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Duke Power Company
P.O. Box 33198
Charlotte, N.C. 28242

HAL B. Tucker
Vice President
Nuclear Production
(704)373-4531

DUKE POWER

August 20, 1990

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Subject: Oconee Nuclear Station
Docket No. 50-269
Unit 1 Cycle 13 Startup Testing Report

Gentlemen:

Pursuant to Oconee Nuclear Station Technical Specification 6.6.1.1 attached is the Startup Test Report for Oconee Unit 1, Cycle 13. Part I of the report contains Zero Power Physics Test information. Part II contains Power Escalation Test results.

Very truly yours,

Hal B. Tucker

PJN/132/lcs

cc: Mr. S. D. Ebneter
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

Mr. L. A. Wiens
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. P. H. Skinner
NRC Resident Inspector
Oconee Nuclear Station

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DUKE POWER COMPANY

OCONEE NUCLEAR STATION

OCONEE 1 CYCLE 13

STARTUP TESTING REPORT

Part I: Zero Power Physics Test

Part II: Power Escalation Test

Prepared by: E. D. Price Jr.

OCONEE 1 CYCLE 13
Startup Testing Report
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Part I: Zero Power Physics Test

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Enclosures

OCONEE 1 CYCLE 13
STARTUP TESTING REPORT

PART I

ZERO POWER PHYSICS TEST

1.0 Introduction and Summary

The Oconee 1 Cycle 13 Zero Power Physics Test (ZPPT) was conducted from 6/2/90 through 6/6/90 per Station Procedure TT/1/A/0711/13. The purpose of this testing was to verify the nuclear parameters upon which the Oconee 1 Cycle 13 safety analysis and Technical Specifications are based.

Zero Power Physics Testing measurements were made with reactor power controlled between 2.0×10^{-10} amps and 5.8×10^{-8} amps on the intermediate range instrumentation; reactivity insertions were maintained < 1100 $\mu\rho$. RCS pressure and temperature were maintained at approximately 2155 psig and 532°F, respectively.

The following nuclear parameters were measured:

(a) All-Rods-Out Boron Concentration (See Enclosure 1.0);

(b) Temperature and Moderator Coefficients of Reactivity (See Enclosure 2.0);

(c) Integral Rod Worth for Control Rod (CR) Groups 4, 5, 6, and 7 (See Enclosure 2.0);

(d) Differential Boron Worth (See Enclosure 1.0).

The plant computer was used to record RC pressure, RC temperature, intermediate range power levels, and control rod positions. Reactivity was calculated by the plant computer and output to a chart recorder.

On 6/6/90 at 1135, ZPPT was declared complete. All acceptance criteria were met except for the Group 5 rod worths which deviated 17.4% from the predicted values.

2.0 Approach to Criticality

The initial RCS heatup following the refueling outage began on 6/3/90. Hot shutdown was reached on 6/3/90 at approximately 2300. Source range count rates were recorded and 1/M (inverse multiplication) vs clock time plots were generated during heatup from approximately 285°F to 452°F while deboration was in progress. No anomalies were noted.

Rod withdrawal for the Control Rod Drive Trip Time Test (CRDTTT) began at 2300 on 6/4/90. The CRDTTT was performed entirely at hot shutdown conditions (i.e., $\geq$ 1% $\Delta k/k$ shutdown) per station procedure IP/0/A/0330/3A. 1/M data was taken as Rod Groups 1 and 2 were withdrawn to their upper limits in order to ensure that criticality would not occur during this step. Rod Groups 3 through 7 were withdrawn individually. The CRDTTT was completed at 0300 on 6/5/90 with the acceptance criteria being satisfied.

1/M vs. withdrawn rod worth plots were maintained throughout the withdrawal of Rod Groups 1 and 2 for the Trip Time Test, then again beginning with Group 3 during the subsequent approach to criticality. Criticality was achieved at 1500 on 6/5/90 with rod groups 1-6 at 100% wd, group 7 at 93.6% wd, group 8 at 35.8% wd, 533.2°F RCS average temperature, and RCS boron concentration at 1714 ppmB.

