



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

Report Nos. 50-324/79-32 and 50-325/79-33

Licensee: Carolina Power and Light Company  
411 Fayetteville Street  
Raleigh, North Carolina 27602

Facility Name: Brunswick Units 1 and 2

Docket Nos. 50-324 and 50-325

License Nos. DPR-62 and DPR-71

Inspected at Brunswick site near Southport, North Carolina

Inspected by: C. Julian 9/27/79  
C. Julian Date Signed

Approved by: P. T. Burnett 9/27/79  
P. T. Burnett, Acting Section Chief Date Signed

SUMMARY

Inspected on August 28-31, 1979.

Areas Inspected

This routine, unannounced inspection involved 28 inspector-hours onsite in the areas of investigation of a unit 1 fuel assembly misload incident and review of post refueling testing results.

Results

Of the 2 areas inspected, no items of noncompliance or deviations were identified.

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## DETAILS

### 1. Persons Contacted

#### Licensee Employees

- \*A. C. Tollison, Jr., Plant Manager
- \*J. M. Brown, Operations and Maintenance Superintendent
- \*G. T. Milligan, Engineering Supervisor
- \*D. N. Allen, Quality Assurance Supervisor
- \*K. E. Enzor, I&C Maintenance Supervisor
- \*M. A. Jones, Project Engineer, Reactor
- \*R. M. Poulk Jr., NRC Coordinator
- E. B. Wilson, Engineer
- D. A. Brenner, Engineer
- E. Eagle, Engineer
- R. Beverage, Quality Assurance

Other licensee employees contacted included various technicians, operators, security force members, and office personnel.

#### Other NRC Inspectors

- \*J. E. Outzs, Resident Inspector
- \*B. R. Messitt
- \*B. T. Moon

\*Attended exit interview

### 2. Exit Interview

The inspection scope and findings were summarized on August 31, 1979 with those persons indicated in Paragraph 1 above. The inspector stated that items of discussion related to the rotated fuel assembly in Unit 1 would be unresolved pending receipt of the operating history of the rotated bundle during cycle 2 operation.

The inspector presented the findings on Unit 1 post refueling tests and plant status as detailed in paragraphs 6 and 7. The licensee representative committed to take action to close the open items identified.

### 3. Licensee Action on Previous Inspection Findings

Not inspected.

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### 4. Unresolved Items

Unresolved items are matters about which more information is required to determine whether they are acceptable or may involve noncompliance or deviations. A new unresolved item identified during this inspection is discussed in paragraph 5.

5. Unit 1 Misloaded Fuel Assembly

During an entrance interview with the plant manager at the start of the inspection, the inspector was informed that the licensee had that day discovered that fuel assembly LJ 0197 occupying core position 29-10 in Unit 1 had been placed in the core rotated 180° about its longitudinal axis from the intended orientation. The licensee had promptly reported the situation to the NRC resident inspector, and intends to make a followup written report to Region II.

Through direct observation and discussions with various licensee personnel, the inspector confirmed that prompt corrective action had been taken. The reactor power level had been reduced to 88% of rated in order to limit the rotated bundle to an apparent linear heat generation rate (LHGR) no greater than 9.7 kilowatts/foot and an apparent minimum critical power ratio (MCPR) not less than 1.38. These operating limits for the rotated bundle were adopted by the licensee at the recommendation of General Electric and are based on their calculated results of the "worst case rotated bundle loading error" reported in the Unit 1 cycle 2 reload submittal document NEDO-24166.

The inspector reviewed computer program OD-6 printouts on August 29, 1979 and August 30, 1979 monitoring thermal data in the fuel assembly at core position 29-10 and verified that the more conservative indicated limits stated above on LHGR and MCPR were not being violated. The inspector observed that administrative action had been taken to assure that the new limits on bundle 29-10 are observed.

The rotated fuel bundle is not directly monitored by an adjacent LPRM detector. Rather, its thermal performance parameters are determined by the process computer assuming core symmetry. Since the cell peaking factors used by the process computer are not appropriate for the case of a rotated bundle, there is uncertainty as to the accuracy of the thermal parameters of this bundle. Allowing an additional margin on the operating limit will prevent exceeding the technical specification limits in future operation, but the reactor had been operated at full rated power during cycle 2 before discovery of the rotated bundle.

After consultation with General Electric, the licensee has determined that the 180° rotation of bundle LJ 0197 in core position 29-10 could cause the linear heat generation rate to exceed its nominal full power rate by 2.24 kw/ft. The licensee's records show that for two separate periods of operation during cycle 2, the process computer generated value for LHGR on bundle LJ 0197 reached a maximum of 11.26 kw/ft. Adding on the anticipated 2.24 kw/ft due to bundle misorientation, it appears that during the two periods in question, bundle LJ 0197 operated at a LHGR value of 13.5 kw/ft. This exceeds the limiting condition for operation of 13.4 kw/ft specified in Technical Specification 3.2.4.

