



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 59 TO FACILITY LICENSE NO. DPR-38

AMENDMENT NO. 59 TO FACILITY LICENSE NO. DPR-47

AMENDMENT NO. 56 TO FACILITY LICENSE NO. DPR-55

DUKE POWER COMPANY

OCONEE NUCLEAR STATION, UNIT NOS. 1, 2 AND 3

DOCKET NOS. 50-269, 50-270 AND 50-287

Introduction

By letter dated January 23, 1978, Duke Power Company (licensee) proposed changes to the Oconee Nuclear Station Technical Specifications. (1) These proposed changes are to the control rod position and axial imbalance limits for operation of Oconee Unit 1 Cycle 4 after $100 \pm$ effective full power days (EFPD) to the end of Cycle 4 (EOC).

Discussion

During startup tests for Oconee Unit 1 Cycle 4 in October 1977, the ejected rod worth of the rod with the greatest predicted worth was outside the acceptance criterion. The worths of the symmetrical rods in each of the other three quadrants were measured. These worths were within the acceptance criterion.

As a result of the ejected rod worth tests, the licensee checked control rod assembly (CRA) patching (electrical alignment) and verified core loading. All other measured physics parameters were within limits and the rod worths were conservatively low and startup tests were continued. During the normal startup test during power escalation, quadrant neutron flux tilts were observed and continuously monitored.

In the Oconee reactors there are four symmetrical strings of detectors in each quadrant which are used to measure tilt. Each of these strings has seven detectors equally spaced axially. These detector indications are averaged. The average power indication for the four strings in a given quadrant is then divided by the average for the 16 symmetrical strings to determine the tilt for that quadrant.

At 40% rated power, which was a startup test power plateau, a tilt of approximately 4% was measured. The tilt had an axial variation from approximately 3% at the top and bottom of the core to approximately 5% in the middle of the core. At this point, the licensee reduced power to 30% of rated power and tested for broken CRA fingers.

7912160 094

In late October, a meeting was held with the licensee and the fuel manufacturer (Babcock & Wilcox). A list of potential causes was presented. At that time none of these potential causes could be positively identified as causing the flux tilt.

So that the tilt anomaly would not cause operational restrictions, the licensee proposed a new tilt Technical Specification limit of 6.03%. Along with this increased tilt limit, the licensee proposed restriction of power to $\leq 75\%$ of rated power and changes to rod position limits and high flux scram level. These changes were approved on October 31, 1977.

At 75% power the tilt decreased slightly but was still greater than the original 3.41% (2.66% plus uncertainty on incore instrumentation) Technical Specification value. The 2.66% measurement assures that the Technical Specification limit of 3.41% tilt is not exceeded. As of 11/2/77 the tilt was measured at 2.79%. In November, an amendment was issued which changed the Technical Specification to allow for unrodded operation up to 100% power with the increased tilt limit for 100 EFPD. Unrodded operations had been shown by analyses submitted by the licensee to result in peaking factors that are lower than during rodded operation. Therefore, unrodded operation at 100% power was found acceptable by the staff.⁽²⁾

The flux tilt has since decreased to below the original Technical Specification limit of 3.41%. The current measured flux tilt is 1.22% as of February 7, 1978.

In early December the licensee informed NRC that it believed the cause to be a combination of a previously unconsidered tilt anomaly ($< 2\%$) in Cycle 3 and the cross core reload shuffling pattern for Cycle 4. The fuel manufacturer has performed calculations using an estimated tilt for Cycle 3. From these calculations, the fuel manufacturer has stated that the measured tilts of Cycle 4 could be caused by the Cycle 3 tilt as reinforced by the cross core shuffling pattern. The tilt during Cycle 3 had not previously been reported since it was below the Technical Specification limit.

By letter dated January 23, 1978, the licensee proposed revised control rod position and axial power imbalance Technical Specifications limits for the period from 100 EFPD to end-of-cycle (EOC). These revised limits considered actual core performance with the tilt. The licensee also presented a discussion and calculation on the possibility that the observed tilt in Cycle 4 could have been caused by a small tilt in Cycle 3 and the cross-core shuffling of once and twice burned fuel for the Cycle 4 design.

