U.S. NUCLEAR REGULATORY COMMISSION REGION IV

NRC Inspection Report: 50-313/89-07 50-368/89-07 Operating Licenses: DPR-51 NPF-6

Dockets: 50~313 50-368

Licensee: Arkansas Power & Light Company (AP&L) P.O. Box 551 Little Rock, Arkansas 72203

Facility Name: Arkansas Nuclear One (ANO), Units 1 and 2

Inspection At: ANO, Russellville, Arkansas

Inspection Conducted: March 13-17, 1989

Inspector:

3/27/89

. C. Wagner, Reactor Inspector, Plant Systems Section, Jivision of Reactor Safety

Approved:

T. F. Stetka, Chief, Plant Systems Section Division of Reactor Safety 3/27/89 Date

Inspection Summary

Inspection Conducted March 13-17, 1989 (Report 50-313/89-07; 50-368/89-07)

Area Inspected: Routine, unannounced inspection of the licensee's commitments for ANO, Units 1 and 2, concerning actions to prevent low-temperature overpressure transient (LTOP) conditions and the implementation of the instrument calibration program.

<u>Results</u>: The inspection completed the NRC verification that the licensee had designed, installed, modified, and maintained the LTOP systems for ANO, Units 1 and 2 in accordance with license conditions and the licensee's commitments. Review of the licensee's procedural controls for the operation and maintenance of the LTOP systems disclosed acceptable administrative directions and operating instructions. The training programs were also found to be acceptable. The NRC inspector noted that the Unit 1 operating procedures were

8904120343 890331 PDR ADOCK 05000313 Q PDC more detailed than comparable Unit 2 procedures and that the Unit 2 Lesson Plans were more detailed than the Unit 1 plans.

Based on the partial completion of inspection effort, the NRC inspector found the surveillance test and calibration procedures to be well organized and to contain detailed instruction.

No violations, deviations, or unresolved items were identified.

DETAILS

1. Persons Contacted

AP&L

- K. Coates, Assistant Maintenance Manager
- A. Cox, Operations Superintendent, Unit 1
- L. Gulick, Operations Superintendent, Unit 2
- G. Kendrich, Instrument and Controls Superintendent
- D. Lomax, Plant Licensing Supervisor
- S. McGregor, Engineering Services Superintendent
- *P. Michalk, Licensing Engineer
- J. Taylor-Brown, QC/QE Superintendent
- *J. Vandergrift, Operations Manager
- *R. Wewers, Work Control Center Manager

NRC

*R. Haag, Resident Inspector

*Denotes those personnel present at the March 17, 1989, exit interview.

The NRC inspector contacted other AP&L personnel during the performance of the inspection.

2. Reactor Vessel Pressure Transient Protection (25019)

Temporary Instruction (TI) 2500/19 was added to the NRC Inspection Manual to provide guidance for verifying that pressurized water reactor licensees had implemented an effective mitigation system for low-temperature overpressure transient conditions. An NRC inspection was initiated on this TI as documented in NRC Inspection Report 50-313/88-45; 50-368/88-45. This inspection completed the basic requirements suggested in the TI in the areas of administrative controls, procedures, training, and surveillance. The NRC inspector also reviewed the available information to resolve a question raised in the above inspection report on Unit 2 and the electrical control systems for both Units.

- a. Unit 1
 - (1) Administrative Controls and Procedures

The NRC inspector reviewed plant administrative and operating procedures to ascertain how the low temperature overpressure protection (LTOP) system was operated. The following pertinent sections were noted:

Administrative Procedure 1015.02, Revision 7, "Decay Heat Removal and LTOP System Control," contained the following:

"3.2 General Rules to Be Followed:

