UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report No.: 50-413/85-02

Licensee: Duke Power Company
422 South Church Street
Charlotte, NC 28242

Docket No.: 50-413 License No.: NPF-35

Facility Name: Catawba

Inspection Conducted: January 7 - 10 and 14 - 18, 1985

Inspectors: G. M. Nejfelt for 02/06/85
P. T. Burnett Date Signed

G. M. Nejfelt 02/06/85
G. M. Nejfelt Date Signed

Approved by: Frank Jape 2/6/85
F. Jape, Section Chief Date Signed
Engineering Branch
Division of Reactor Safety

SUMMARY

Scope: This routine, unannounced inspection entailed 98 inspector-hours on site in the areas of witnessing and review of initial criticality and zero power physics tests.

Results: No violations or deviations were identified.

8503050130 850207
PDR ADOCK 05000413
G PDR

REPORT DETAILS

1. Licensee Employees Contacted

   J. W. Hampton, Station Manager
   *S. W. Cox, Superintendent, Technical Services
   C. W. Graves, Jr., Superintendent, Operations
   *W. F. Beaver, Performance Engineer
   *C. L. Hartzell, Compliance Engineer
   *D. H. Robinson, Reactor Engineer
   B. C. East, Engineer (I and E)

   Other licensee employees contacted included four shift test directors, six shift test engineers, four operators, three shift supervisors, security force members, and three office personnel.

   Other Organization

   M. Heibel, Westinghouse Nuclear Operations

   NRC Resident Inspectors

   *P. H. Skinner, Senior Resident Inspector, Operations
   *P. K. VanDoorn, Senior Resident Inspector, Construction

   *Attended exit interview

2. Exit Interview

   The inspection scope and findings were summarized on January 18, 1984, with those persons indicated in paragraph 1 above. No enforcement or followup items were identified. Also, no proprietary information is contained in this report, although the inspectors did review proprietary materials.

3. Licensee Action on Previous Enforcement Matters

   This subject was not addressed in the inspection.

4. Unresolved Items

   Unresolved items were not identified during this inspection.

5. Initial Criticality

   a. Precritical Tests (72596)

      (1) IP/O/A/3220/01, Rod Drop Test Measurement - Hot, was performed on January 4, 1985, with the reactor coolant system temperature at approximately 557°F and all reactor coolant pumps operating.

The inspectors reviewed the data sheets and visicorder charts for all 53 rods to verify that the rod drop measurements and quality of information obtained were acceptable. Rod drop measurements, which were based on the beginning of decay of stationary gripper coil voltage to dashpot entry, were in the range of 1.55 and 1.63 seconds with a maximum error of ±0.02 seconds between the licensee's values and inspectors' values. Therefore, all measured rod drop times were well within the 3.3 second limit of Technical Specification 3.1.3.4. Additionally, steady deceleration was observed in the dashpot region for each rod, as indicated in the Final Safety Analysis Report, Table 14.2.12-2.

(2) A review of plant records confirmed that the following instrument tests were performed within twenty-four hours of starting the approach to criticality:

(a) IP/1/A/3240/04D, E; Excore Nuclear Instrumentation System, Source Range N31, N32 Channel Operational Test.

(b) IP/1/A/3240/04F, G; Excore Nuclear Instrumentation System Intermediate Range - N35, N36 Channel Operational Test.

(c) IP/1/A/3240/04H, I, J, K; Excore Nuclear Instrumentation System, Power Range - N41, N42, N43, N44 Analog Channel Operational Test.

Results from test 3240/04H were reviewed by the inspectors and were acceptable. The results from other tests were in the plant review cycle and were not reviewed by the inspectors. The completed procedures will be reviewed in a future inspection.

These procedures satisfy the surveillance requirements of Technical Specifications 4.3.1.1 (table 4.3-1, items 2, 3, 4, 5, and 6) and 4.10.3.2.

b. Initial Criticality (72592)

PT/1/A/4150/19, 1/M, Approach to Criticality (including changes 1-3), was witnessed as it was being performed, and the completed procedure was reviewed. Initial criticality was achieved in a well monitored, well controlled manner. The initial critical configuration of control rod bank D at 141 steps withdrawn, with a nuclear coolant system (NC) boron concentration of 969 ppmB was in good agreement with the predicted concentration of 934 ppmB for D bank at 141 steps. Subsequently the all rods out (ARO) boron concentration was measured to be 975 ppmB, which was in good agreement with predicted concentration of 946 ppmB, and satisfied the acceptance criterion of being within ±50 ppmB of prediction. Throughout the dilution process, the proper performance of the source range monitors was confirmed using three-observation chi-squared tests. This test is a valid confirmation of counting system performance when used with a constant neutron source. Once the reactor was very slightly super critical the neutron source was no longer constant over the period of observation, and the counters apparently failed the test. This caused some confusion on the part of those monitoring inverse multiplication because of procedural requirements to plot only data points supported by valid chi-squared test. In time the constantly increasing count rate became more obvious and criticality was declared at 2008 on January 7, 1985. The chi-square test was, in fact, the first, most sensitive indicator of criticality. Procedure changes to provide criteria for abandoning the chi-square test as multiplication increases are being considered.