3.0 Pre-Physics Measurements

After establishing steady conditions with the reactor critical, NI overlap was verified and recorded. The point of adding sensible heat was determined. From the sensible heat determination, the upper testing limit on the intermediate range NIs (as indicated on the Control Room Chart) was established for ZPPT.

An on-line OAC reactimeter checkout* was then performed by making reactivity insertions of about ± 500 and ± 1000 $\mu\rho$, and measuring the associated doubling times. These doubling times were input to an off-line reactivity calculation and the results compared to the on-line reactivity values.

*NOTE: An off-line OAC reactimeter checkout was performed during RCS heatup. This checkout verified correct calculational and chart recorder response to three test cases in which simulated power ramps were input via floppy disks.

4.0 Physics Testing

A. All Rods Out Boron Concentration Measurement

The RCS equilibrium boron concentration was measured with Groups 1-6 at 100% wd, Group 7 at 96.5% wd, and APSR Group 8 at 34.7% wd. The control rods were moved to their all-rods-out position (Groups 1-7 at 100% wd, Gp. 8 at 35% wd) and the associated reactivity change was converted to ppmB. The All Rods Out Boron concentration was then calculated and verified to be within 50 ppmB of its predicted value.

B. Reactivity Coefficient Measurements

The temperature coefficient measurement was made while maintaining equilibrium boron concentration in the RCS, with CR Group 7 withdrawn to 95.5% wd and with APSR Group 8 at 34.7% wd. This measurement was made by varying RCS temperature by approximately 8°F and observing the associated reactivity change. The change in reactivity was divided by the change in RCS temperature to calculate the temperature coefficient. The measured temperature coefficient was corrected for the difference in RCS average test temperature and reference temperature (532°F). The moderator temperature coefficient was calculated by subtracting the predicted isothermal Doppler coefficient from the measured temperature coefficient.

C. Control Rod Integral Worths and Differential Boron Worth Measurement

The worths of CR Groups 4, 5, 6, and 7 were measured by steadily deborating the RCS and compensating for the resulting positive reactivity ramp by inserting (in discrete steps of ~1000 μρ) the control rods from 100% wd on Group 7 to 0% wd on Group 4 (with no rod overlap). The reactivity changes resulting from the discrete control rod insertions were summed for each group to obtain the group integral worth.

The results of the rod worth measurements test revealed that Group 5 worth differed 17.4% from the predicted value and did not meet the acceptance criterion of ± 15% deviation. Group 7 worth deviated 13.4% from predicted but still met the acceptance criteria. Safety Group 4 worth was measured in order to meet the allowable total rod worth deviation of ± 10% from predicted values.

Per the Oconee Generic Startup Testing Program, an evaluation of the Group 5 anomaly was required prior to reaching 100% FP. Based on review of Intermediate Power Range Testing data by GO Nuclear Design, and considering that the measured rod worths of Groups 5 and 7 were conservative relative to predicted values, it was decided to escalate to 100% FP. GO Nuclear Design will be issuing a Memorandum to File describing their evaluation.

The differential boron worth was calculated by dividing the total rod worth of groups 5, 6, and 7 inserted during the rod worth measurements (not including Group 4) by the corresponding change in RCS boron concentration. The initial value for the boron concentration was recorded at critical equilibrium conditions. The final values of boron concentration and reactivity were recorded as they approached steady-state at a rate of less than 80 μρ/minute.

