



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

Report No.: 50-413/85-28

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

Docket No.: 50-413

License No.: NPF-35

Facility Name: Catawba Unit 1

Inspection Conducted: June 24 - 28, 1985

Inspector: P. T. Burnett

10 July 1985  
Date Signed

Approved by: Frank Jape  
F. Jape, Section Chief  
Engineering Branch  
Division of Reactor Safety

7/10/85  
Date Signed

SUMMARY

Scope: This routine, unannounced inspection entailed 27 inspector-hours on site in the areas of review of completed startup and surveillance test procedures.

Results: No violations or deviations were identified.

8508020247 850712  
PDR ADOCK 05000413  
PDR

## REPORT DETAILS

### 1. Persons Contacted

#### Licensee Employees

- \*J. W. Hampton, Station Manager
- \*H. B. Barron, Superintendent of Operations
- \*W. F. Beaver, Performance Engineer
- \*W. H. Bradley, Quality Assurance (QA) Supervisor
- \*B. F. Caldwell, Superintendent, Station Services
- \*J. W. Cox, Superintendent, Technical Services
- \*D. M. Robinson, Reactor Engineer
- \*F. N. Mack, Jr., Project Service Engineer
- C. L. Hartzell, Compliance Engineer
- M. Hawes, Associate Engineer
- \*P. G. LeRoy, Licensing Engineer

Other licensee employees contacted included engineers and office personnel.

#### 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 June 28, 1985, with those persons indicated in paragraph 1 above. The inspector described the areas inspected and briefly discussed the inspection findings. No dissenting comments were received from the licensee. The licensee acknowledged that no proprietary information had been provided to the inspector during the inspection.

The licensee was informed of the following inspector followup item by telephone call on July 2, 1985.

Inspector Followup Item 413/85-28-01: Retain ECP Calculations - paragraph 6.b.

### 3. Licensee Action on Previous Enforcement Matters

This subject was not addressed in the inspection.

### 4. Unresolved Items

Unresolved items were not identified during the inspection.

5. Review of Completed Startup Test Procedures (72576, 72580, 72584, 72600, 72608, 72616, 72624)

The following completed startup test procedures were reviewed to assure that the acceptance criteria were satisfied and all test deficiencies resolved:

- a. TP/1/A/2150/06B, Pseudo Rod Ejection Test (Power Operation), was performed on March 5, 1985, at a nominal power level of 30% rated thermal power (RTP), with D bank at the full-power insertion limit of 162 steps. The measured value of  $\beta_0$  was 2.46 with the rod full out, which was conservatively less than the Technical Specification limit of 4.55, and less than the accident analysis value of 5.9. The reactivity worth of the ejected rod was measured by use of the reactivity computer, which is not reliable at power. Prompt doppler feedback is faster than the response time of the instrument, and invalidates the measurement. Nevertheless, the measurement was as described in the Final Safety Analysis Report (FSAR), and the absence of any significant power increase in response to rod withdrawal confirms that the rod worth was much less than the 230 percent millirho (pcm) assumed in the accident analysis.
- b. TP/1/A/2650/07, Turbine Trip, was performed on March 27 - 28, 1985, from a best-estimate thermal power of 67.5%. The runback was approximately 15.3% and all acceptance criteria were satisfied.
- c. TP/1/A/2650/12, Station Blackout Test, was performed on January 29, 1985. Witnessing of the test was performed during inspection 413/85-04. All applicable acceptance criteria were satisfied. The pressurizer and steam generator Power-operated Relief Valve (PORVs) were not actuated; hence the corresponding acceptance criteria were not applicable. Three work requests were issued to address equipment failures or misoperation, but none of the failures affected the ability to control and cooldown the plant.
- d. TP/1/A/2650/03, Loss of Control Room Functional Test, was performed on January 31, 1985. All acceptance criteria were satisfied. It was necessary to issue seven work requests to correct equipment deficiencies identified during the test, but none of the deficiencies invalidated the test. The test also identified the need for procedure changes to block safety injection (SI) prior to initiating cooldown from outside the control room. The need for changes was discussed with operations personnel responsible for procedures. They stated that the design department had identified approximately 100 valves that would change position when cooldown from outside the control room initiated SI. They reasoned that a wholesale blocking of the valve changes might invalidate some functions required by 10 CFR 50, Appendix R. Therefore, they identified the specific valves that could not be allowed to change position during the cooldown. The inspector confirmed steps were added to OP/1/A/6100/04 (Retype 2), Shutdown from

Outside the Control Room from Hot Standby to Cold Shutdown, to position four valves, remove power from eight valves and remove two fuses prior to starting the cooldown. That completed the followup action to the test.