Evaluation

The staff has previously reviewed and found acceptable 100% rated power operation in the unrodded mode for Oconee Unit 1 up to 100 EFPD.⁽²⁾ The proposed changes are simply an extension of the 0 to 100 EFPD Technical Specifications. The licensee's analysis in support of the proposed

Technical Specifications is for the period after 100 effective full power days (EFPD) of operation to EOC. The proposed Technical Specifications have been established with the same calculation models and methods as previously reviewed and found acceptable by us for Oconee 1 Cycle 4. The proposed Technical Specifications would allow continued operation in an unrodded mode (change in rod position limits) with a maximum quadrant tilt of 6.03% (not a change).

The rod position limits are based on the most limiting of the following three criteria: power peaking, ejected rod worth, and shutdown margin. The quadrant tilt limits are established to prevent the linear heat generation rate peaking beyond analyzed conditions. A discussion of these considerations follows.

The power peaking analysis for Oconee 1 Cycle 4 operation from 100 (+10) EFPD to EOC in the unrodded mode was performed assuming the existence of a 6% quadrant tilt at all power levels. This tilt was determined to cause <9% increase in local peaking. This increase in local peaking has been established from a conservative relationship between peaking and tilt established by many full-core PDQ and FLAME calculations with tilt induced by various means. The comparison of calculated and measured power distributions at full power at 56.6 EFPD shows that a factor of 1.09, in conjunction with the standard total and radial nuclear uncertainty factors would be conservative for a case where the tilt is 1.67%. No data is presented for larger tilts, although analysis of the power peaking has shown conservatism above 1.67% up to 6.03%. All other peaking penalties normally included in the generation of Technical Specifications operating limits were included in this analysis. Operation in the unrodded mode was found to provide reduced peaks during the fuel cycle at all times after 4 EFPD compared to rodded operation. The peaking for the unrodded core is lower than for the rodded core for normal operation after 100 EFPD.

The ejected rod worth insertion limits were determined in an extremely conservative fashion. The Hot Full Power (HFP) ejected rod worth limits were based on projected EOC data and were still found to be less limiting than the shutdown margin insertion limits. At Hot Zero Power (HZIP) the 0-100 EFPD rod insertion limits were adjusted based on a projected slight increase in the maximum ejected rod worth at EOC. The resulting rod insertion limits were less limiting than shutdown margin criteria at all power levels above zero power. Thus only the zero power limit (64% withdrawn) is based on ejected rod criteria.

The shutdown rod insertion limits were determined using standard techniques based on symmetric conditions and adjusting these calculations to account for the tilt. The calculated stuck rod worths were increased 10%.

The net effect of all these conservatisms is that the core will be restricted in operating flexibility but allowed to operate at full power in a safe manner. The APSR position limits, Technical Specification Figure 3.5.2 - 4A3, originally approved for operation after 235 ± 10 EFPD should be observed after 100 ± 10 EFPD. The imbalance limits that are currently in force for 0 to 100 EFPD are more restrictive than necessary for the proposed mode of rods-out operation from 100 EFPD to EOC, and can thus be retained. This represents another conservatism in the analysis. The rod position limits were determined based on the super-position of the most conservative calculated and measured data. On these bases, the staff finds the proposed changes to the Oconee Unit 1 Technical Specifications to be acceptable.

The actual tilt has decreased to below the previous Technical Specification value (approximately 1% below), and the continued use of the increased tilt specification is not required. In previous staff safety evaluations (2,3) an increased tilt was found acceptable based on compensations in rod position limits and nuclear power trip setpoint. This increased tilt limit is no longer required to provide margin during normal operation. This increased tilt limit would also allow a substantial increase in tilt from the current value before corrective action is required. Although increased tilts have been observed during cycle startups and when there have been control rod misalignments, to our knowledge there have never been any unexplained increases in quadrant tilt in mid-cycle. Because of the potential for a major change in the nuclear plant's characteristics without corrective action or explanation, we consider it prudent at this time to limit the flux tilt to its previous value except for Technical Specification 3.5.2.4.a(3). The excepted specification is for a shutdown requirement in case of tilts greater than analyzed. The shutdown requirement exception would allow operation at restricted power between tilts of 3.41% and 6.03%. The staff finds that the power restriction plus the licensee's commitment for a 24 hour notification to the staff in case of exceeding the 3.41% is sufficient to ensure appropriate action by the licensee and staff. This change is acceptable in that it assures corrective action in case of tilts beyond the previous limit. On this basis, we are reducing the current tilt specification (except for 3.5.2.4.a(3)) of 6.03% to its previous value of 3.41%. We are continuing our review of the 6.03% limit and are awaiting additional information from the licensee.