PART II

POWER ESCALATION TEST

1.0 Introduction and Summary

The Oconee 1 Cycle 13 Power Escalation Test was performed between 6/6/90 and 6/28/90 per Station Procedure PT/0/A/0811/01. Testing was performed at 14% Full Power (FP), 51% FP, 73% FP, and 93% FP to verify nuclear parameters upon which the Oconee 1 Cycle 13 safety analysis and Technical Specifications are based. The following tests and verifications were performed:

(a) Initial Core Symmetry Check @ 14% FP;

(b) NSS Heat Balance @ 14% FP, 74% FP, and 93% FP (See Enclosure 3.0);

(c) Incore Detector Checkout @ 14% FP, 50% FP and 93% FP;

(d) Power Imbalance Detector Correlation Slope Measurement @ 73% FP;

(e) Core Power Distribution @ 14% FP, 51% FP and 93% FP (See Enclosures 4.0-4.3 and 5.0);

(f) All-Rods-Out Critical Boron Concentration @ 93% FP (See Enclosure 1.0).

The unit reached 14% FP at 1600 on 6/6/90. Low power testing (LPT) was completed at 2000 that same day. The unit reached 74% FP at 1200 on 6/7/90. During this period several incore detector failures were noted to have rendered the backup recorders inoperable. A work request was generated to investigate the cause of the failures. Operations also experienced heater drain pump problems that limited power to less than 80% FP. The incore problems were resolved by I&E and testing at this intermediate plateau was completed at 1800 on 6/9/90. The unit reached 93% FP on 6/11/90 at 0300. Preliminary full power testing (FPT), consisting of Incore Detector Checkout, Thermal Hydraulic calculation extrapolations, and NSS Heat Balance, was performed at this power level. FPT was concluded at 1630 on 6/28/90. Power Escalation Testing was declared complete the same day.

2.0 NSS Heat Balance/RC Flow Verification

Off-line secondary and primary heat balances were performed at 14% FP (primary only), 74% FP, and 94% FP. These tests verified the accuracy of the Core Thermal Power Applications (CTPA), the on-line plant computer program which performs primary and secondary heat balances. OAC computer points (temperatures, pressures, flow-rates etc.) are trended via the Emergency Data Transmittal PC. Using this data, the Reactor Group PWRCALC PC program calculates RCS % design flow, verifies Primary/Secondary Power from the Primary/Secondary heat balance, and compares RPS flow values. The results were compared to CTPA averages for the same period, and agreement within 2% FP was verified.

The PWRCALC program results demonstrated that the RC flow rate was above that assumed in the core design (108.5% design flow).

Normalization of the plant computer flow constants (used to calculate flow from the primary delta-P instrumentation) was performed at FPT and the on-line power calculations were then verified to agree within 2% FP.

3.0 Core Power Distribution

Core Power Distribution tests were conducted at 51% FP and at 93% FP. These tests verified that reactor power imbalance, quadrant power tilt, minimum DNBR, maximum linear heat rate (LHR) and radial/total power peaks did not exceed their respective specified limits. An initial Core Symmetry Check was performed at 14% FP. All acceptance criteria were met.

Specific checks were made as follows:

Incore imbalance was compared to the error adjusted imbalance LOCA limit curve and was verified to be within specified limits (based on Tech Spec 3.5.2.6).

The maximum positive quadrant power tilt was verified to be less than the error adjusted LOCA limit (based on Tech Spec 3.5.2.4).

The LHR was verified to be within the LOCA limit at each core level (per Reload Report DPC-RD-2015).

The worst case minimum DNBR and maximum LHR, when extrapolated to the overpower trip setpoint, were verified to be within the clad failure and fuel melt limits, respectively (per Tech Spec 2.1 and Reload Report).

Prior to performing the radial and total peaking factor comparisons, PT/0/B/0302/06 (Review and Control of Incore Neutron Detector Signals) was performed to identify erroneous SPND signals. This test was performed at 14% FP as part of Core Symmetry Verification, and at 73% FP and 93% FP as directed in the Incore Detector Checkout Enclosure.

