U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-409/85011(DRS)

Docket No. 50-409 License No. DPR-45

Licensee: Dairyland Power Cooperative
2615 East Avenue - South
LaCrosse, WI 54601

Facility Name: LaCrosse Boiling Water Reactor

Inspection At: LaCrosse Site, Genoa, WI

Inspection Conducted: June 10-14, 1985

Inspector: M A Ring for P. R. Rescheske 7/8/85
Date

Approved By: M A Ring M. A. Ring, Chief 7/8/85
Test Programs Section Date

Inspection Summary

Inspection on June 10-14, 1985 (Report No. 50-409/85011(DRS))
Areas Inspected: Routine, unannounced safety inspection of surveillance of core thermal power distribution limits; core thermal power evaluation; determination of reactor shutdown margin; nuclear instrumentation testing and calibration; control rod sequences and reactivity checks; and control rod scram time testing. The inspection involved a total of 40 inspector-hours onsite by one NRC inspector including four inspector-hours onsite during off-shifts.
Results: Of the six areas inspected, no violations or deviations were identified.

DETAILS

1. Persons Contacted

*J. D. Parkyn, Plant Superintendent
*G. S. Boyd, Operations Supervisor
L. W. Kelley, Assistant Operations Supervisor
*S. Raffety, Reactor Engineer
*P. Bronk, Nuclear Engineer
R. E. Gardner, Instrument and Electrical Supervisor
*R. R. Wery, Quality Assurance Supervisor

The inspector also interviewed other licensee employees including members of the operating staff and the instrument and electrical department.

*Denotes persons attending the exit meeting of June 14, 1985.

2. Surveillance of Core Power Distribution Limits

The inspector reviewed information related to the surveillance of core power distribution limits including the computer printouts and the Cycle 10 refueling plan. The off-line computer code TRILUX is a United Nuclear Corporation (UNC) fuel management code used by the licensee for power distribution, critical power ratio, and burnup studies. The refueling plan, LAC-TR-126 (February 1985) and LAC-TR-128 (Final, April 1985), was written by the licensee to summarize the proposed reload pattern, control rod program, fuel exposure, and reactor physics for Cycle 10. The inspector noted that all calculations and analyses are performed in-house using the TRILUX code and analytical methods; Exxon is the fuel vendor, but does not provide the core management program. Prior to Cycle 10 startup, the projected history of the cycle was calculated using TRILUX. During the operating cycle the licensee verifies that each control rod is within the established control rod program, thereby satisfying the Technical Specification (TS) surveillance requirements for Maximum Average Planar Linear Heat Generation Rate (MAPLHGR), Minimum Critical Power Ratio (MCPR), and Linear Heat Generation Rate (LHGR). Periodically, about once per month, a TRILUX calculation is run using input values from actual plant conditions. The inspector examined the TRILUX printouts obtained on May 1, 1985, at 81.45% Core Thermal Power (CTP) and on May 16, 1985, at 96.58% CTP and verified that MAPLHGR $\leq$ 8.11 kw/ft (TS 4.2.4.2.1), MCPR $\geq$ the applicable limit as a function of core flow (TS 4.2.4.2.3), LHGR $\leq$ 11.52 kw/ft (TS 4.2.4.2.4), and the maximum average exposure of each non-periphery fuel assembly < 16,800 MWD/MTU (TS 4.2.4.2.5). The inspector concluded that the licensee's methodology and calculations were technically adequate and satisfied all Technical Specification requirements.

No violations or deviations were identified.

3. Core Thermal Power Evaluation

The inspector reviewed Operations Procedure OP-35-04, "Procedures for Certain Tests Required During the First Startup and Power Escalation After the 1985 Refueling Outage," Section 4.4, used by the licensee during power escalation to check the operation of the Automatic Gain Control System (AGCS) by comparing the indicated power to the power level determined by a heat balance. The function of the AGCS is to automatically adjust the output gains of the Nuclear Instrumentation (NI) power range Channels 5, 6, 7 and 8 to the measured reactor steam flow signal (thermal power). The inspector also reviewed Section 4.5.3, "Calorimetric Check of Channels 5-8," Volume IV, of the LACBWR Operating Manual, which outlines the method for performing a heat balance calculation during operation in the power range (usually > 15% CTP). The licensee requires a short form (approximate) heat balance calculated each shift and a long form (or primary) heat balance calculation performed weekly. The acceptance criteria established by the licensee states that each NI channel shall indicate to within 4% rated CTP of the reactor thermal power determined by the heat balance (Note: 100% rated CTP = 165 MWt). The inspector reviewed the calculations performed on April 17 through June 10, 1985, from about 25% to 100% CTP, and verified that the methodology and calculations were technically adequate and that the results and the frequency of calculations satisfied the requirements.

No violations or deviations were identified.

