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SUBJECT:
FORWARDING APPLICANT"S STARTUP REPT FOR SUBJECT FACILITY, CYCLE 4.

PLANT NAME: OCONEE - UNIT 1

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DUKE POWER COMPANY
POWER BUILDING
422 SOUTH CHURCH STREET, CHARLOTTE, N. C. 28242

WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

April 17, 1978

TELEPHONE: AREA 704
373-4083

Mr. Edsón G. Case, Acting Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Robert W. Reid, Chief
Operating Reactors Branch No. 4

Reference: Oconee Unit 1
Docket No. 50-269

Dear Sir:

Attached for your information is the Startup Report for Oconee 1, Cycle 4.

Very truly yours,

W. O. Parker, Jr. By [signature]

William O. Parker, Jr.

GBS:ge

Attachment

A001 S 1/1

DUKE POWER COMPANY

OCONEE NUCLEAR STATION

UNIT 1, CYCLE 4

STARTUP TESTING SUMMARY

DUKE POWER COMPANY
OCONEE NUCLEAR STATION
UNIT 1, CYCLE 4
STARTUP TESTING SUMMARY

I. INTRODUCTION

The Cycle 4 Startup Test Program for Oconee Unit 1 consisted of pre-critical tests, zero power physics tests, and power escalation tests. This report provides a summary of the zero power and power escalation test results and includes, where appropriate, comparisons of measured and predicted values of important core parameters.

The zero power physics testing was initiated on October 14, 1977, and was completed on October 16, 1977. Testing was conducted with the reactor at Hot Zero Power conditions (532°F, 2155 psig, and 0% FP). The core parameters measured included all-rods-out critical boron concentration, isothermal temperature and moderator coefficients of reactivity, individual control rod groups and total group reactivity worths, ejected rod worth measurements, and differential boron worth measurements. The measurements and results are further described in Section II.

Following satisfactory completion of zero power physics testing, the power escalation testing began on October 17, 1977, and was completed on January 19, 1978. The protracted term of this testing was due to operational problems caused by the identification of a quadrant power tilt and the extensive testing performed during the evaluation of the tilt and the occurrence of two RCS leaks requiring unit shutdowns. The power escalation tests included core power distribution measurements at approximately 40% FP, 75% FP and 100% FP, power imbalance detector correlation tests, and measurements of reactivity coefficients at power. Section III describes the individual tests in more detail and summarizes the results of these tests.

II. ZERO POWER PHYSICS TESTING

A. Initial Criticality

Cycle 4 initial criticality was achieved on Oconee 1 at 21:26 hours on October 14, 1977 by first withdrawing control rods (Group 7 to 75% withdrawn and Group 8 to 37.5% withdrawn) and initiating a continuous but regulated feed and bleed deboration of the Reactor Coolant System. Inverse multiplication plots versus boron concentration and time were maintained, and the feed and bleed was terminated when these plots reached a value of approximately 0.15. Criticality was achieved with equilibrium conditions reached at 23:20 hours with Control Rod Group 7 at 82% withdrawn and a Reactor Coolant System boron concentration of 1310 ppm.

This measured critical boron concentration of 1310 ppm met the acceptance criterion of 1302 ppm $\pm$100 ppm.

B. All Regulating Rods Out Boron Concentration

The all rods out configuration was achieved by boration of Control Rod Group 7 to 100% withdrawn, and then achieving an equilibrium boron condition within the Reactor Coolant System. The Reactor Coolant System boron concentration at these equilibrium conditions was sampled and measured to be 1334 ppm.

This value of 1334 ppm met the acceptance criterion of 1328 ppm $\pm$100 ppm.

C. Temperature Coefficients of Reactivity

The hot zero power temperature coefficients of reactivity were measured at two control rod configurations - all rods out (Group 8 inserted) and Groups 5-7 fully inserted. The test consisted of sequentially changing the RCS temperature by -5°F, +10°F, and -5°F and by measuring the associated changes in the core reactivity. The temperature coefficient was obtained by dividing the reactivity changes by the corresponding temperature changes. The moderator coefficient of reactivity was obtained by subtracting the predicted isothermal Doppler coefficient from the temperature coefficient.

The measured moderator and temperature coefficients of reactivity are shown in Table 1 along with their predicted values. The test satisfactorily met the acceptance criteria requiring the measured and predicted reactivity coefficients to agree within a tolerance of $\pm 0.4 \times 10^{-4}$ $(\Delta K/K)/°F$ and requiring the measured moderator coefficient to be less than $+0.5 \times 10^{-4}$ $(\Delta K/K)/°F$.