The radial and total peaking factors were measured and compared to the predicted values at 73% and 93% FP. The following acceptance criteria were applied:

(a) $$\% \text{ Deviation} = \frac{(\text{Predicted} - \text{Measured})}{\text{Measured}} \times 100$$

$$\leq \begin{cases} \pm 15\% \text{ for radial peaking factors} \\ \pm 20\% \text{ for total peaking factors (recommended maximum deviation - not an acceptance criterion)} \end{cases}$$

(b) $$\text{Largest Peak \% deviation} = \frac{LMP-LPP}{LMP} \times 100$$

$$\leq \begin{cases} + 5.0\% \text{ for radial peaking factors} \\ + 7.5\% \text{ for total peaking factors} \end{cases}$$

Where: LMP is the largest measured peaking factor
LPP is the largest predicted peaking factor

(c) The <u>full core</u> root mean square radial peaking factor deviation (RMS) for all core locations with <u>operable</u> incore detector strings was limited as follows:

$$\% \text{ RMS deviation} = \left[\sum_{i=1}^{n} \frac{(PP_i - MP_i)^2}{n - 1} \right]^{\frac{1}{2}} \times 100 \quad \leq 7.5\%$$

Where: PP = Predicted radial peaking factor
MP = Measured radial peaking factor
n = Total number of operable incore detector strings

Note: OAC computer substitutions for core locations with inoperable detectors was allowed during FPT.

4.0 <u>Power Imbalance Detector Correlation</u>

The Power Imbalance Detector Correlation Test was performed at 73% FP. The purpose of this test was to measure the excore to full incore power imbalance correlation slopes for NI Channels 5, 6, 7, and 8, and to verify these slopes to be equal to or greater than 0.95.

The incore/excore imbalance correlation slope for each NI Channel (5-8) was determined by a least squares fit of excore to incore imbalance indications. A total of 11 incore imbalance points which ranged between -8.36% and +2.05% FP were used. All the slopes were verified to be greater than 0.95.

The correlation slopes for NI Channels 5, 6, 7, and 8 were calculated to be 1.241, 1.248, 1.246, and 1.231, respectively.

5.0 Reactivity Measurement at Power

Per the Oconee Generic Startup Physics Test Program (May 1986 reissue), testing for measurement of reactivity coefficients at power is no longer required. The All Rods Out Critical Boron at Power measurement was made at 93% FP, and the boron anomaly between measured and predicted concentration was verified to be less than 50 ppmB.

OCONEE 1 CYCLE 13

STARTUP REPORT

ENCLOSURE 1.0

ALL-RODS-OUT (ARO) BORON AND DIFFERENTIAL BORON WORTH RESULTS

	Zero Power ARO Critical Boron Concentration	At-Power ARO Critical Boron concentration	Differential Boron Worth
CONDITIONS	0% FP, 0 EFPD Gp 7 @ 100% wd Gp 8 @ 35% wd (Initial critical equilibrium: Gp 7 @ 96.5 wd Gp 8 @ 34.7% wd 1717 ppmB)	100% FP, 4.3 EFPD Gp 7 @ 100% wd Gp 8 @ 35% wd (Conditions at time of Measurement: Gp 7 @ 91.6% wd Gp 8 @ 35% wd 93% FP, 1211 ppmB)	Initial: Gp 7 @ 100% wd Gp 8 @ 35% wd 1718 ppmb Final: Gp 4 @ 100% wd Gp 5 @ 0% wd Gp 8 @ 35% wd 1311 ppmB
MEASURED VALUE	1721 ppmB	1194 ppmB	- 0.8880% Δk/k per 100 ppmB
PREDICTED VALUE	1723 ppmB	1168 ppmB	- 0.8350% Δk/k per 100 ppmB
DEVIATION	- 2 ppmB	+ 26 ppmB	- 5.90% (% Dev = $\frac{\text{Pred - Meas}}{\text{Meas}}$ X 100)
ACCEPTANCE CRITERIA	Predicted ± 50 ppmB	Predicted ± 50 ppmB	Measured more positive than - 1.33% Δk/k and ± 15% deviation from predicted