4. Determination of Reactor Shutdown Margin

The inspector reviewed Operations Procedure OP-35-04, Sections 4.1.6 through 4.1.9, used by the licensee to demonstrate the shutdown margin for the Cycle 10 core. On April 14, 1985, after criticality was achieved with a 29-rod bank at 12.761 dial inches, the maximum worth control rod (No. 10) was fully withdrawn while compensating with the remaining 28 rod bank (NOTE: fully withdrawn is about 83 dial inches). As specified in Technical Specification 4.2.4.6, a subcritical shutdown margin of at least 0.5% $\Delta k/k$ was demonstrated when the 28-rod bank was fully inserted with rod No. 10 in its fully withdrawn position. With the reactor temperature at 112.5°F (cold condition), the licensee determined that the reactor was subcritical by 0.980% $\Delta k/k$ (as calculated from source range Channel 1) and 0.896% $\Delta k/k$ (from Channel 2). The inspector verified that the licensee was using an approved methodology and that the calculations and results were in accordance with written instructions and Technical Specification requirements.

No violations or deviations were identified.

5. Nuclear Instrumentation Testing and Calibration

The inspector reviewed Section 4, "Nuclear Instrumentation," Volume IV of the LACBWR Operating Manual, and Section 5.2.15 of the Technical Specifications which states the minimum frequencies for testing, calibrating, and checking instrumentation. The inspector noted that the LACBWR NI System consists of eight "ex-core" instrument channels: source range Channels 1 and 2, intermediate range Channels 3 and 4, wide range Channels 5 and 6,

and power range Channels 7 and 8. The Automatic Gain Control System (AGCS) compares the output gains of the NI power range Channels 5, 6, 7 and 8 to the measured steam flow signal and adjusts the gains as required to make the signals equal. The inspector reviewed the following tests and associated data sheets (from Volume IV of the Operating Manual), and verified that the results and the frequency of testing satisfied the Technical Specifications, and that the data was properly recorded and reviewed:

- Procedure 4.6.1 and Data Sheet N-1/N-2, used for testing source range Channels 1 and 2 prior to Cycle 10 startup on April 6, 1985, and prior to a startup on May 17, 1985.

- Procedure 4.6.2 and Data Sheet N-3/N-4, used for testing intermediate range Channels 3 and 4 prior to Cycle 10 startup on April 6, 1985, and prior to a startup on May 17, 1985.

- Procedure 4.6.3 and Data Sheet N-5/N-6, used for testing wide range Channels 5 and 6 with AGCS prior to Cycle 10 startup on April 8, 1985, and monthly during operation.

- Procedure 4.6.4 and Data Sheet N-7/N-8, used for testing power range Channels 7 and 8 with AGCS prior to Cycle 10 startup on April 11, 1985, and monthly during operation.

- Data Sheet N-9 used for monthly surveillance testing of scram contacts for NI Channels 5, 6, 7 and 8.

- Procedure 4.7, AGCS refueling Technical Specifications Tests N-10A and N-10B and associated data sheets for NI Channels 5, 6, 7 and 8; used for testing AGCS pressure transmitters and d/p cell transmitters during the refueling outage. Test N-10A was performed on March 20, 1985, and Test N-10B was performed on April 11, 1985.

No violations or deviations were identified.

6. Control Rod Sequences and Reactivity Checks

The inspector reviewed procedures and test results concerning control rod sequences and reactivity checks, and verified that the licensee's methodology and calculations were technically adequate, and that the results satisfied Technical Specification requirements. The following observations were made during this review:

a. Operations Procedure OP-35-04, Section 4.1, was used by the licensee to determine the 29-rod bank position for initial criticality for Cycle 10 startup. On April 14, 1985, with the reactor temperature stabilized at about 110°F, criticality was achieved with a 29-rod bank at 12.761 dial inches. The predicted critical position at this temperature was calculated to be 12.613 dial inches, resulting in a 0.148 inch deviation or 0.234% $\Delta k/k$ difference from the actual critical position. The inspector noted that the results satisfied the Technical Specification 4.2.4.9 limit of 2% maximum reactivity discrepancy allowed following a core load.

b. Procedure 1.1, "Predicted Critical Control Rod Position," Volume I of the LACBWR Operating Manual, is used by the licensee to calculate the predicted 29-rod critical bank position for reactor startups during Cycle 10. The inspector reviewed the completed data sheets for a number of startups in April and May 1985, and verified that the results indicated that the reactivity error between the actual and predicted critical positions did not exceed the Technical Specification 4.2.4.7 limit of 0.6% $\Delta k/k$.

c. The inspector noted that the licensee performs monthly TRILUX calculations using inputs from actual plant conditions and determines the value of the effective multiplication factor k_{eff} from the computer printout. The calculated k_{eff} is compared to the predicted k_{eff} for Cycle 10 (1.0126) and the reactivity anomaly is plotted. The inspector reviewed the calculations performed on May 1 and May 16, 1985, and verified that the calculated k_{eff} was within the bounds of 1.0126 ± 0.6% $\Delta k/k$ per Technical Specifications.