D. Control Rod Worth Measurements

Group integral and differential worths were obtained for Control Rod Groups 5 through 7 with Group 8 at 37.5% withdrawn by deboration from an all-rods-out configuration. The measured reactivity

worths of the Regulating Control Rod Groups 5 through 7 met the acceptance criteria requiring the predicted worth of the individual groups to be within ±15% of the measured value and the predicted total worth of the regulating groups to be within ±10% of the measured value. Table 2 illustrates the control rod worth measurement data as well as comparisons to pertinent predicted values.

E. Boron Worth Measurements

A measured differential boron worth of 1.069%(ΔK/K)/100ppm was obtained, which met the acceptance criterion of 0.998%(ΔK/K)/100ppmb ±10% of measured value.

F. Ejected Rod Worth Measurement

In order to measure the worst case ejected control rod worth, Rod 4 in Control Rod Group 6 (predicted to be the most reactive rod) was borated out of the core while Control Rod Group 5 was maintained at 17% withdrawn and Control Rod Group 8 at 37.5% withdrawn. The measured worth of rod 6-4 was found to be much less than the predicted worth. Due to this low measured value, it was decided to measure the worths of each of the seven remaining rods in Group 6. (Group 6 rods are arranged in the core in two concentric rings, each ring containing four rods in ¼ core symmetric locations). The measured individual rod worths (error-adjusted) varied between 0.42% ΔK/K and 0.58%ΔK/K for the control rods located in the outer ring and between 0.32%ΔK/K and 0.35%ΔK/K for the control rods located in the inner ring.

The maximum measured worth of 0.58%ΔK/K met the acceptance criteria requiring the ejected rod worth to be less than or equal to 1%ΔK/K and to be within ±20% of the predicted value of 0.58%ΔK/K. However, the significant variation of the worths of control rods located in symmetric locations as observed during this test suggested the possibility of an asymmetric radial flux distribution in the core. As a result, a reverification of the fuel assembly loading and control rod arrangement was undertaken to confirm that no core loading errors occurred.

The video tape of the as-loaded core was reviewed, and the identification numbers of each fuel assembly and the type of control components were compared to the design core loading diagram, and no discrepancies were identified. In addition, the control rod group power supply connections were checked and verified to be correct. These evaluations confirmed that the core had been loaded and control rods arranged in accordance with the prescribed design. Since the zero power physics results met the prescribed acceptance criteria and since the core loading was confirmed to be correct, it was decided to take the unit to 40% FP in a controlled manner to obtain the necessary core power distribution data to further evaluate the observed asymmetry in the control rod worth distribution. These evaluations are described in Section III.

III. POWER ESCALATION SEQUENCE TESTING

Oconee 1 Cycle 4 Power Escalation Sequence Testing was considerably extended because of asymmetry in the radial flux distribution in the core, identified during the Cycle 4 startup testing. The asymmetric radial flux distribution, observed as asymmetry in the control rod worth distribution at zero power, developed into a quadrant power tilt when the reactor attained 15% FP. Several tests and analyses were performed to characterize the tilt and to determine its cause. The normal power escalation test sequence was modified because of the additional testing performed to characterize the tilt and because of the restrictions imposed on power level and control rod positions as a result of the tilt. A summary of the tests performed to characterize the tilt is given below, followed by the results of the power escalation tests. A complete analysis of the tilt is given in the B & W Topical Report BAW-1477, "Oconee 1 Cycle 4 Quadrant Flux Tilt," January 1978.

A. Evaluation of the Quadrant Power Tilt

The power distribution generated by the incore detector system at 15% FP showed a quadrant power tilt of +6% in the WX quadrant and approximately -7% in the diagonally opposite quadrant. This result was consistent with the ejected rod worth data and was also qualitatively indicated independently on the out-of-core detectors. With subsequent escalation to 40% FP, the tilt decreased to approximately +3% and -4% at 3.5 EFPD.