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- "3.2.1 Unless specifically exempted by Tech. Specs., the core flood tank outlet valves shail be closed and the valve operators deenergized if RCS pressure is < 600 psig.
- "3.2.2 Unless specifically exempted by Tech. Specs., the HPI valves shall be closed with their key switches selected to the "LTOP" position when RCS temperature is < 280°.
- "3.2.3 The pressurizer electromatic relief valve (ERV) should normally be available (power available and the block valve, CV-1000, open) with the setpoint selector switch selected to the low pressure setpoint. This is not required if the RCS is opened to the reactor building (i.e., head removed). Other exceptions should be authorized by the Shift Supervisor.
- "3.2.4 The Plant Computer generated "LTOP" alarm (K-11 E-5) should be operational whenever the computer is available. Computer points P428, P3071, P3086, and P3920 must be active for the alarm to function."

(These rules were noted to be verified once per shift when the RCS temperature was < 280°F in accordance with Section 3.3 of the procedure.)

- Operating Procedure 1102.10, Revision 29, "Plant Shutdown and Cooldown," included requirements in Section 8.2.33 that the LTOP rules discussed above be implemented when the reactor coolant system (RCS) temperature was in the range of 350°F and 280°F.
- Operating Procedure 1102.02, Revision 42, "Plant Startup," contained requirements in Section 12.10 to ensure that the LTOP system was placed in a normal operation lineup when the RCS temperature was increased above 325°F but prior to 350°F.

The above procedures were based on the existence of a "bubble" in the pressurizer, i.e., the initial conditions required the existence of a gas space (either steam or nitrogen gas) in the pressurizer prior to proceeding. Therefore, the NRC inspector reviewed Operating Procedure 1103.05, Revision 18, "Pressurizer Operation." This procedure contained the following precaution:

"5.3 The plant shall not be operated in a water solid condition when the RCS pressure boundary is intact except as allowed by Emergency Operating Procedure (OP 1202.01) and during system hydro test (TS 3.1.2.11)."

The NRC inspector also reviewed the instructions, contained in Section 10.0 of Operating Procedure 1104.04, Revision 40, "Decay Heat Removal Operating Procedure," for transferring from a steam bubble to a nitrogen gas bubble to control pressurizer pressure.

The NRC inspector found all of the above procedures to contain sufficiently detailed instructions to provide assurance of proper system operation.

No violations or deviations were identified.

(2) Training

The NRC inspector reviewed the reactor operator training course (AA-51002-003) related to the LTOP system. The course was part of the Makeup and Purification System Lesson Plan. The LTOP system requirements and the bases for those requirements were discussed in the lesson plan. The NRC inspector also verified that the lesson plan was included in both the reactor operator training and requalification training course schedules.

No violations or deviations were identified.

(3) Surveillance

During the review of the related operating procedures, the NRC inspector noted that the LTOP system alarms were tested in accordance with Supplement I to Operating Procedure 1102.10, "Plant Shutdown and Cooldown." The NRC inspector also noted that the relief valve was required to be exercised (stroke tested) in accordance with Supplement I of Pressurizer Operation Procedure 1103.05. The Unit 1 Technical Specification (TS) 4.2-1 stated that the ERV was required to be exercised each refueling outage; the procedure ensured that the TS requirement would be fulfilled. However, since . limiting valve stroke time value was provided, the NRC inspector requested data on the stroke time that had been assumed in the analysis and on the stroke times which had been recorded in the previous performances of the procedure. The NRC inspector was informed that no stroke time value had been assumed in the LTOP analyses because the ERV was considered a "fast acting" valve. The valve exercising, in accordance with Supplement I of 1103.05, had been accomplished

in December 1986, and in November 1988, but the requirement for recording the stroke time had not been included in the 1986 revision of the procedure. The NRC inspector was informed that the stroke time was being recorded to evaluate valve performance in accordance with the provisions of Section XI of the ASME Boiler and Pressure Vessel Code and to establish the acceptance criteria to be used in the future for evaluating ERV operability. The stroke time recorded during the November 19, 1988, test was 0.76 seconds.