Based on our evaluation, operation in the proposed manner does not reduce the safety margins of the current Technical Specification limits. We conclude that the probability or consequences of any transients and accidents considered in the FSAR are not increased and that the safety margins are not reduced. Thus, we conclude that these changes do not involve a significant hazards consideration.

Environmental Consideration

We have determined that these amendments do not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendments involve an action which is insignificant from the standpoint of environmental impact, and pursuant to 10 CFR §51.5(d)(4) that an environmental impact statement, or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of these amendments.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendments do not involve a significant increase in the probability or consequences of accidents previously considered and do not involve a significant decrease in a safety margin, the amendments do not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public.

Dated: February 17, 1978

References

1. Letter from W. O. Parker, Jr. (Duke Power Company) to E. G. Case (U.S. Nuclear Regulatory Commission), dated January 23, 1978.
2. Letter from A. Schwencer (U.S. Nuclear Regulatory Commission) to W. O. Parker, Jr., (Duke Power Company), dated November 23, 1977.
3. Letter from A. Schwencer (U.S. Nuclear Regulatory Commission) to W. O. Parker, Jr., (Duke Power Company), dated October 31, 1977.

UNITED STATES NUCLEAR REGULATORY COMMISSIONDOCKET NOS. 50-269, 50-270 AND 50-287DUKE POWER COMPANYNOTICE OF ISSUANCE OF AMENDMENTS TO FACILITY
OPERATING LICENSES

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment Nos. 59, 59 and 56 to Facility Operating License Nos. DPR-38, DPR-47 and DPR-55, respectively, issued to Duke Power Company for operation of the Oconee Nuclear Station, Unit Nos. 1, 2 and 3, located in Oconee County, South Carolina. The amendments are effective as of the date of issuance.

During startup tests of Cycle 4 of the Oconee Unit No. 1 reactor a core flux tilt, not predicted nor understood at that time, was observed. NRC issued a license amendment in November 1977 restricting core operations to 100 effective full power days in order for the licensee to gain an understanding of the reasons for the tilt. The tilt has since decreased and the licensee made a submittal on January 23, 1978 with an acceptable explanation of the phenomenon. These amendments revise the Oconee Nuclear Station's common Technical Specifications to allow Cycle 4 operation of Oconee Unit No. 1 past 100 effective full power days.

The application for the amendments complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license

POOR ORIGINAL

Dupe of

7911290592

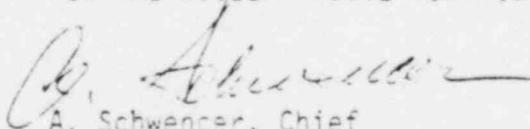
amendments. Prior public notice of these amendments was not required since the amendments do not involve a significant hazards consideration.

The Commission has determined that the issuance of these amendments will not result in any significant environmental impact and that pursuant to 10 CFR §51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of these amendments.

For further details with respect to this action, see (1) the application for amendments dated January 23, 1978, (2) Amendment Nos. 59, 59 and 56 to License Nos. DPR-38, DPR-47 and DPR-55, respectively, and (3) the Commission's related Safety Evaluation. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N. W., Washington, D. C. and at the Oconee County Library, 201 South Spring Street, Walhalla, South Carolina 29691. A copy of items (2) and (3) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland, this 17th day of February 1978.

FOR THE NUCLEAR REGULATORY COMMISSION



A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors

POOR ORIGINAL