- e. TP/1/A/2650/06, Unit Loss of Electrical Load, was performed on April 19, 1985, but was not completely signed-off at the time of the inspection. The review confirmed that all acceptance criteria had been satisfied, and all data plots looked reasonable, except for feedwater temperature to steam generator D, which showed a temperature 15 degrees lower than the others. The licensee identified that as a calibration problem. Further discussions with the licensee revealed that the test would not be signed-off until problems with four of nine atmospheric relief valves, that did not open during the test were resolved. Nevertheless, no PORV or safety valve had been called upon to operate during the test.
- f. TP/1/A/2150/04, Doppler Only Power Coefficient Verification, was performed at nominal power levels of 30, 50, 75, and 90% rated thermal power (RTP). At each power level six to eight alternating changes in power level were performed. The ratio of change in average coolant temperature to change in power level was recorded and compared with predicted values. The acceptance criterion was that the difference in absolute values of the measured and predicted values could not exceed 0.5 degrees F/% power. At each power level the licensee first averaged separately the measured and predicted values before making the comparison. The inspector felt that a more experimentally valid method of comparing the results was to take the absolute difference between measured and predicted values for each load swing and average the differences. The result was that at every power level the average of the differences (the inspector's values) was greater than the difference of the averages (the licensee's values), but in all cases the acceptance criterion was satisfied. In the course of reviewing startup test procedures, the inspector noted that the boronometer was sometimes used to obtain boron concentration for test input. To confirm independently the validity of using the boronometer the inspector performed an analysis of variance using data from the licensee's test log and the SUPERCALC 3 (Release 2) program for personal computers. The results (see Attachment 1) showed that for periods of unchanging boron concentration the mean deviation between boronometer and chemical analysis was about one percent. When changing conditions were added to the sample the mean deviation increased to nearly 4%. Discussions with licensee personnel revealed that they were aware of the differences during transient conditions, which required a fifteen minute offset in comparisons of the two sources. The inspector also reviewed an Intra-Station letter dated April 24, 1985, on the xenon/core-power transient observed in conjunction with TP/1/A/2150/05, Rod Below Bank Test. The letter appeared to be a complete description of the licensee's experience, and following discussions with licensee personnel, the inspector had no further questions.



No violations or deviations were identified in the inspection of the startup tests.

#### 6. Review of Surveillance Tests

- a. Incore-Excore, Power-Range Nuclear Instrument Calibration PT/1/A/4600/05A, Incore-Excore Calibration, was performed as part of the startup test program on April 1 - 3, 1985, at power levels slightly below 75% RTP. Chamber current for the top and bottom chambers of the power-range nuclear instruments were recorded as a function of flux axial offset. A computer program was used to convert the currents to full-power equivalents and to determine the best-fit linear relationship between current and axial offset for each chamber. The program did not provide as output any indication of the quality of the fit.

The inspector chose to investigate the quality of fit for a representative detector, N41, using the SUPERCALC 3 (Release 2) program and a least squares spreadsheet provided with that program. The results are shown in tabular and graphic form in Attachment 2. The quality of fit is acceptable for the application.

- b. PT/1/A/4600/16, Surveillance for Startup, was performed six times between May 26 and June 24, 1985, and all completed procedures were reviewed by the inspector. In conjunction with the surveillance, an estimated critical position (ECP) calculation was performed using OP/0/A/6100/06. Although there was no procedural requirement, sometimes the calculation sheet was attached to the periodic test (PT), but not always. Since completed operating procedures (OPs) are not retained as permanent records, but PTs are, it is desirable to formalize the practice. This will be discussed further with the licensee at a later inspection (Inspector Followup Item 413/85-28-01: Retain ECP Calculations).
- c. PT/1/A/4600/02C, Mode 3 Periodic Surveillance Items, was reviewed by the inspector for the period January 23 to June 22, 1985. Comparison with records of plant mode status maintained by the licensee confirmed that the PT was performed when required. Daily calculations of shutdown margin performed using OP/0/A/6100/05, Reactivity Balance Calculation, were attached to the PT as required by a note in the PT.

#### 7. Followup Of Inspector-Identified Item (92701)

(Closed) Inspector-Identified Item 413/85-18-01: Review F-delta-H acceptance criterion for the rod below the bank test. The licensee has established that the F-delta-H limit in the FSAR, Table 15.4.3-1, was for fullpower operation. Hence, by use of the power dependence function of Technical Specification 3.2.3, they determined a fifty-percent power limit of 1.92 for the perturbed value. The maximum observed value was 1.71.