In a telephone conversation on September 21, 1979, a licensee representative stated that they feel that the 2.24 kw/ft value stated above is extremely conservative and that further analysis by General Electric is

in progress. This matter of possibly exceeding the Technical Specification limit on LHGR will remain unresolved pending the licensee and General Electric completing their analysis of the rotated bundle. The maximum LHGR experienced by bundle LJ 0197 during Unit 1 cycle 2 operation will then be determined (Unresolved Item 50-325/79-33-01).

Fuel handling procedure FH-11 calls for a core verification to be performed after refueling using an underwater television system. The inspector reviewed the documentation of the Unit 1 fuel handling evolution and the core verification. Three people, an engineer, a senior reactor operator, and a quality assurance representative, simultaneously observed the core verification on a television monitor placed on the refueling platform and concluded that the core was correctly loaded. A video tape was made of the core verification. The licensee found the rotated bundle during a later review of the tape in search of misloaded bundles in other areas which have produced higher LHGR values than expected during cycle 2.

The inspector viewed the bundle orientation verification tapes for Unit 1 and Unit 2 for the current fuel cycle. No additional core loading errors were found. The rotated bundle LJ 0197 was clearly misoriented on two Unit 1 core verification tapes, and probably would have been detected had the tape been reviewed by the licensee prior to beginning of cycle 2 operation. The plant manager stated that an independent review of the core verification tapes prior to reactor restart is a corrective action under consideration. The inspector stated that the corrective action proposed by the licensee in his event report will be reviewed during a future inspection (Inspector followup item 50-325/79-33-02).

#### 6. Review of Unit 1 Post Refueling Testing

The inspector reviewed the results of Unit 1 post refueling testing as follows:

PT 50.0 "Post Refueling Outage Startup Testing",  
PT 50.1 "LPRM and APRM Initial Sensitivities",  
PT 50.2 "SRM/IRM/APRM Overlap Determinations",  
PT 50.3 "TIP Reproducibility",  
PT 50.3.1 "Total TIP Uncertainty",  
PT 50.4 "Process Computer New Cycle Update and Verification",  
PT 50.12 "Measurement of In-Sequence Critical Data", and  
PT 14.3 "Shutdown Margin"

The data generated from procedures PT 50.3 and 50.3.1 consist of a large array of numbers which must be mathematically manipulated for evaluation of results. This was accomplished by means of the plant process computer using a program written by the plant staff. The inspector noted that the output was not labeled so as to allow audit of the data and that no test run of the programs had been documented to verify that the programs perform the calculations correctly. The licensee had identified previously one error in the program used to evaluate PT-50.3 data. The licensee representative agreed to correct these problems and the inspector stated that

this item would be reviewed during a future inspection (Inspector follow-up item 50-325/79-33-03).

Procedure PT 50.12, "Measurement of In-Sequence Critical Data", measures the initial, post-refueling critical control blade configuration and compares it to the General Electric prediction. This comparison is made for information only, and no acceptance criterion is specified. The inspector questioned whether a suitable acceptance criterion should be stated for this test, as a large disagreement between observed and predicted critical control blade configuration could be indication of insufficient shutdown margin or a core reactivity anomaly. The licensee representative agreed to evaluate the need for an acceptance criteria for PT 50.12 (Inspector followup item 50-325/79-33-04).

#### 7. Plant Status

The inspector noted during a control room tour that both units were operating with an abnormally high number of annunciator alarms locked in. Discussion with the operators revealed that there was an assortment of alarms due to equipment out of service, alarms due to intermittent equipment problems and alarms that are normally in during operation. Licensee representatives stated that a program is under way to make design changes as required to eliminate unnecessary alarms during normal operation.

The inspector expressed particular concern about the reactor building closed cooling water (RBCCW) and service water discharge radiation monitors having a common annunciator. On August 29, 1979 this annunciator was lit on Unit 2 due to a high reading on the RBCCW radiation monitor channel. A licensee representative stated that this was due to a high background reading in the area of the RBCCW detector and that this condition had existed for about a month. Under these conditions, a legitimate high count rate alarm on the service water discharge channel would not annunciate on the control room board to alert the operator to a potential release of radioactivity from the plant. The plant manager stated that this condition would be given priority for correction (Inspector followup item 50-324/79-32-01).

#### 8. Review of Unit 2 Post Refueling Testing

The results of the following post refueling tests performed on Unit 2 were reviewed by the inspector.

PT 50.6, "Post Refueling Outage Startup Testing"  
PT 50.1, "LPRM and APRM Initial Sensitivities"  
PT 14.3, "Shutdown Margin"  
PT 50.2, "SRM/IRM/APRM Overlap Determinations"

No items of noncompliance were identified in this review.

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