d. Operations Procedure OP-35-04, Section 4.3, was used by the licensee to acquire data during the Cycle 10 heatup and to evaluate temperature dependence. The inspector determined that the results indicated that the reactor will have a negative moderator temperature coefficient for temperatures ranging from ambient to 577°F, thereby, satisfying Technical Specification 4.2.4.5.

e. Procedure 1.2, "Control Rod Program and Restrictions on Rate of Power Changes," Volume I of the LACBWR Operating Manual, was used by the licensee to establish a control rod program for Cycle 10 which meets the Technical Specifications for control rod worth (TS 4.2.5.2 and 4.2.5.3), and MAPLHGR, MCPR, and LHGR limits. Restrictions on the rate of control rod withdrawal and the rate of power changes are also imposed by the licensee to limit stress in the fuel cladding. In addition, the analyses described in the Cycle 10 Refueling Plan, LAC-TR-126, includes control rod patterns and withdrawal sequences, and the limitations on the rate of power escalation. The inspector reviewed the "Control Rod Power Change" Data Sheets for April and May 1985, and verified that the rod movements performed for power changes below 60% CTP were recorded hourly and in accordance with written instructions.

No violations or deviations were identified.

7. Control Rod Scram Time Testing

The inspector reviewed Procedure 6.4.1, "Rod Scram Test," Volume IV of the LACBWR Operating Manual, used by the licensee to measure the scram time of each of the 29 control rods and to ensure that the rod scram systems are functioning properly. The scram testing required by Technical Specification 5.2.12.a prior to Cycle 10 startup was completed on April 8, 1985. The inspector reviewed the data sheet and verified that the total scram insertion time for each rod did not exceed 3.0 seconds (TS 4.2.5.1) and that the operability of the scram solenoid valves was checked in conjunction with this test (TS 5.2.14).

The timing device used by the licensee to measure scram times is a permanently installed, 60 second, Cramer Type 691 electrical stopclock with an accuracy of 0.01 second. This Rod Scram Timer measures the lapsed time beginning with the operation of the full-scram relay and ending with the closing of the rod full-in relay of the selected rod under test. The inspector noted that because the Rod Timer is used to satisfy Technical Specification requirements, it must be controlled and tested. The inspector discussed with the licensee the frequency and method of testing. According to Procedure I&E-03-11, "Testing of Stopwatches and Timing Devices," the accuracy of timing devices will be tested to a known standard on a periodic basis. The most recent test performed on the Rod Timer was on January 4, 1984, which was 17 months prior to this inspection. According to 10 CFR 50, Appendix B, Criterion XII and ANSI N18.7-1976, Section 5.2.16, the method and frequency of testing shall be defined/specified. The inspector questioned the licensee definition of "periodic" testing and noted that the Rod Timer is not currently included in the scheduling for tests and calibrations. The inspector also had a concern regarding the method for testing the Rod Timer. The standard timing device is the ET105 stopwatch which has an acceptance criteria of 200 milliseconds (due to operator error). According to Procedure ACP-13.1, Section 4.11, and other licensee commitments, the standard used for testing shall have an accuracy of at least equal to or better than the device which is being tested. The inspector questioned the licensee's compliance to this requirement because the stopwatch (standard) is allowed to have an error of 200 milliseconds (0.2 second), whereas the Rod Timer is accurate to 0.01 second. Furthermore, the inspector noted that during the January 4, 1984 test, the Rod Timer was tested over an interval of 2 seconds; the results indicated that the standard reading was 2 seconds while the Rod Timer read 1.8 seconds. The inspector was concerned that a test interval of only 2 seconds may not be adequate to test the accuracy of the Rod Timer, especially with the stopwatch method. The test data from scram timing the control rods typically ranges from 1.7 to 2.2 seconds and the Technical Specification limit is 3.0 seconds; therefore, the inspector determined that no significant safety issues would result due to the possible inaccuracies of the Rod Timer. Since these concerns came to the attention of the inspector at the end of the inspection period, sufficient time was not available to determine if the licensee is in conformance with all requirements. This will be tracked as an unresolved item (409/85011-01(DRS)) pending review and evaluation of the information by the inspector.

No violations or deviations were identified.

8. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, violations, or deviations. An unresolved item disclosed during the inspection is discussed in Paragraph 7.

9. Exit Interview

The inspector met with the licensee representatives (denoted in Paragraph 1) on June 14, 1985. The inspector summarized the scope and findings of the inspection. The licensee acknowledged the statements made by the inspector with respect to the unresolved item. The inspector also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspector during the inspection. The licensee did not identify any such documents/ processes as proprietary.