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UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA ST., N.W., SUITE 3100
ATLANTA, GEORGIA 30303

Report Nos. 50-338/80-12 and 50-339/80-11

Licensee: Virginia Electric and Power Company
Richmond, VA 23261

Facility Name: North Anna

Docket Nos. 50-338 and 50-339

License Nos. NPF-4 and CPPR-78

Inspection at North Anna site near Mineral, Virginia

Inspector: C M Upright for 4/1/80
P. T. Burnett Date Signed

Accompanied by: D. P. Falconer

Approved by: C M Upright 4/1/80
C. M. Upright, Acting Section Chief, Date Signed
RONS Branch

SUMMARY

Inspection on March 10-14, 1980

Areas Inspected

This routine, announced inspection involved 29 inspector-hours on site in the areas of post-refueling operations, start-up testing, core performance monitoring and fuel handling.

Results

In the four areas inspected, no items of noncompliance or deviations were identified.

## DETAILS

1. Persons Contacted

Licensee Employees

*W. R. Cartwright, Station Manager
*J. D. Kellams, Superintendent of Operations
*E. W. Harrell, Superintendent of Maintenance
*E. R. Smith, Jr., Superintendent of Technical Services
E. J. Lozito, Director Nuclear Fuel Operations Group
*J. P. Smith, Reactor Engineer
*C. R. Swope, Senior QC Inspector
*T. Johnson, QC Inspector
*W. R. Madison, NRC Coordinator
J. R. Eastwood, Senior Engineering Technician - Maintenance
L. O. Goodrich, Mechanical Maintenance Supervisor
A. G. Neufer, Shift Supervisor
S. Dodds, Nuclear Training Supervisor
S. L. Harvey, Operating Supervisor
A. P. Miller, Nuclear Training Coordinator

Other licensee employees contacted included 3 nuclear fuel operations engineers, 2 shift supervisors and 2 operators.

NRC Resident Inspectors

*M. S. Kidd
*A. Tattersall

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on March 14, 1980 with those persons indicated in paragraph 1 above.

Station management made a commitment that a program to inspect fuel handling equipment, particularly wire ropes, hooks and grippers, in accordance with ANSI B30.2-1976 would be established for both units. Further, the program will be implemented prior to the next use of that equipment to handle fuel, and grippers will be treated as hooks. This subject is discussed further in paragraph 8.

3. Licensee Action on Previous Inspection Findings

Not inspected.

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Post Refueling Operations

Inspector followup item 50-338/80-05-04 was addressed to the observation that two critical configurations recorded early in cycle 2 for unit 1, and characterized by boron concentration, control rod insertion and system temperature, appeared to be mutually exclusive. By review of the logs of boron concentration, pure-water addition and borated-water addition maintained by the test engineers during that period, the licensee was able to identify a single, isolated case of inaccurate boron analyses. That inaccuracy led to a condition where two recorded critical configurations of essentially the same temperature and rod insertion had significantly different boron concentrations. Discovery of the error removes that discrepancy, and this item is closed.

6. Startup Testing of Unit 2

Inspection report 339/79-18 addressed two perceived inadequacies in procedure 2-SU-17, "Initial Criticality". The first was that the dilution rate of 50 gallons per minute was to be continued until the inverse multiplication was as little as .03. The second was that the calibration of the reactivity computer was specified over a span of reactivity less than the span that was anticipated to be used in subsequent tests. These problems were corrected in the version of 2-SU-17 that was issued on 8-8-79.

The instructions now require that the dilution rate be decreased to 30 gallons per minute when the inverse counterate ratio (ICRR) is less than 0.3 and to twenty gallons per minute when the ICRR is less than 0.2. Appendix B of that procedure now requires the reactivity computer to be calibrated over the span of -40 pcm to +40pcm. These issues are resolved.

7. Core Performance Monitoring

A meeting was held at VEPCO corporate offices on March 12, 1980 with Dr. E. J. Lozito and three engineers of his nuclear fuel operations (NFO) organization. The topics addressed were:

a. Temperature Coefficients

Beginning-of-cycle temperature coefficients for North Anna 1 cycle 2 were much more negative than for cycle 1 at essentially identical boron concentrations. The contrast with some Surry post-refueling tests was almost as great. The operative difference appears to be that North Anna 1 at the beginning of cycle 2 had a much higher average core burnup than the comparison cases (about 10,000 megawatt days per

metric ton versus 7,000 megawatt days per metric ton). The harder spectrum and correspondingly reduced boron reactivity worth both contribute to making the isothermal temperature coefficient more negative.

The methods used to analyze data from the at power measurements of temperature coefficient with boron concentration less than 300 ppm were discussed and the draft procedure followed was reviewed.

