

ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION

REGION IV

Docket Nos.: 50-313; 50-368
License Nos.: DPR-51; NPF-6
Report No: 50-313/97-07; 50-368/97-07
Licensee: Entergy Operations, Inc.
Facility: Arkansas Nuclear One, Units 1 and 2
Location: 1448 S.R. 333
Russellville, Arkansas 72801
Dates: October 11 through November 22, 1997
Inspectors: J. Melfi, Acting Senior Resident Inspector
S. Burton, Resident Inspector
Approved by: Elmo E. Collins, Chief, Project Branch C
Division of Reactor Projects
Attachment: Supplemental Information

EXECUTIVE SUMMARY

Arkansas Nuclear One, Units 1 and 2
NRC Inspection Report 50-313/97-07; 50-368/97-07

This routine announced inspection included aspects of licensee operations, maintenance, and plant support. The report covers a 6-week period of resident inspection.

Operations

- Main Feedwater Pump B failed due to a faulted capacitor on an internal controller module. The failure in the integrated control system (ICS) was due to a failed relay coil that was revealed during the transient. No related equipment failure trends were noted (Section 01.2).
- Unit 2 waste control operators were thorough in conducting turnover, knowledgeable of conditions on their watch station, and familiar with procedure requirements, system design and operation, and related theoretical topics (Section 01.4).

Maintenance

- Maintenance performed by the licensee was done professionally and thoroughly. All work was performed according to procedures by knowledgeable personnel. Supervisory involvement was seen in all the maintenance activities observed (Section M1.1).
- The licensee showed good radiological work practices during a containment entry. The job order work instructions were followed (Section M1.2).
- The surveillance activities performed by the licensee were completed by knowledgeable workers following approved procedures. Licensee personnel were knowledgeable of the components being tested and demonstrated good communications skills (Section M1.3).
- The licensee performed the surveillance test satisfactorily and the test met requirements. The inspectors identified a followup item on system performance (Section M1.4).

Plant Support

- When the Unit 2 Phase C main transformer deluge manual pull station was activated, the licensee responded to the potential tampering in accordance with site security procedures. Initial activities did not consider the possibility that other safety-related systems could have also been affected. When questioned about the potential for tampering, the licensee initiated their tampering procedures, implemented interim guidance, and verified the condition of safety-related equipment. The licensee also upgraded their procedures for potential tampering events (Section F1.1).

Report Details

Summary of Plant Status

Unit 1 began the inspection reporting period at 100 percent power and had two planned reductions in power to approximately 85 percent on October 17 and November 14, 1997, for main turbine valve and governor valve testing. At 7:02 p.m. on October 21, 1997, Unit 1 had an unplanned power reduction to 40 percent due to Main Feedwater Pump B tripping. Unit 1 returned to 100 percent power at 12:30 a.m. on October 23, 1997 (see Section O1.2), and remained at 100 percent power throughout the inspection period.

Unit 2 began the inspection period at 100 percent power. The licensee reduced power to 97 percent on November 21 for 3 hours to support quarterly turbine stop and governor valve testing. After the testing, the licensee restored power to 100 percent where it remained throughout the reporting period.

I. Operations

O1 Conduct of Operations

O1.1 General Comments (71707)

The inspectors observed various aspects of plant operations, including compliance with Technical Specifications; conformance with plant procedures and the Safety Analysis Report; shift manning; communications; management oversight; proper system configuration and configuration control; housekeeping; and operator performance during routine plant operations, the conduct of surveillances, and plant power changes.

The conduct of operations was professional and safety conscious. Evolutions such as surveillances and plant power changes were well controlled, deliberate, and performed according to procedures. Shift turnover briefs were comprehensive. Housekeeping was generally good and discrepancies were promptly corrected. Safety systems were properly aligned.

Specific events and other noteworthy observations are detailed below.