Following criticality, adequate overlap of source and intermediate range detectors was confirmed. Next the zero-power testing range was established by first determining the power level for onset of nuclear heating.

The reactivity computer checkout and qualification were performed over the nominal range of -40 pcm to +40 pcm. The average deviation of four observations (two positive and two negative) met the acceptance criterion of less than four percent from theoretical.

This was the last activity performed under this procedure. No violations or deviations were identified in witnessing or reviewing activities performed under this procedure.

6. Zero Power Physics Tests (72700)

TP/1/A/2100/02, Zero Power Physics Controlling Procedure, was inspected from time-to-time to assure that it was current with the activities in progress. No discrepancies were observed with respect to the procedure or the accompanying test log book. Portions of specific tests scheduled by this procedure were witnessed, and all test results available during the inspection were reviewed. The specific tests inspected included:

a. Boron Endpoint Measurement (72572)

PT/1/A/4150/10, Boron Erdpoint Measurement, was performed for the following control rod configurations:

- ARO (January 9, 1985)
- D Control bank in (January 11, 1985)
- D and C Control banks in (January 12, 1985)
- D, C, B and A control banks in (January 13, 1985)

All critical boron concentrations were within 50 ppmB of predictions.

b. Isothermal Temperature Coefficient Measurement (72572, 61708)

PT/1/A/4150/12A, Isothermal Temperature Coefficient, was performed for the following configurations with the results given:

- ARO (January 10, 1985), -1.75 pcm/°F
- D control bank in (January 11 - 12, 1985), -2.77 pcm/°F
- D and C control banks in (January 12, 1985), -8.01 pcm/°F

After applying the calculated value of the zero power doppler coefficient of -1.73 pcm/°F, the resulting moderator temperature coefficient for ARO was -0.015 pcm/°F. This result satisfied the requirement of Technical Specification 3.1.1.3.a, but not the licensee's procedural requirement that the moderator temperature coefficient be less than or equal to -1 pcm/°F.

Accordingly, the licensee implemented PT/1/A/4150/20, Temporary Rod Withdrawal Limit Determination. Review of the procedure raised no question.

c. Control Rod Worth Measurements (72572, 61710)

In the period January 11 - 13, 1985, the reactivity worths of control banks D, C, B and A, and shutdown banks E, D, and C were measured using procedure PT/1/A/4150/11A, Control Rod Worth Measurement by Boration/Dilution. The test data for control banks A, B, and D and shut down banks D and E were selected for intensive review by the inspectors. Over half the reactivity increments from the reactivity computer chart traces for these rod banks were independently analyzed. Differences between licensee and inspectors' values were typically 0.2 pcm (1-2% of the measurement), although a few differences were as great as 0.5 pcm. Each bank worth measurement satisfied the acceptance criterion of being within two percent of its predicted worth.

d. Core Power Distribution (61702)

Two measurements of core power distribution at low power were made using PT/1/A/4150/05. The measurement, FCM/1/01/001, with all rods out indicated an overall quadrant power tilt ratio (QPTR) of 1.07, with three fuel assemblies differing from predicted power sharing by more than 10%. The measurement with D bank in, FCM/1/01/002, indicated a QPTR of 1.054, with four fuel assemblies differing from prediction by more than 10%.

The licensee has evaluated the effect of power distribution on future at-power operation and has concluded that operation up to 49% power can be supported. The anomalous power distribution is also being evaluated by the fuel vendor. Part of the evaluation will include a reappraisal of the method of calculating the theoretical factors used in the power distribution analysis.

Additional power maps had been scheduled for the 30% power testing plateau. In response to the problems above, power maps at 10 to 20% power have been added to the schedule.

e. Reactivity Computers

PT/0/B/4150/20 A, B, Reactivity Computer Checkout for the Westinghouse and IBM 9000 respectively were performed routinely. Checkouts on January 12, 1985, were selected for review. The IBM 9000 reactivity computer used as the primary means to measure reactivity was calibrated and verified to leave each analogy to digital converter within ±0.01 VDC throughout its exponential input range. The reactivity computer checkouts were satisfactory and performed in accordance with the appropriate procedure.

No violations or deviations were identified in the inspection of the zero power test.

7. Reactor Coolant Systems Leakage Measurements (61728)

The computer program RCSLK9 from the NRC Independent Measurements Program was installed on the IBM PC in the residents' office for use in measuring reactor coolant system leak rates. Data were collected to prepare the plant specific parameters required for program input.