This discussion closed inspector followup item 338/80-05-02.

b. Evaluation of Monthly Core Performance Data

The evaluation of the core power distribution flux maps produced monthly at the station is performed by the NFO staff. The methods used to confirm the validity of the raw data as well as to analyze them were discussed. Based upon these discussions inspector followup item 338/80-05-03 is closed.

c. Determination of Boron Reactivity Worth

In zero power physics testing precise determination of reactor coolant system boron concentration was made for the all-rods-out configuration and at the end of each successive calibration of a control rod bank. The boron concentration was then plotted against the integral of the reactivity inserted by the control rods. That is the reactivity is determined from the summation of reactivity computer measurements. A straight line is fitted through the points and the slope take as the boron reactivity worth. This approach assumes boron worth is independent of concentration over the range measured and independent of control rod configuration. These assumptions appear to be quite valid since the plotted points fell on or are very close to the least-squares fitted line.

d. Control Rod Calibrations by the Rod Swap Method

In the zero power physics tests for cycle 2 of unit 1 the licensee supplemented the usual control rod calibrations against boron concentration with some rod interchange rod swapping of the calibrated bank against an uncalibrated bank. The interpretation of the results was discussed with the licensee. Because of the differences in control rods configurations the worth of a rod bank by one calibration method may not be compared directly with the worth obtained in another calibration method. In each method, the measured values must be compared with the calculated values which represent the modeling of the control rod configuration during the measurement. In other words, the two types of measurements of control bank worth are not checks on the other but two independent tests of the analytical ability to model and calculate control rod worth.

From the discussions it was learned that the measurements described above are not generally reflected directly in the plant curve books. The curves appearing

there are calculated. So long as the measured values of parameters such as temperature coefficient, rod worth and boron worth fall within the numerical acceptance criteria defined by the licensee, the measurements are interpreted to validate the calculations used to create the plant curve book data. Hence, no adjustment of the curve book is required. If a measured value were to fall outside of the acceptable range the offending parameter or curve would be remodeled and reanalyzed and again a calculated curve or value would appear in the plant curve book.

The NFO organization has written procedures to guide the analysis of plant data. These procedures are judged by the licensee to be outside the purview of the Station Nuclear Safety and Operating Committee (SNSOC) and to date have been subject to internal review only. The inspector briefly reviewed a package of the following draft procedures:

Nuclear Fuel Operation Group: Temporary Procedures

1.1 APDMS Data Round-Off Fix Procedure
1.2 APDMS Detector Background Fix Procedure

Procedures

1.1 Analysis of HZP Rod Worth Data (Dilution/Boration)
1.2 Analysis of Boron Endpoint Data
1.4 Analysis of Boron Worth Coefficient
1.5 Analysis of HZP Isothermal/Moderator Temperature Coefficient Data
1.9 Control Rod Withdrawal Limit
1.7C Flux Map Single Point Analysis

Standard procedures listed in the procedure index but not in the review package were:

1.3 Analysis of Boron Endpoint Data
1.7A Flux Map Analysis (Conventional)
1.7B Flux Map Analysis (Low Power)
1.8 Analyses of Al-Power Rod-Worth Data
1.9 Analysis of Power Coefficient Data
1.10 Analysis of MTC Data (at power)

The procedures may be characterized as being in narrative, academic, form rather than in a step-by-step, operational, form. Each procedure defined a problem, identified the source of the data and prescribed the methods of data reduction. In his concluding interview with the director of NFO the inspector stated that the procedures should be put in a final, locally-approved form as soon as possible and that prior to placing in final form the procedures should be subjected to peer review. Review by station reactor engineers was recommended since they could also address the assumptions in the procedures regarding methods of data collection and plant status during the tests. The inspector also stated that acceptance criteria should be added to the procedures. Agreement in principal was obtained,

but no schedule for completion was provided. Later, North Anna technical services personnel agreed that they should and would take part in reviewing the NFO procedures.

8. Fuel Handling

As of this inspection, procedures for inspection of cranes and hoisting equipment addressed in mechanical maintenance administrative procedure 9.0, which was issued on June 28, 1979, have yet to be applied to fuel handling equipment. The existing periodic test and operating procedures currently addressed to that equipment are deficient in that they do not provide for inspection of wire rope, grippers and other hook-like devices. These inadequacies had been addressed earlier in inspection report 339/79-18. The license made a commitment to take corrective procedural action prior to any use of equipment in either unit to handle fuel. Specifically, a inspection program for the fuel handling equipment will be instituted in accordance with ANSI B30.2-1976, and within the context of the inspections described therein grippers will be treated as hooks.