2-2002-0739 stated, "Thus all of the remaining 76 heater sleeves (excludes twelve that leaked in 2000 and six that leaked in 2002) are susceptible to PWSCC failure. Because PWSCC failures are a statistical probability, it is expected that these failures would occur over a period of time rather than all at once." The inspectors noted that, with the current materials and ongoing actions, Unit 2 would be susceptible to future pressure boundary leakage caused by PWSCC of Alloy 600 nozzle material. Operation with reactor coolant system boundary leakage is a condition prohibited by plant Technical Specifications.

The inspectors noted that the licensee had not initiated actions to prevent the recurrence of pressure boundary leakage. The inspectors also noted that no inspections other than visual examinations to find leakage were being performed by the licensee to detect degradation of the heater sleeves that would allow for repairs or replacement prior to reactor coolant system pressure boundary leakage occurring. The inspectors determined that licensee personnel had not established adequate measures to prevent recurrence of reactor coolant system pressure boundary leakage due to PWSCC of Alloy 600 nozzles, a significant condition adverse to quality.

Analysis. The deficiency associated with this finding was the failure to establish corrective measures to prevent recurrence of a significant condition adverse to quality. Specifically, the licensee had not established corrective measures to preclude additional occurrences of reactor coolant system pressure boundary leakage due to PWSCC of Alloy 600 nozzle material. This finding was greater than minor because it affected the reactor safety barrier integrity cornerstone objective for providing reasonable assurance that the physical design barriers protect the public from radionuclide releases caused by accidents or events. Using NRC Manual Chapter 0609 Significance Determination Process Phase 1 Screening Worksheet, this performance deficiency affected the reactor coolant system barrier function. The issue was determined to be of very low safety significance since there was no current pressure boundary leakage associated with the remaining pressurizer heater sleeves.

Enforcement. 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that measures be established to assure that conditions adverse to quality are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The failure to establish corrective measures to prevent recurrence of reactor coolant system pressure boundary leakage due to PWSCC of Alloy 600 nozzle material is considered a violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action." Because this finding is of very low

safety significance and has been entered into Entergy's corrective action program as CR ANO-2-2002-0739 and CR ANO-2-2002-1036, this violation is being treated as an NCV consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000368/2004002-02, "Ineffective Corrective Actions to Prevent Recurrence of PWSCC of Alloy 600 Material"

#### 40A5 Other Activities

(Closed) Unresolved Item (URI) 05000368/2003003-01, Inadequate Station Battery Monitoring

Inspection Report 050313/2003008 and 050368/2003008 documents inspection of this URI. This URI is closed with no further findings of significance.

#### 40A6 Meetings, Including Exit

On March 18, 2004, the inspector presented the inspection results for the review of the ALARA planning and controls program to Mr. R. Lingle, Plant Manager, Operations and other members of his staff who acknowledged the findings. On March 24, 2004, a telephonic re-exit was conducted with Mr. D. James, Licensing Manager and other members of his staff to present a correction to the ALARA inspection results.

On March 26, 2004, the resident inspectors presented the inspection results of the resident inspections to Mr. J. Forbes, Vice President, Operations and other members of the licensee's management staff. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. Several documents included proprietary information as identified by the licensee. The inspectors noted that, while proprietary information was reviewed, none would be included in this report.

#### 40A7 Licensee-identified Violations

The following violation of very low significance (Green) was identified by the licensee and is a violation of NRC requirements which meet the criteria of Section VI of the NRC Enforcement Policy, NUREG-1600, for being dispositioned as an NCV.

10 CFR Part 50, Appendix B, Criterion III, states, in part, that measures shall be established to assure that the design basis is correctly translated into specifications and procedures. On February 26, 2004, the licensee discovered that they had no procedure or method to track design transients for the Unit 2 regenerative heat exchanger. Consequently, the licensee could not definitively determine the number of design transients to the heat exchanger and had to make conservative assumptions in the performance of a new heat exchanger fatigue analysis. This condition is described in



the licensee's corrective action program in CR ANO-2-2004-0396. This finding is of very low safety significance because analytical margin existed beyond the original fatigue analysis which ensured operability of the heat exchanger.