A testing program was initiated following confirmation of the power tilt at 15% FP. Each test was designed to either confirm or rule out a potential source of the tilt. A rod exercise test at 15% FP verified that no rods in the low power quadrant were uncoupled. The tilt remained when an all rods out test was performed at 40% FP, ruling out a control rod drive mispatch between different rod groups. The next test carried out at 30% FP was full insertion of each rod group for a period of two hours. This test was designed to determine if the tilt source could be identified with one rod group. If one or more fingers of a control rod had broken off and remained in a fuel assembly during rod withdrawal, full insertion would regain a symmetric poison distribution and the tilt would diminish with xenon redistribution during the two hour testing duration. The results of this test showed that the tilt did change as different rod groups were moved into and out of the core, but no rod configuration induced a confirming effect. Therefore, the source of the tilt being associated with any control rod or rod group was ruled out. The final test, performed at 100% FP after resolution of the tilt concern, was the insertion of movable incore detector probes into four symmetric core locations in both the maximum and minimum tilted quadrants. This measurement confirmed quantitatively and independently the power tilt calculated by the incore detector system and the plant computer.

The results of the testing program and the verification of the reload core loading, and the review of reload design analyses did not identify a source for the tilt, but did rule out many potential sources. One potential source which could not be ruled out was that a small tilt that did exist in the previous cycle had been carried over and amplified by the reload design shuffle scheme.

Technical Specifications required modifications in order to accommodate and justify conservatively safe operation with the power tilted core. At the 40% FP power level testing plateau, it was decided to switch to an all rods out mode of operation in order to improve the power distribution, to reduce the worth of inserted rods at power, and to provide additional shutdown margin. Part length rods remained inserted to perform their normal function. NRC approval was obtained separately for operation at 75% FP, 100% FP up to 100 EFPD, and 100% FP after 100 EFPD, in an all rods out mode of operation with increased tilt limits. As the cycle progressed, the tilt was closely monitored and experienced a steady and continuous decrease to normally acceptable values as it burned itself out. The evaluation of the tilt and subsequent operation was conducted in a manner which assured conservatively safe operation at all times.

B. Core Power Distribution Results

Core power distribution measurements were performed at 40% FP, 75% FP, and 100% FP in order to verify that the measured power distribution is consistent with the predicted distribution. Corrected instrument readings from the incore instrumentation were taken from the process computer while the plant was operating at these power plateaus and were then compared to calculated power distributions at comparable burn-up, rod pattern, boron concentration, and power levels.

The results of these comparisons are shown on the enclosed eighth core maps of radial and total peaking factors. (Figures 1-6). Acceptance criteria for the radial and total peaking factors were modified because of the existence of the quadrant power tilt. The following acceptance criteria were used at the three power level testing plateaus.

40% FP Acceptance Criteria

The largest measured radial peak $\leq$ 115% of the largest predicted radial peak.

The largest measured total peak $\leq$ 117.5% of the largest predicted total peak.

75% FP and 100% FP Acceptance Criteria

The largest measured radial peak $\leq$ 105% + 1.67x(Measured Tilt (%) + 0.4)% of the largest predicted radial peak.

The largest measured total peak $\leq$ 107.5% + 1.67x(Measured Tilt (%) + 0.4)% of the largest predicted total peak.

These acceptance criteria for the core power distribution measurements at 40% FP, 75% FP, and 100% FP were met.

During the execution of the core power distribution test, the following parameters were checked:

1. SPND background readings and background corrections
2. Reactor power imbalance values
3. Worst case extrapolated minimum DNBR
4. Quadrant power tilt
5. Extrapolated worst case maximum linear heat rate
6. Non-extrapolated worst case maximum linear heat rate
7. Tilt and imbalance values from back-up incore detectors.

Table 3 provides the results of the minimum DNBR and maximum linear heat rate measurements and extrapolations and shows that all values, both extrapolated and measured, met the acceptance criteria.

C. Power Imbalance Detector Correlation Test Results

The Power Imbalance Detector Correlation Test was performed initially at the 40% testing plateau in order to verify that the out-of-core detectors measurement of offset was sufficiently conservative with respect to the incore measured offset to assure that the tolerance assumed in the safety analysis would be met during full power operation. All four out-of-core detectors were verified to satisfy the desired offset correlation.

Following several days operation at full power, the power imbalance detector correlation test at 75% FP was performed to verify that the out-of-core detectors measure core offset within the tolerances assumed in the Safety Analysis (i.e., out-of-core offset = incore offset $\pm$3.5%). The test verified that all four out-of-core detectors satisfy the desired offset correlation. A comparison of incore detector imbalance to back-up recorder imbalance showed that for all values of imbalance measured the maximum difference was well within the $\pm$7.5% acceptance criteria for incore to back-up incore calculated offset.