The NRC inspector reviewed the ERV Installation and Maintenance Manual (Consolidated Safety Valves Type 31533VX-30 with Bellows) dated August 1978. The manual contained detailed installation, operation, and maintenance instruction but did not specify a minimum or maximum stroke time.

The NRC inspector also reviewed the procedure and previously completed data sheets for the calibration of the LTOP relief valve operating pressure switch. The calibration of this switch (PS-1008A) was performed in accordance with Procedure 1304.04, "Pressurizer Relief, Spray and Heater Surveillance Test." The input to PS-1008A, which is located in the NNI cabinets, is provided by the safety grade Reactor Protection System transmitters.

The NRC inspector found the procedures and records to be acceptable.

No violations or deviations were identified.

(4) Instrumentation and Controls (I&C)

The NRC inspector reviewed the I&C drawings related to the operation and alarm functions of the Unit 1 LTOP system. A partial listing of the drawings that were reviewed is provided in the Attachment. The NRC inspector made the following observations during the drawing reviews:

- The power supply for the ERV was provided from 125 VDC panel D11.
- The normal (2450 psi) and LTOP setpoint control functions operated in the same manner (i.e., the control contact circuits were in parallel).
- The normal operation circuitry was interlocked with +24 volt and -24 volt control power to inhibit spurious operation; the LTOP setpoint circuitry was nr c.

- o Both operating modes incorporated a dual setpoint to provide for a prescribed amount of pressure reduction (i.e., the valve received an open signal from the high setpoint which was sealed in until the low setpoint contact opened the circuit to the control relay.)
- Dual ERV position indication was provided by a contact from the control relay for the ERV solenoid and by the acoustical monitoring system.

The NRC inspector found the drawings to provide proper control and position indication to fulfill the licensee commitments on the implementation of the LTOP system.

No violations or deviations were identified.

b. Unit 2

(1) Administrative Controls and Procedures

The NRC inspector reviewed the Unit 2 procedures related to the LTOP system and found them to be similar to the Unit 1 procedures. The NRC inspector made the following observations:

- Operating Procedure 2102.10, Revision 18, "Plant Shutdown and Cooldown," contained requirements to disable all but one high pressure safety injection (HPSI) pump when the RCS was cooled below 300°F in Section 9.26; and additional requirements in Section 9.27 to place to LTOP relief valves in service when RCS temperature was between 275°F and 270°F. The remaining HPSI pump and all but one charging pump were required to be disabled in accordance with Section 9.40 when the RCS temperature was below 200°F.
- Operating Procedure 2102.02, Revision 27, "Plant Startup," provided instructions, in Section 10.2, to remove the LTOP relief valves from service during the heatup process.

The NRC inspector determined that the above procedures fulfilled the commitment in the October 11, 1977, licensee letter to the NRC to provide procedural requirements on aligning the LTOP during plant cooldown and heatup. The NRC inspector noted that the LTOP alarms were not specifically addressed in these Unit 2 plant procedures; however, a misalignment alarm which monitored the position of the LTOP isolation valves was provided. The isolation valves needed to be open when the RCS temperature was less than 275°F (and closed above that temperature) to avoid the misalignment alarm.

The NRC inspector also reviewed Operating Procedures 2103.02, Revision 20, "Filling and Venting the RCS," and 2104.04, Revision 11, "Shutdown Cooling System." While the NRC inspector did not find any specific problems with these procedures, he did not observe the precautions against operating the RCS in a water solid condition that were noted in the Unit 1 procedures. There were, however, restrictions on operating an RCP without a steam bubble in the pressurizer.

No violations or deviations were identified.

(2) Training

The NRC inspector reviewed the Unit 2 reactor operator training courses (AA-52002-001) and found it to contain a detailed description of the LTOP system. The NRC inspector observed that the lesson plan described the system configuration and operation and discussed the purpose and operation of the associated misalignment alarms. The NRC inspector also verified that the course was included in the Unit 2 reactor operator class schedule.

No violations or deviations were identified.

