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January 22, 1985

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. John F. Stolz, Chief
Operating Reactors Branch No. 4

Subject: Oconee Nuclear Station, Unit 2
Docket No. 50-270

Dear Sir:

This submittal provides supplemental information to a Duke Power letter of December 19, 1984 which transmitted the technical specification amendment request to support the operation of Oconee Unit 2 at full rated power during Cycle 8. Specifically, this submittal provides details of minor changes to be incorporated into the Oconee Startup Physics Test Program which was referenced in the December 19th letter of transmittal.

Within the December 19th letter, it was noted that startup testing of Oconee Unit 2, Cycle 8 will be in accordance with the Oconee Startup Physics Test Program which was initially approved by the Staff in a March 23, 1981 letter, and subsequently modified by Duke letters dated May 29, 1981 and May 19, 1983. The present supplement constitutes an additional modification to this same document.

Please find attached (Attachment 1) pages containing the specific startup physics tests which are being modified (changes are identified by vertical lines). Also attached (Attachment 2) is a detailed justification of the proposed changes to the procedure for determination of the moderator temperature coefficient of reactivity.

Inasmuch as this submittal consists of a supplement to a previously submitted amendment request, as yet unapproved, Duke considers additional license fees to be unjustified.

Very truly yours,

Hal B. Tucker

Hal B. Tucker

RFH:slb

Attachments

IE26 Original 1/1 To: Reg Files

cc: Mr. James P. O'Reilly, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Ms. Helen Nicolaras
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Mr. J.C. Bryant
NRC Resident Inspector
Oconee Nuclear Station

Mr. Heyward Shealey, Chief
Bureau of Radiological Health
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

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Attachment 1

Changes in Startup Physics Test Program

Modifications dated January 1985 for following tests:

- -Critical Boron Concentration
- -Moderator Temperature Coefficient
- -Control Rod Worth

CRITICAL BORON CONCENTRATION

CONDITIONS:

HZP, ~ 532°F, ~ 2155 psig, steady reactor coolant flow (3 or 4 pumps).

PROCEDURE:

Critical boron concentration measurement is taken at the "all-rods-out" (ARO) configuration.

The ARO critical boron concentration is measured by establishing an equilibrium RCS boron concentration at or slightly greater than the predicted ARO critical boron concentration. Control Rod Groups 1-7 are fully withdrawn to perform the Rod Drop Time Test. This rod withdrawal is also the initial approach to criticality. Control Rod Group 8 is maintained at the nominal design position but may be moved, if necessary, for reactivity control and to allow the Rod Drop Test to be performed. Based on the $\frac{1}{M}$ data or critical rod positions (if criticality is achieved), the boron concentration is adjusted to establish criticality at the ARO condition with subsequent rod withdrawal. A sample of the equilibrium boron concentration is then taken and analyzed to determine the critical boron concentration. Since it may not be practical to establish equilibrium critical conditions with Group 7 fully withdrawn, the small amount of inserted worth of Group 7 or worth of Group 8 (from its nominal design position) is measured by a reactivity calculation. This reactivity is then used to adjust the boron concentration to obtain the measured ARO boron concentration.

The uncertainty associated with these measurements is less than 20 ppm B.

The results are reviewed by the Test Coordinator and compared with the predicted boron concentrations. If the difference between the measured and predicted values does not exceed 50 ppm B, the results are acceptable.

FOLLOW-UP ACTIONS

If the difference between measured and predicted critical boron concentration is greater than 100 ppm B, the results will be reviewed by cognizant engineers to determine the appropriate corrective actions required to resolve the discrepancy. This review will be completed, and the results and recommended actions approved by the Technical Review Committee prior to exceeding 5% FP.

If the acceptance criteria is not met, the results will be reviewed by cognizant engineers to determine the appropriate corrective actions required to resolve the discrepancy. This review will be completed and the results and recommended corrective actions approved by the Technical Review Committee prior to 100% FP.

MODEPATOR TEMPERATURE COEFFICIENT

CONDITIONS:

HZP, ~ 532°F, ~ 2155 psig, steady reactor coolant flow (3 or 4 pumps).

PROCEDURE:

The moderator temperature coefficient (MTC) test begins with the reactor at equilibrium critical conditions. The test is performed by executing a change in reactor coolant average temperature of approximately 10 degrees while data is taken. The change in reactivity associated with this maneuver is compensated for by control rod movement as required. After the first temperature plateau is established and data is taken, the reactor coolant temperature is changed 10°F to the second plateau and stabilized. Both temperature plateaus are within 15 degrees of 532°F. Changes in reactivity associated with the induced temperature transient are measured by the reactivity calculation. The measured overall temperature coefficient is then calculated by dividing the change in reactivity between the first and second temperature plateaus by the change in temperature between the first and second temperature plateaus.

This measured temperature coefficient is then corrected to 532°F. The average reactor coolant temperature during the test is the average of the two plateau temperatures. The deviation between this average temperature and 532, ΔT (°F), is multiplied by the temperature rate of change of the temperature coefficient, ΔTC/ΔT (Δk/k/°F/°F), to give the required average temperature correction ΔTC (Δk/k/°F). This correction is made to the measured overall temperature coefficient to give the overall temperature coefficient at 532°F. Finally, the overall temperature coefficient is corrected for the contribution of the isothermal doppler coefficient of reactivity to yield the moderator coefficient of reactivity.