D. Reactivity Coefficient at Power

The temperature coefficient of reactivity and the power coefficient of reactivity were measured at the 100% FP testing plateau. The measured temperature coefficient was -1.36×10^{-4} (ΔK/K)/°F which met the acceptance criterion of being less than -0.15×10^{-4} (ΔK/K)/°F for power levels above 95% FP. A maximum negative temperature coefficient limit of -1.54×10^{-4} (ΔK/K)/°F was established for the beginning of this fuel cycle in order to assure that the end-of-cycle moderator temperature coefficient value is not more negative than the value used in the FSAR steamline break analysis. The measured temperature coefficient also satisfied this criterion.

The measured power-Doppler coefficient was -0.72×10^{-4} $(\Delta K/K)/\%FP$. This value is more negative than the upper limit of -0.55×10^{-4} $(\Delta K/K)/\%FP$, and therefore, met the acceptance criterion.

Table 1 also contains the values of the reactivity coefficients measured at the 100% FP testing plateau.

TABLE 1
SUMMARY OF REACTIVITY COEFFICIENTS

	CONDITIONS	MEASURED VALUE	PREDICTED VALUE	ACCEPTANCE CRITERION
HOT ZERO POWER TEMPERATURE COEFFICIENT #1	GPS 5-7@100%WD GP 8@37.5%WD 1324 ppmb	$+0.09 \times 10^{-4} (\Delta K/K)/°F$	$-0.06 \times 10^{-4} (\Delta K/K)/°F$	Predicted $\pm 0.4 \times 10^{-4} (\Delta K/K)/°F$
HOT ZERO POWER MODERATOR COEFFICIENT #1	GPS 5-7@100%WD GP 8@37.5%WD 1324 ppmb	$+0.28 \times 10^{-4} (\Delta K/K)/°F$	$+0.13 \times 10^{-4} (\Delta K/K)/°F$	Predicted $\pm 0.4 \times 10^{-4} (\Delta K/K)/°F$ Less than $\mp 0.5 \times 10^{-4} (\Delta K/K)/°F$
HOT ZERO POWER TEMPERATURE COEFFICIENT #2	GPS 6&7@0%WD GP 5@17%WD GP 8@37.5%WD 1057 ppmb	$-0.70 \times 10^{-4} (\Delta K/K)/°F$	$-0.73 \times 10^{-4} (\Delta K/K)/°F$	Predicted $\pm 0.4 \times 10^{-4} (\Delta K/K)/°F$
HOT ZERO POWER MODERATOR COEFFICIENT #2	GPS 6&7@0%WD GP 5@17%WD GP 8@37.5%WD 1057 ppmb	$-0.51 \times 10^{-4} (\Delta K/K)/°F$	$-0.53 \times 10^{-4} (\Delta K/K)/°F$	Predicted $\pm 0.4 \times 10^{-4} (\Delta K/K)/°F$ Less than $\mp 0.5 \times 10^{-4} (\Delta K/K)/°F$
HOT FULL POWER TEMPERATURE COEFFICIENT	71 EFPD	$-1.36 \times 10^{-4} (\Delta K/K)/°F$	N/A	Less than $-0.15 \times 10^{-4} (\Delta K/K)/°F$ Greater than $-1.54 \times 10^{-4} (\Delta K/K)/°F$
HOT FULL POWER POWER-DOPPLER COEFFICIENT	71 EFPD	$-0.72 \times 10^{-4} (\Delta K/K)/\%FP$	N/A	Less than $-0.55 \times 10^{-4} (\Delta K/K)/\%FP$

8

TABLE 2

SUMMARY OF CONTROL ROD WORTH MEASUREMENTS

CONTROL ROD GROUP	PREDICTED WORTH (%ΔK/K)	MEASURED WORTH (%ΔK/K)	% DEVIATION FROM MEASURED
Group 7	0.76	0.86	+11.6%
Group 6	0.88	0.89	+ 1.1%
Group 5	1.12	1.24	+ 9.7%
TOTAL 5-7	2.76	2.99	+ 7.7%