(3) Surveillance

The NRC inspector reviewed the calibration procedure and records for the RCS temperature input to the LTOP misalignment alarm (2TIS-4614-1A). The NRC inspector found the procedure (2304.118) to contain sufficiently detailed guidance to assure proper calibration of the module. The records for the last three calibrations indicated that the calibrations had been performed within the required refueling intervals with acceptable results.

The NRC inspector also reviewed the procedure and records for the LTOP relief valves tests. The procedure (2306.09) provided instructions on removing the relief valve and performing a "bench" test of the lift pressure. A QC inspector was required to witness the valve testing and ensure cleanliness.

The NRC inspector found the procedures to contain sufficient detail to assure proper calibration and relief valve lift setpoint checks.

No violations or deviations were identified.

(4) Relief Valve Operability

An NRC inspector had raised a concern during the earlier LTOP inspection related to the operability of the Unit 2 Lonergan relief valves following the lifting of the code safety valves. Additional information was requested in the December 22, 1988,

NRC letter transmitting the inspection report and was provided in the licensee's January 6, 1989, letter to the NRC. The NRC inspector had raised the concern because the vendor drawing indicated a type of valve which could be damaged by the amount of backpressure which would result from the discharge of the pressurizer code safety valves into the common discharge header. This problem was recognized by the licensee's contractor who requested authorization to select an upgraded Lonergan relief valve which would not be damaged by the condition. The NRC inspector reviewed the licensee's letter dated May 16, 1978. which authorized the purchase of the qualified valves, and Purchase Order No. 6600-M-2235A-AC, Revision 9, which ordered the upgraded valves. The NRC inspector also reviewed the Material Receiving Report for the valves and found it to reflect the receipt of two 300 psi rated, type 316 stainless steel relief valves. The NRC inspector, therefore, determined that the installed LTOP relief valves met the specifications prescribed by the licensee and would not be damaged by backpressure.

No violations or deviations were identified.

(5) Instrumentation and Controls

The NRC inspector reviewed the I&C drawings related to the Unit 2 LTOP system. The Unit 2 drawing review was not as complicated as the Unit 1 I&C review because the Unit 2 valves were not electrically operated. The NRC inspector noted that the motor operated block valves for the relief valves (two block valves in series with each relief valve) were powered from safety-related sources. Two of the block valves (2CV-4730-1 and 2CV-4741-1) were powered from the "red" train, with the redundant valves being powered from a redundant source (2CV-4731-2 from the "green" train and 2CV-4740-2 from a 125 VDC source).

The NRC inspector also reviewed the alarm circuitry and noted that the arrangement of the block valve position indication limit switches provided the circuit with a more "fail-safe" arrangement than would have been provided by a simpler design.

A partial listing of the drawings which were reviewed is provided in Attachment.

No violations or deviations were identified.

3. Calibration (56700)

In order to ascertain if the licensee had implemented a program, for the calibration of installed plant instrumentation that was in accordance with regulatory requirements and industry guidance, the NRC inspector reviewed

selected procedures and records. This inspection covered only a portion of the activities which needed to be reviewed in order to fully evaluate the licensee's program; a followup inspection will be conducted.

The NRC inspector reviewed the test procedures to ensure that the technical content was sufficiently detailed and explanatory so that a properly qualified technician could be expected to perform the proper evolutions. The procedures were also reviewed for technical adequacy and to ensure that normal industry standards were included. The NRC inspector reviewed the completed test records to determine if the documentation had been properly completed and that the stated or referenced acceptance criteria had been met.

In addition to the test and calibration procedures and records discussed in paragraphs 2.a(3) and 2.b(3), the NRC inspector reviewed the following Unit 1 documents:

a. <u>Test Procedure 1304.102</u>. <u>Revision 2</u>, "<u>High Range Containment</u> Pressure Instrument Calibration"

This test procedure (TP) included the calibration of the transmitter, repeater, indicator, and recorder. The NRC inspector noted that the procedure addressed the equipment qualification (EQ) of the transmitter by documenting the "as-found" and the "as-left" conditions for those parameters affecting the EQ of the device. The NRC inspector also noted that actual, internal absolute pressure was measured inside the reactor containment and that this value was utilized to calculate the psig input and transmitter output.