#### ATTACHMENTS:

1. Checkout of Boronometer
2. Data and Least Squares Fit

## ATTACHMENT 1

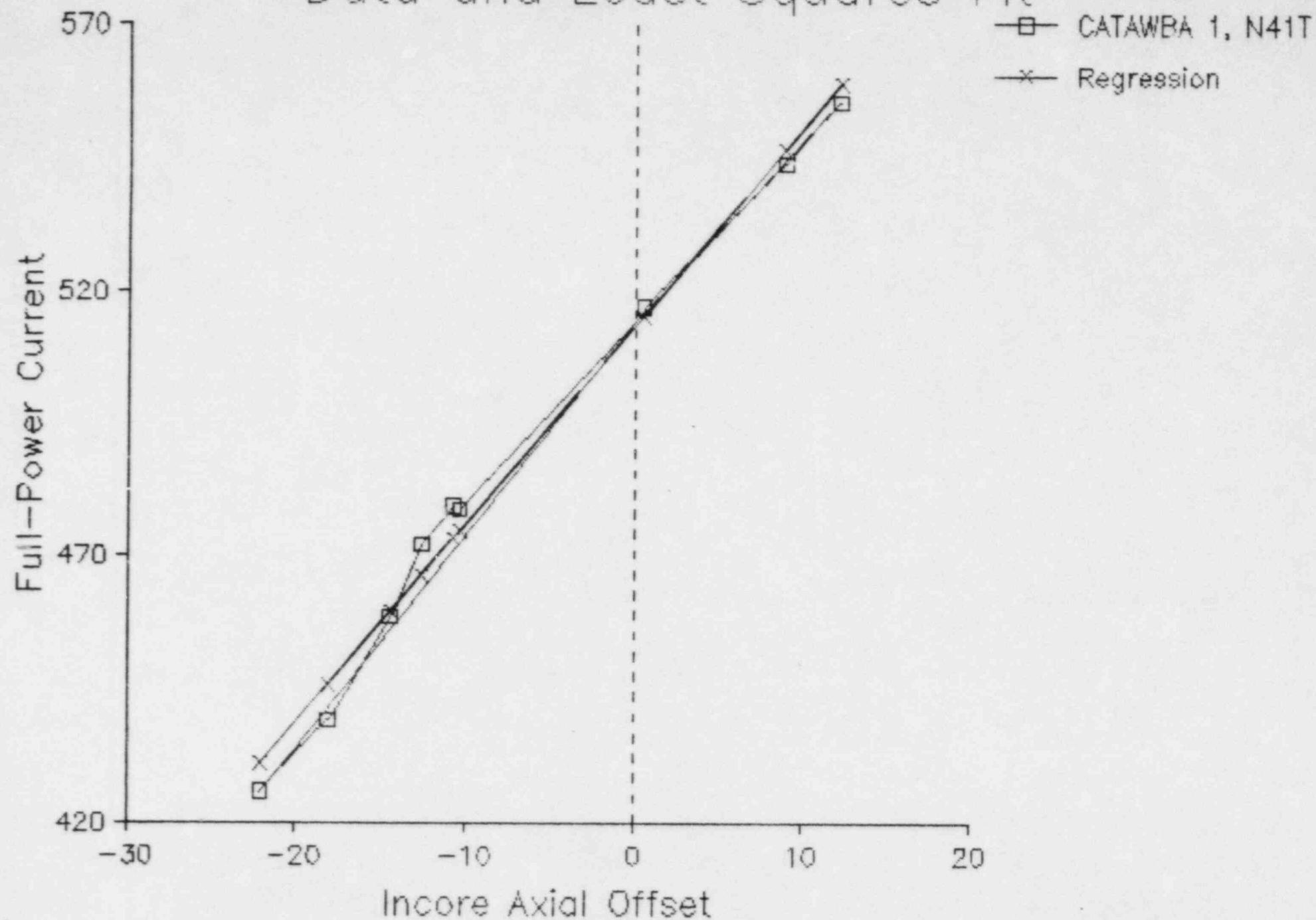
## CATAMBA 1: Checkout of Boronometer

| Time                | NC<br>Sample | Boron-<br>ometer | Variance | Entry |
|---------------------|--------------|------------------|----------|-------|
| 03-18-84            |              |                  |          |       |
| 0015                | 695          | 692              | .000019  | 1     |
| 0030                | 695          | 701              | .000074  | 2     |
| 0045                | 707          | 696              | .000246  | 3     |
| 0100                | 707          | 692              | .000460  | 4     |
| 0115                | 701          | 706              | .000051  | 5     |
| 0130                | 701          | 709              | .000129  | 6     |
| 0145                | 695          | 700              | .000051  | 7     |
| 0200                | 695          | 703              | .000131  | 8     |
| 0215                | 695          | 692              | .000019  | 9     |
| 0400                | 695          | 690              | .000052  | 10    |
| 0430                | 695          | 700              | .000051  | 11    |
| 0445                | 704          | 692              | .000296  | 12    |
| 0500                | 698          | 692              | .000075  | 13    |
| 0700                | 689          | 687              | .000008  | 14    |
| 0900                | 691          | 700              | .000167  | 15    |
| 1130                | 696          | 698              | .000008  | 16    |
| 03-22-85            |              |                  |          | 16    |
| 1515                | 701          | 753              | .005135  | 17    |
| 1545                | 697          | 772              | .010400  | 18    |
| 1600                | 703          | 631              | .011550  | 19    |
| 1700                | 704          | 750              | .004004  | 20    |
| 03-23-85            |              |                  |          | 20    |
| 0100                | 695          | 701              | .000074  | 21    |
|                     |              |                  |          | 21    |
|                     |              |                  |          | 21    |
| Result for 03-18-85 |              |                  | .010713  |       |
| Overall result      |              |                  | .039641  |       |

Where: Variance =  $\frac{((\text{NC Sample} - \text{Boronometer}))^2}{(\text{NC Sample} + \text{Boronometer})/2}$

Result = Squareroot((Sum of the Variances)/(Number of Entries))

## Data and Least Squares Fit



## Data and Least Squares Fit

CATAWBA 1, N41B

Regression