The Reactor Coolant System's average temperature values are obtained by taking the average of hot and cold leg RTD readings. The hold time at each temperature plateau during the test is approximately five minutes.

The measurement uncertainty associated with this measured value varies as a function of the magnitude of the temperature coefficient itself. In all cases within or near the acceptable range of temperature coefficient values, the error is less than $\pm 6.0 \times 10^{-6}$ Δk/k/°F.

The results are reviewed by the Test Coordinator and compared with the predicted MTC. If the difference between the measured and predicted values does not exceed $.30 \times 10^{-4}$ Δk/k/°F, then the results are acceptable.

FOLLOW-UP ACTIONS:

If the measured maximum positive MTC exceeds 0.5×10^{-4} Δk/k/°F, the results will be reviewed by cognizant engineers to determine the appropriate corrective actions required to resolve the discrepancy. This review will be completed and the results and recommended actions approved by the Technical Review Committee prior to exceeding 5% FP.

If the acceptance criteria is exceeded, the results will be reviewed by cognizant engineers to determine the appropriate corrective actions required to resolve the discrepancy. This review will be completed and the results as well as recommended corrective actions approved by the Technical Review Committee prior to 100% FP.

CONTROL ROD WORTH

CONDITIONS:

HZP, ~ 532°F, ~ 2155 psig, steady reactor coolant flow (3 or 4 pumps).

PROCEDURE:

The measurements of regulating group rod worths begin from a critical steady state condition with all regulating groups withdrawn as far as possible (i.e., Group 7 between 93% and 100% withdrawn). From this point, a boron concentration necessary to deborate control rod Groups 7 and 6 to 0% withdrawn and Group 5 to approximately 10% withdrawn is calculated. The deboration is commenced, and chemistry sampling is initiated on a thirty minute frequency. The resulting reactivity change during deboration is compensated for by discrete insertion of control rods in steps of approximately 500 μρ with these reactivity insertions being recorded by the reactimeter calculation. Differential rod worths for these insertions are then calculated by dividing the difference in reactivity for each insertion by the difference in control rod position, and integral worths are calculated by summing the differential worths for each group.

The results are reviewed by the Test Coordinator and compared with the predicted group worths. If the difference between the measured and predicted individual rod group worths does not exceed 15%, and the difference between the measured and predicted total worth of rod Groups 5, 6 and 7 does not exceed 10%, then the results are acceptable.

FOLLOW-UP ACTIONS:

If the difference between the measured and predicted total worth of rod groups exceeds 10%, then, following calculation of the minimum rod position for which the worth of the control rods withdrawn would equal 1% $\Delta k/k$, additional rod group worths will be measured. The worths of safety rod groups will be measured in sequence from Group 4 to Group 1, until either the difference between the measured and predicted total worth of all rod groups measured does not exceed 10%, or the minimum rod position calculated above is reached in which case additional testing will be performed. The results will be reviewed by cognizant engineers to determine the appropriate additional corrective actions required to resolve the discrepancy. This review will be completed and the results as well as the recommended actions approved by the Technical Review Committee prior to exceeding 5% FP.

If the difference between the measured and predicted individual rod groups worths exceeds 15%, the results will be reviewed by cognizant engineers to determine the appropriate corrective actions required to resolve the discrepancy. This review will be completed prior to reaching 100% FP.

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Attachment 2

Justification for Change in MTC Test

JUSTIFICATION FOR CHANGE IN MTC TEST

The equation used to calculate the overall temperature coefficient at 532°F will be:

$$\alpha_{\substack{T overall \\ (532)}} = \frac{\Delta\rho_{12}}{\Delta T_{12}} + \left[\left(\frac{T_1 + T_2}{2}\right) - 532 \right] \left(\frac{\Delta\alpha_T}{\Delta T}\right)$$

where: $\alpha_{T_{overall}}$ - overall temperature coefficient at 532°F (includes moderator temperature coefficient and isothermal doppler coefficient).

$\frac{\Delta\rho_{12}}{\Delta T_{12}}$ - measured overall temperature coefficient between between plateau 1 and plateau 2.

$\left(\frac{T_1 + T_2}{2}\right)$ - average reactor coolant temperature for the test.

and $\left(\frac{\Delta\alpha_T}{\Delta T}\right)$ - predicted temperature rate of change of the overall temperature coefficient.

The predicted temperature rate of change of the overall temperature coefficient will be supplied in the Physics Test Manual each cycle by Nuclear Design. The factor which dominates the temperature rate of change of the overall temperature coefficient is the rate of change of moderator density with temperature. The rate of change of moderator (water) density with temperature is fairly constant, especially over a small temperature interval. Therefore, this approximation is valid.

Nuclear Design has supplied the following data for Oconee 2 Cycle 8 in support of this change:

MODERATOR TEMPERATURE	TEMPERATURE COEFFICIENT
522 °F	1.250×10^{-5} % ΔK/K/°F
532 °F	0.157×10^{-5} % ΔK/K/°F
542 °F	-0.964×10^{-5} % ΔK/K/°F

The temperature coefficients at a given temperature are calculated from K-eff at +/- 10°F from that temperature. The temperature rate of change of the temperature coefficient is calculated from these data in a similar manner:

MODERATOR TEMPERATURE	$(\Delta\alpha_T/\Delta T)$
527 °F	1.09×10^{-6} % ΔK/K/°F/°F
537 °F	1.12×10^{-6} % ΔK/K/°F/°F

These data can be considered typical.