ATTACHMENT: SUPPLEMENTAL INFORMATION

Enclosure

**SUPPLEMENTAL INFORMATION  
KEY POINTS OF CONTACT**

Licensee Personnel

R. Beard, Supervisor, Systems Engineering  
S. Bennett, Licensing Specialist  
B. Berryman, Manager, Planning and Scheduling  
L. Compton, Manager, Engineering Programs and Components  
S. Cotton, Manager, Training  
C. Eubanks, General Manager, Plant Operations  
J. Forbes, Vice President, Operations  
F. Forrest, Unit 1 Operations Manager  
R. Gordon, Manager, Systems Engineering  
D. Hawkins, Licensing Specialist  
A. Heflin, Unit 2 Operations Manager  
J. Hoffpauir, Manager, Maintenance  
R. Holeyfield, Manager, Emergency Planning  
B. James, Manager, Alloy 600 Project  
D. James, Manager, Licensing  
J. Kowalewski, Director, Engineering  
R. Lingle, Plant Manager, Operations  
J. Miller, Manager, Nuclear Engineering Design  
T. Mitchell, Director, Nuclear Safety Assurance  
K. Nichols, Manager, Design Engineering  
R. Partridge, Manager, Technical Support  
B. Patrick, Manager, Radiation Protection  
S. Pyle, Licensing Specialist  
D. Scheide, Licensing Specialist  
W. Sims, Supervisor, Design Engineering  
C. Tyrone, Manager, Quality Assurance

**LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

Opened and Closed

05000368/2004002-01	NCV	Failure to Perform a Radiological Survey (Section 2OS2)
05000368/2004002-02	NCV	Ineffective Corrective Actions to Prevent Recurrence of PWSCC of Alloy 600 Material (Section 4OA3)

Closed

05000368/2003003-01	URI	Inadequate Station Battery Monitoring (Section 4OA5)
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05000313/2002004-00 LER Reactor Coolant System Pressure Boundary Leakage from a Fatigue Stress Crack of a Weld Connecting a Drain Line to a High Pressure Injection Line (Section 4OA3)

Discussed

05000368/2002001-00 LER Reactor Coolant System Pressure Boundary Leakage Due to PWSCC of Pressurizer Heater Sleeves (Section 4OA3)

**LIST OF DOCUMENTS REVIEWED**

In addition to the documents called out in the inspection report, the following documents were selected and reviewed by the inspectors to accomplish the objectives and scope of the inspection and to support any findings:

Condition Reports

Unit 1

CR-ANO-1-2001-0350, -2002-1147, -2003-0796, and -2004-0268

Unit 2

CR ANO-2-1995-0367, -2000-0190, -2000-0988, -2000-1080, -2000-1087, -2001-0216, -2001-1120, -2001-1379, -2002-0021, -2002-0401, -2002-0512, -2002-0547, -2002-2007, -2003-0345, -2003-0585, -2003-0786, -2003-0820, -2003-0975, -2003-1339, -2003-1936, -2004-0032, -2004-0053, -2004-0065, -2004-0073, -2004-0132, -2004-0139, -2004-0184, -2004-0253, -2004-0406, and -2004-0420

Common

CR-ANO-C-2003-0701, -2003-0999, -2003-1332, and -2004-0526

Drawings

Target Rock Corporation Drawing 97AA-001, "Solenoid Operated Valve, High Temperature and High Pressure, Energize To Open (FC), Size: 1 Inch," Revision B

Engineering Requests

ER-ANO-2002-0086-000  
ER-91-R-2013-01, Revision 10  
ER-ANO-2000-3333-051, Revision 0

Maintenance Action Items

MAI 43619  
MAI 56383  
MAI 58183

Miscellaneous

LI-112, "10 CFR 72.48 Review Program," Revision 1

Engineering Evaluation 973968E101, "Develop Operational Guidance for Compliance with License Power Limit," dated May 2, 1997

Letter from C&D Technologies to ANO, "C&D Series LC-1 versus LCR-1 Cells," dated February 26, 2004