TABLE 3

TABULATED RESULTS OF MINIMUM DNBR AND MAXIMUM LINEAR HEAT RATE CALCULATIONS

POWER LEVEL %FP	WORST CASE MAXIMUM LINEAR HEAT RATE (KW/FT)	MAXIMUM ACCEPTABLE WORST CASE MAXIMUM LHR (KW/FT)	WORST CASE MINIMUM DNBR	EXTRA-POLATION POWER LEVEL[1]	WORST CASE EXTRA-POLATED MAXIMUM LHR (KW/FT)	MAXIMUM ACCEPTABLE WORST CASE EXTRAP. MAXIMUM LHR (KW/FT)	WORST[2] CASE EXTRA-POLATED MINIMUM DNBR	MINIMUM ACCEPTABLE WORST CASE EXTRAP. MINIMUM DNBR
39.33	4.96	15.5	9.78	85.0	10.72	20.15	2.79	1.30
74.65	8.93	15.5	4.76	105.5	12.62	20.15	2.79	1.30
98.80	10.75	15.5	3.49	105.5	11.48	20.15	2.83	1.30

1-The extrapolation power level is the overpower trip setpoint of the next power level plateau in the escalation sequence.

2-All cases extrapolated to 105.5%FP

FIGURE 1

40% FP RADIAL PEAKING FACTORS

	8	9	10	11	12	13	14	15
	0.95	1.14	1.18	1.02	1.13	0.92	0.87	0.71
H	0.91	1.09	1.12	0.98	1.15	0.95	0.77	0.69
		1.19	1.22	1.32	1.09	1.07	1.03	0.66
K		1.14	1.29	1.23	1.09	1.09	0.87	0.69
			1.20	1.07	1.09	1.16	1.10	0.56
L			1.07	1.08	1.12	1.13	1.18	0.61
				1.25	1.05	0.87	0.86	
M				1.21	1.09	0.94	0.92	
					0.89	0.95	0.59	
N					0.94	1.12	0.66	
						0.67	Measured	
O						0.76	Predicted	

Largest Measured Peak = 1.32
Largest Predicted Peak = 1.29

Deviation From Predicted = +2.32%

Core Conditions for Predicted Peaking Factors

Group 6 = 100% wd

Group 7 = 77.4% wd

Group 8 = 45.2% wd

Imbalance = +0.30% FP

Core Burnup = 3 EFPD

Core Conditions for Measured Peaking Factors

Group 6 = 100% wd

Group 7 = 81.0% wd

Group 8 = 47% wd

Imbalance = -0.31% FP

Core Burnup = 3.2 EFPD

FIGURE 2

40% FP TOTAL PEAKING FACTORS

	8	9	10	11	12	13	14	15
	1.20	1.45	1.51	1.35	1.47	1.14	1.10	0.96
H	1.08	1.31	1.34	1.16	1.39	1.16	1.02	0.90
		1.50	1.80	1.66	1.34	1.40	1.36	0.83
K		1.35	1.56	1.49	1.34	1.33	1.09	0.89
			1.48	1.33	1.67	1.48	1.39	0.71
L			1.38	1.33	1.49	1.39	1.48	0.77
				1.63	1.40	1.11	1.04	
M				1.46	1.32	1.13	1.14	
					1.09	1.26	0.74	
N					1.13	1.37	0.82	
						0.84		
O						0.93		

0.84 Measured
0.93 Predicted

Largest Measured Peak = 1.80
Largest Predicted Peak = 1.56

Deviation From Predicted = +15.38%

Core Conditions for Predicted Peaking Factors

Group 6 = 100% wd

Group 7 = 77.4% wd

Group 8 = 45.2% wd

Imbalance = +0.31% FP

Core Burnup = 3 EFPD

Core Conditions for Measured Peaking Factors

Group 6 = 100% wd

Group 7 = 81.0% wd

Group 8 = 47.0% wd

Imbalance = -0.31% FP

Core Burnup = 3.2 EFPD

FIGURE 3

75% FP RADIAL PEAKING FACTORS

	8	9	10	11	12	13	14	15
	0.98	1.17	1.19	1.04	1.15	0.97	0.91	0.72
H	0.90	1.08	1.11	0.97	1.14	0.95	0.77	0.70
		1.17	1.31	1.34	1.13	1.09	1.06	0.70
K		1.13	1.26	1.22	1.08	1.09	0.87	0.71
			1.22	1.11	1.15	1.19	1.14	0.70
L			1.05	1.07	1.11	1.12	1.18	0.62
				1.28	1.07	0.90	0.91	
M				1.20	1.09	0.95	0.93	
					0.93	1.00	0.62	
N					0.95	1.13	0.68	
						0.70	Measured	
O						0.77	Predicted	