O1.2 Unit 1 - Power Runback Due to Main Feedwater Pump B Trip

a. Inspection Scope (71707)

At 7:02 p.m. on October 21, 1997, Unit 1 had a transient due to a Main Feedwater Pump B trip and subsequent power reduction to 40 percent. The inspectors reviewed this transient because of previous similar transients that resulted in a failure of the ICS to perform a plant runback as designed.

b. Observations and Findings

At 7:02 p.m. on October 21, 1997, Unit 1 was operating at 100 percent power when flow from Main Feedwater Pump B went low and the pump tripped indication lit. Following a main feedwater pump trip, the ICS is designed to perform an automatic plant runback at 50 percent per minute, open the feedwater crossover valve, and initiate pressurizer spray. These automatic actions by the ICS will prevent a reactor trip. Following the Main Feedwater Pump B trip, none of these automatic actions occurred. Prompt operator action successfully avoided a reactor trip, and the ICS reduced power at a slower rate due to the mismatch between primary and secondary power levels. The ICS stabilized plant power at 55 percent by 7:10 p.m. From 7:14 to 7:18 p.m., operators manually reduced plant power to 40 percent.

Main Feedwater Pump B tripped due to a malfunction with the feedwater pump control system. Licensee investigation found that an internal capacitor in a controller module failed and had temporarily reduced the 5-volt power supply voltage. The licensee's investigation concluded that the capacitor failed due to a manufacturing defect. With this power supply degraded, the control valves closed. The licensee had previous feedwater pump trips on June 22, 1996; May 20, 1996; and April 4, 1995. The inspectors reviewed condition reports from these events to assess if previous corrective actions on the feedwater pump control system should have precluded this event. The inspectors concluded that no previous corrective actions could have prevented this transient. Previous transients were due to computer code or external sensor problems affecting the feedwater pump control system. The October 21 ICS failure to initiate a runback was due to a failed relay coil. A maintenance history search did not reveal any other failed relay coils in the ICS. The licensee had tested the relay satisfactorily before installation during last refueling outage. The licensee replaced the failed relay in the ICS.

c. Conclusions

The inspectors concluded that Main Feedwater Pump B failed due to a faulted capacitor on an internal controller module. The failure in the ICS was due to a failed coil on a relay that was revealed during the transient. No other trends of failures were noted.

O1.3 Unit 2 - Operation of Dual Function Containment Isolation Valves (Temporary Instruction 2515/136)

The NRC issued a temporary instruction due to an inability, identified at another power plant, to manually override and close containment isolation valves in the presence of an engineered safety feature open signal. This was an information gathering temporary instruction. The inspectors reviewed the ability of the licensee to remotely close dual function containment isolation valves in spite of a sealed in "containment isolation" or "safety injection" signal.

The inspectors reviewed the licensee's responses to the questions raised by the temporary instruction and found no immediate safety concerns. The inspectors sampled

the information gathered for completeness and accuracy. Deficiencies were discussed and resolved with the licensee and additional information was added to their responses to the temporary instruction questions and forwarded to NRC headquarters.

In addition to the inspection requirements, the inspectors found the switches on dual function valves properly labeled. Operators were well trained in the differences between types of signal override functions and how and when to use the override functions. Operators demonstrated knowledge of the method for remote operation for the two valves that did not contain an override feature from the control room. Procedures and training records supported the operator's ability to operate remotely overridden valves.

O1.4 Unit 2 - Auxiliary Building Tour with the Waste Control Operator

a. Inspection Scope (71707)

On November 2, 1997, the inspectors observed shift turnover, waste control operator turnover, and associated rounds and tour of the Unit 2 auxiliary building.

b. Observations and Findings

Turnover included an update and review of the status board, logs, and evolutions in progress. In addition to routine inspection and log taking, the operator performed delithiation of the reactor coolant system according to Procedure 2104.002, Revision 35, "Chemical Volume and Control," and adjusted fuel pool cleanup pump flow and differential pressure per Procedure 2104.006, Revision 17, "Fuel Pool System." The operator demonstrated good knowledge of system operation and theory for both of the evolutions. The operator confirmed that the procedures used were the most recent revision, reviewed applicable precautions and limitations, and appropriately communicated the evolutions with the control room. The inspectors noted that the operator was aware of, and alert for, new deficiencies on the watch station. The operator showed concern for maintaining exposure as low as is reasonably achievable and demonstrated awareness of dose rates when performing inspections in high radiation areas.

c. Conclusions

Unit 2 waste control operators were thorough in conducting turnover, knowledgeable of conditions on their watch station, and familiar with procedure requirements, system design and operation, and related theoretical topics.