Point Paper, "ANO-1 Heater Drain Pump Trip Impact on NRC Performance Indicators"

Shift Turnover Checklist - Extended Emergency Diesel Generator Outage, Revision dated January 15, 2003

Staffing Contingency Plan (Labor Disruption)

Upper Level Document, "Alternate AC Generator System," Revision 1

### Operating Procedures

AOP 2203.019, "Loss of Condenser Vacuum," Revision 5

OP 1102.004, "Power Operation," Revision 41

OP 1412.001, "Preventive Maintenance of Limitorque SB/SMB Operators," Revision 13

OP 2104.037, "Alternate AC Diesel Generator Operations," Revision 6

OP 2104.039, "HPSI System Operation, Supplement 4," Revision 42

OP 2107.001, "Electrical System Operations," Revision 48

OP 2107.004, "DC Electrical System Operation," Revision 20

OP 2305.005, " Valve Stroke and Position Verification, Supplement 3," Revision 21

OP 2403.095, "Unit 2 Direct Current Ground Detection," Revision 0

### Work Orders (WO)

WO 00040143

WO 50271262

WO 50286130

### Section 2OS2: ALARA Planning and Controls (71121.02)

#### Corporate Procedures

RP-105, Radiation Work Permit (RWP), Revision 4

RP-107, Radiation Protection Glossary, Revision 2

RP-110, ALARA Program, Revision 2

#### Arkansas Nuclear One Site Procedures

1000.006, Procedure Control, Change 051-01-0

1000.031, Radiation Protection Manual, Change 019-03-0

1052.023, Conduct of Chemistry, Change 007-06-0

1604.050, RCS Shutdown Chemistry Program, Change 009-02-0

#### RWP/ALARA Packages

RWP 2003-2402, Routine Maintenance Activities  
RWP 2003-2410, Reactor Building Coordinator Activities  
RWP 2003-2420, Remove/Replace Scaffold and Insulation  
RWP 2003-2430, Remove/Replace Bullet Noses and ICI Flanges  
RWP 2003-2431, Remove/Replace Reactor Head  
RWP 2003-2452, Reactor Vessel Head Nozzle Inspection  
RWP 2003-2466, Pressurizer Heater Nozzle Inspection and Repair  
RWP 2003-2467, Freeze Seal Activities  
RWP 2003-2468, Permanent Shield Rack for 2-CV-4820/4821  
RWP 2003-2469, 2SI-7B Cut-out and Replace with Spool Piece  
RWP 2003-2505, Maintenance Activities on 2-CV-4651

#### ALARA Managers Committee Meeting Minutes

ANO-2003-00128, ANO-2003-00129, ANO-2003-00132, ANO-2003-00133, ANO-2004-00010, ANO-2004-00011, ANO-2004-00012, ANO-2004-00013, ANO-2004-00017, ANO-2004-00018, and ALARA Managers' Committee Meeting Minutes, October 10, 2003

#### ALARA Condition Reports

##### Unit 1

ANO-1-2004-00295

##### Unit 2

ANO-2-2003-1324, -2003-1855, and -2004-0262

##### Common

ANO-C-2004-0102, -2004-0219, and -2004-0232

##### Echelon

ECH-2004-00047

#### Section 4OA2: Problem Identification and Resolution (71152)

All Unit 1 CRs numbered ANO-1-2003-1274 through ANO-1-2004-0517  
All Unit 2 CRs numbered ANO-2-2003-1944 through ANO-2-2004-0595  
All Common ANO CRs numbered ANO-C-2003-1097 through ANO-C-2004-0526

## LIST OF ACRONYMS

ALARA	as low as reasonably achievable
ANO	Arkansas Nuclear One
CFR	<i>Code of Federal Regulations</i>
CR	condition report
ER	engineering request
HPSI	high pressure safety injection
LER	licensee event report
MAI	maintenance action item
PWSCC	primary water stress corrosion cracking
NCV	noncited violation
RWP	radiation work permit
SSC	structure, system, or component
URI	unresolved item