Largest Measured Peak = 1.34
Largest Predicted Peak = 1.26

Deviation From Predicted = +6.35%

Core Conditions for Predicted Peaking Factors

Group 6 = 100% wd

Group 7 = 77.4% wd

Group 8 = 41.9% wd

Imbalance = +1.14% FP

Core Burnup = 5 EFPD

Core Conditions for Measured Peaking Factors

Group 6 = 100% wd

Group 7 = 84.1% wd

Group 8 = 42.3% wd

Imbalance = -0.05% FP

Core Burnup = 6.3 EFPD

FIGURE 4

75% FP TOTAL PEAKING FACTORS

	8	9	10	11	12	13	14	15
	1.17	1.39	1.47	1.31	1.42	1.14	1.08	0.89
H	1.09	1.30	1.31	1.13	1.34	1.13	1.02	0.90
		1.39	1.59	1.61	1.35	1.35	1.32	0.83
K		1.34	1.51	1.43	1.29	1.30	1.08	0.90
			1.43	1.31	1.54	1.43	1.39	0.83
L			1.33	1.27	1.43	1.35	1.46	0.78
				1.58	1.34	1.08	1.05	
M				1.40	1.29	1.11	1.14	
					1.08	1.25	0.74	
N					1.11	1.37	0.83	
						0.83	Measured	
O						0.94	Predicted	

Largest Measured Peak = 1.61
Largest Predicted Peak = 1.51

Deviation From Predicted = +6.62%

Core Conditions for Predicted Peaking Factors

Group 6 = 100% wd

Group 7 = 77.4% wd

Group 8 = 41.9% wd

Imbalance = +1.14% FP

Core Burnup = 5 EFPD

Core Conditions for Measured Peaking Factors

Group 6 = 100% wd

Group 7 = 84.1% wd

Group 8 = 42.3% wd

Imbalance = -0.05% FP

Core Burnup = 6.3 EFPD

FIGURE 5

100% FP RADIAL PEAKING FACTORS

	8	9	10	11	12	13	14	15
	0.95	1.13	1.19	1.06	1.18	0.98	0.89	0.72
H	0.92	1.08	1.11	0.98	1.14	0.96	0.81	0.73
		1.17	1.30	1.30	1.11	1.11	0.97	0.73
K		1.12	1.26	1.21	1.08	1.09	0.89	0.73
			1.10	1.10	1.18	1.17	1.18	0.62
L			1.08	1.07	1.09	1.11	1.17	0.63
				1.26	1.11	0.95	0.92	
M				1.18	1.08	0.94	0.92	
					0.95	1.08	0.67	
N					0.95	1.11	0.68	
						0.73	Measured	
O						0.77	Predicted	

Largest Measured Peak = 1.30
Largest Predicted Peak = 1.26

Deviation From Predicted = +3.17%

Core Conditions for Predicted Peaking Factors

Group 6 = 100% wd

Group 7 = 84.0% wd

Group 8 = 38.0% wd

Imbalance = +1.80% FP

Core Burnup = 28.4 EFPD

Core Conditions for Measured Peaking Factors

Group 6 = 100% wd

Group 7 = 82.8% wd

Group 8 = 34.8% wd

Imbalance = -2.40% FP

Core Burnup = 28.4 EFPD

FIGURE 6

100%FP TOTAL PEAKING FACTORS

	8	9	10	11	12	13	14	15
H	1.11	1.30	1.40	1.24	1.36	1.11	1.08	0.91
	1.08	1.28	1.28	1.14	1.32	1.10	0.98	0.89
K		1.37	1.49	1.49	1.31	1.38	1.18	0.86
		1.33	1.47	1.41	1.29	1.26	1.03	0.87
L			1.35	1.25	1.46	1.34	1.37	0.74
			1.30	1.31	1.46	1.32	1.34	0.76
M				1.44	1.29	1.05	1.06	
				1.42	1.30	1.10	1.08	
N					1.06	1.27	0.77	
					1.11	1.29	0.79	
O						0.85	Measured	
						0.90	Predicted	

Largest Measured Peak = 1.49
Largest Predicted Peak = 1.47
Deviation from Predicted = +1.36%

Core Conditions for Predicted Peaking Factors

Group 6 = 100% WD

Group 7 = 84% WD

Group 8 = 38% WD

Imbalance = +1.80% FP

Core Burnup = 28.4 EFPD

Core Conditions for Measured Peaking Factors

Group 6 = 100% WD

Group 7 = 82.8% WD

Group 8 = 34.8% WD

Imbalance = -2.40% FP

Core Burnup = 28.4 EFPD