II. Maintenance

M1 Conduct of Maintenance

M1.1 General Comments

a. Inspection Scope (62707)

The inspectors observed all or portions of the following maintenance activities:

- Unit 2 - Job Order 00970754, "Investigate and Repair Apparent SIT Tank Reference Leg Leak," performed on October 29, 1997.
- Unit 1 - JO 00957047, "Replace Torque Switch and Diagnostic Test on CV-1279," performed on November 18, 1997.
- Unit 1 - Job Order 00952577, "Adjust Packing to stop leak on CV-1279," performed on November 18, 1997.

b. Observations and Findings

The inspectors found all the work performed in these activities to be professional and thorough. All work was performed according to procedures and the workers were knowledgeable of their assigned tasks. Maintenance supervisory involvement was observed on all of these activities and appropriate foreign material exclusion controls were implemented. Infrequently performed tests or evolution briefs were held when required.

In addition, see the specific discussions of maintenance observed under Section M1.2 below.

c. Conclusions

Maintenance performed by the licensee was done professionally and thoroughly. All work was performed according to procedures by knowledgeable personnel. Supervisory involvement was seen in all the maintenance activities observed.

M1.2 Unit 2 - Repair of Apparent Safety Injection Tank Level Instrument Reference Leg Leak

a. Inspection Scope (62707, 71750)

The inspectors observed licensee activities during a containment entry to repair a safety injection tank level instrument leak.

b. Observations and Findings

On October 27, 1997, the licensee noticed that the narrow range and wide range level instruments, monitoring the same safety injection tank level, displayed different levels and trended away from each other. The licensee initiated Condition Report 2-97-0563 on this issue. The licensee believed that a leak in a common reference leg caused the wide range level indication to deviate from both narrow range levels. The condition report recommended a containment entry to fix a leaking reference leg.

The licensee initiated Job Order 00970754 to repair these leaks and entered containment on October 29, 1997. Since this was a containment entry, the licensee generated Radiological Work Permit 1997-0022 for this job. The inspectors attended the radiological work permit prejob brief and observed the work in progress. The workers followed the job order work instructions, obeyed the radiological work permit requirements, and showed appropriate radiological work practices. The licensee found and tightened minor leaks on the different reference legs and refilled the reference legs. The different level indications then agreed with each other and the safety injection tank level indications have not shown the same drift after the maintenance.

c. Conclusions

The licensee showed good radiological work practices during a containment entry. The job order work instructions were followed.

M1.3 General Comments on Surveillance Activities

a. Inspection Scope (61726)

The inspectors observed all or portions of the following surveillance activities:

- Unit 1 - Procedure 1106.009, Revision 26, "Turbine Startup (Warmup & Roll)"; Supplement 2, "Throttle Valve Testing"; and Supplement 3, "Governor Valve Testing," performed on October 17, 1997.
- Unit 2 - Procedure 1607.001, Revision 13 (Unit 1), and Revision 12 (Unit 2), "Reactor Coolant System Sampling," performed on October 31, 1997.
- Unit 2 - Procedure 1605.022, Revision 1, "Determination of Dissolved Oxygen," performed on October 31, 1997.
- Unit 2 - Procedure 1605.092, Revision 0, "Analysis Using the Gas Chromatograph," performed on October 31, 1997.
- Unit 2 - Procedure 2106.009, Revision 27, "Turbine Generator Operations," Supplement 3, "Turbine Generator Valve Stroke Test," performed on November 21, 1997.

b. Observations and Findings

The inspectors found that these surveillance activities were performed according to the licensee's procedures by knowledgeable workers or operators. When applicable, calibrated test equipment was used and personnel were knowledgeable of the components being tested. The personnel demonstrated very good communications, self-checking, peer-checking, and following of procedures. Supervisory involvement in the performance of these surveillances was noted by the inspectors. Where applicable, appropriate radiological work permits were followed.

In addition, see the specific discussions of surveillances observed under Section M1.4 below.

c. Conclusions

The surveillance activities performed by the licensee were completed by knowledgeable workers following approved procedures. Licensee personnel were knowledgeable of the components being tested and demonstrated good communications skills.