The NRC inspector reviewed the test data and noted that the test procedure had been acceptably completed on October 10, 1988, and on January 26, 1989.

No violations or deviations were identified.

b. TP 1403.154, Revision 4, "Relay Calibration for WB Load Centers"

The TP provided instructions in separate supplements for calibrating the 28 relays from 8 different 480 volt load centers (LCs). Only 6 of the listed relays (3 in LC-5 and 3 in LC-6) were, however, listed as required by TSs. The NRC inspector found the TP instructions to be adequate and verified that the trip setpoints were in accordance with the TS Limiting Condition for Operation (LCO) 3.5.1.86.

The NRC inspector reviewed the records for the calibrations completed on October 24, 1987, and October 16, 1988. All of the listed relays were calibrated during the 1987 test but only four were calibrated during the 1988 test. The NRC inspector questioned why the two remaining TS required relays had not been calibrated and was informed that changes to the surveillance program were being implemented and that the relays in question had been calibrated as part of the maintenance program. The NRC inspector reviewed Repetitive Task Instruction (RTI) No. 1412.018, Revision 2, and verified that the relays in question had been calibrated on September 22, and October 3, 1988, respectively. The NRC inspector also reviewed the schematic wiring diagrams for these relays and noted that the relays calibrated in accordance with the RTI perform only an alarm function.

No violations or deviations were identified.

c. TP 1304.85, Revision 7, "Valve Monitoring System Calibration"

This TP was written to check the operation of the acoustical flow monitor for the pressurizer relief and safety valves. The NRC inspector found the procedure to be acceptable in ulfilling the requirements of LCO 3.5.1-1.

The NRC inspector also reviewed the completed data from the December 14, 1986, and December 2, 1988, calibrations and found the data to be acceptable.

No violations or deviations were identified.

d. General Observations

The NRC inspector found the individual test and calibration procedures to be very good in the areas of guidance and instructions. Of specific note were the instructions on what actions were required when an out-of-tolerance condition was detected. The NRC inspector also noted, however, that there were few provisions for double verification of adjustments, setpoints, or returning components to operation after manipulation. While the NRC inspector did not determine a requirement for double checks and verifications, the advantage of such checks was discussed with the licensee during the exit meeting.

No violations or deviations were identified.

4. Exit Interview

The inspection scope and findings were summarized on March 17, 1989, with those persons indicated in paragraph 1 above. The licensee acknowledged the NRC inspector's findings. The licensee did not identify as proprietary any of the material provided to, or reviewed by, the NRC inspector during this inspection.

ATTACHMENT

LIST OF DRAWINGS REVIEWED

UNIT 1 DRAWINGS

M416-3	Revision 8	Pressurizer Electronic Relief Valve Logic
E-204	Revision 20	Schematic Diagram Pressurizer Relief Valve
MIR-433-15		Reactor Control Luop Schematic
E-558	Revision 30	Connection Diagram Main Control Panel CO4 (Sheet 1)
M201-73-15		Wiring Diagram For CO4
M201-75-19		Wiring Diagram For CO4
		UNIT 2 DRAWINGS
E-2014	Revision 25	Single Line Diagram 2B51
E-2015	Revision 24	Single Line Diagram 2B61
E-2302		Schematic Diagrams for Pressurizer Relief Valves and Alarm Circuitry (Sheets 1, 2, and 3)
E-2702		Schematic Diagrams for RCS Hot Leg Temperature Control (Sheets 5 and 6)
E-2456		Schematic Diagrams for Annunciators (Sheets 1, 2, and 3)
E-2416		Functional Description and Logic Diagrams (Sheets 1, 3, and 5)