M1.4 Unit 1 - Penetration Room Ventilation System Surveillance

a. Inspection Scope (61726)

The inspectors observed the licensee perform the penetration room ventilation system.

b. Observations and Findings

The inspectors observed the licensee perform Procedure 1104.043, Supplement 1, "Penetration Room Ventilation Lead System Monthly Test," and Revision 14, "Penetration Room Ventilation System," on November 14, 1997. The test met Technical Specification requirements and was performed by knowledgeable personnel. The licensee verified that air inleakage was in the penetration rooms by performing a smoke test around the penetration room doors. During the test, the inspectors noticed that the differential pressure indication from the south penetration room was much greater than that measured from the north penetration room. The inspectors walked down the instrumentation and found that the slope of the instrumentation lines was not constant for the south penetration room and it would be possible to have a loop seal in the instrumentation lines. The inspectors also questioned if there was an air inleakage source into the north penetration room. The discrepancy for the difference in air pressure measurements and if the slope of the instrumentation taps could affect the measurement will be tracked as an Inspector Followup Item 50-313/9707-01.

c. Conclusions

The licensee performed the surveillance test satisfactorily and the test met requirements. The inspectors identified a followup item on system performance.

IV. Plant Support

F1 Control of Fire Protection Activities

F1.1 Unit 2 - Initiation of Fire Protection Deluge System on the Main Transformer

a. Inspection Scope (71750)

On October 7, 1997, at 7:36 a.m., the fire protection deluge system initiated for Phase C of the Unit 2 main transformer. The cause of the fire system activation was the initiation of the manual pull station. Because of the potential for tampering, the inspectors reviewed the licensee's response to the event.

b. Observations and Findings

At 7:36 a.m. on October 7, a fire water flow alarm, for Phase C of the Unit 2 main transformer was received in the control room. Control room operators reviewed indications and determined there was no evidence of a transformer malfunction. Auxiliary operators were dispatched to investigate the cause. It was determined that the deluge system activated because the manual pull station had initiated. This pull station is located outside the fire protection building across the road from the main transformer. The transformer was inspected, no evidence of fire was found, and the deluge system was secured and placed in standby. The licensee inspected the transformer support equipment for water damage and sampled the transformer oil for water. The licensee determined that the deluge system activation had not affected transformer operability.

The licensee initiated a security investigation to determine the cause of the fire water flow alarm activation. Initial actions by both the security and the operations departments included briefings to heighten the awareness of the shifts to the problem. Security also started an investigation which included interviews, review of station key card access to determine who may have witnessed the event, additional monitoring of the affected equipment with a security camera, and interviews of the responding auxiliary operators. Potential causes for the event included self-initiation due to improper resetting of the pull station after maintenance and accidental or purposeful manual initiation. Because of the possibility of multiple methods of initiation, the licensee's determination of the cause was inconclusive. Security did not initiate additional walkdowns of safety-related equipment or initiate tampering procedures on both units until questioned by the resident inspectors and the regional staff. Unit 1 personnel initially were not included in heightened awareness. As a result of the event, security and operations have initiated corrective actions to enhance procedures and to better communicate and integrate events of this nature.

c. Conclusions

When the Unit 2 Phase C main transformer deluge manual pull station was activated, the licensee responded to the potential tampering in accordance with site security

procedures. Initial activities did not consider the possibility that other safety-related systems could have also been affected. When questioned about the potential for tampering, the licensee initiated their tampering procedures, implemented interim guidance, and verified the condition of safety-related equipment. The licensee also upgraded their procedures for potential tampering events.

ATTACHMENT

PARTIAL LIST OF PERSONS CONTACTED

Licensee

B. Allen, Maintenance Manager, Unit 2
G. Ashley, Licensing Supervisor
D. Bentley, I&C Coordinator, Unit 2
P. Dietrich, Maintenance Manager, Unit 1
R. Eddington, General Manager
B. Gordon, System Engineering Supervisor, Unit 2
R. Hutchinson, Vice President, Nuclear Operations
M. Little, Operations Shift Supervisor, Unit 1
D. Mims, Director, Licensing
A. South, Licensing Engineer
D. Wagner, QA Supervisor
C. Zimmerman, Plant Manager, Unit 1

INSPECTION PROCEDURES (IPs) USED

IP 61726: Surveillance Observations
IP 62707: Maintenance Observations
IP 71707: Plant Operations
IP 71750: Plant Support Activities
IP 92901: Followup - Plant Operations

ITEMS OPENED

50-313-9707-01 IFI Penetration Room Ventilation System Fan Performance
(Section M1.4)