OCONEE UNIT 1 CYCLE 13 STARTUP REPORT

ENCLOSURE 2.0

INTEGRAL GROUP ROD WORTH MEASUREMENTS

PARAMETER	MEASURED VALUE (% Δk/k)	PREDICTED VALUE (% Δk/k)	DEVIATION* (%)	ACCEPTANCE CRITERIA
Gp 7 Integral Worth	1.008	0.873	-13.4	± 15% Deviation
Gp 6 Integral Worth	0.938	0.992	5.8	± 15% Deviation
Gp 5 Integral Worth	1.700	1.403	-17.4	± 15% Deviation
Gp 4 Integral Worth	0.705	0.681	- 3.4	± 15% Deviation
Gp 4-7 Integral Worth	4.351	3.949	- 9.2	± 10% Deviation

REACTIVITY COEFFICIENTS

* % Deviation = $\frac{\text{predicted-measured}}{\text{measured}} \times 100$

PARAMETER	CONDITIONS	MEASURED VALUE	PREDICTED VALUE	DEVIATION (Meas - Pred)	ACCEPTANCE CRITERIA
Hot Zero Power Temperature Coefficient (ARO)	T_{av} = 537°F Gp 7 @ 95.5% wd Gp 8 @ 34.7% wd 1717 ppmB	4.057×10^{-6} Δk/k/°F	-3.49×10^{-6} Δk/k/°F	$+7.55 \times 10^{-6}$ Δk/k/°F	Deviation Less than $\pm 0.3 \times 10^{-4}$ Δk/k/°F
Hot Zero Power Moderator Temperature Coefficient (ARO)		2.014×10^{-5} Δk/k/°F	1.259×10^{-5} Δk/k/°F	$+7.55 \times 10^{-6}$ Δk/k/°F	Deviation Less than $\pm 0.3 \times 10^{-4}$ Δk/k/°F and Measured Value ≤ $+0.5 \times 10^{-4}$ Δk/k/°F

OCONEE 1 CYCLE 13

STARTUP REPORT

ENCLOSURE 3.0

NSS HEAT BALANCE/RC FLOW VERIFICATION

Test Plateau	Plant Computer On-Line Primary Power Level (% FP)	Plant Computer On-Line Secondary Power Level	Plant Computer "Delta Temp" Power Level	Off-Line* Calculated Primary Power Level	Off Line* Calculated Secondary Power Level	RCS Flow (% Design Flow)
LPT	13.8	8.8	14.5	13.8	N/A	111.77
IMPT	70.8	74.1	71.8	70.8	74.1	110.52*
FPT	89.9	93.5	90.3	89.9	93.6	110.17*
FPT (adjusted constants)	98.3	98.5	98.6	N/A	N/A	114.11

*Calculated by the off-line secondary heat balance program (PWRCALC)

OCONEE 1 CYCLE 13

STARTUP REPORT

ENCLOSURE 4.0

RADIAL PEAKING FACTORS AT IMPT

	8	9	10	11	12	13	14	15
H	0.92 0.97 5.1%	1.14 1.22 6.9%	1.08 1.12 3.5%	1.30 1.36 4.6%	1.06 1.05 -1.1%	1.19 1.20 0.4%	0.79 0.79 0.4%	0.33 0.33 -0.3%
K		1.21 1.28 5.6%	1.15 1.26 8.8%	1.04 1.09 4.6%	1.38 1.37 -0.7%	1.35 1.34 -0.4%	1.20 1.16 -3.1%	0.39 0.37 -4.4%
L			1.29 1.34 3.6%	1.37 1.38 0.6%	1.02 1.01 -1.7%	1.33 1.34 1.1%	0.92 0.93 0.8%	0.26 0.26 -0.8%
M				1.11 1.06 -4.6%	1.39 1.34 -4.2%	1.10 1.09 -0.4%	0.45 0.47 3.3%	
N					**** 1.22 ****	1.09 1.12 2.6%	0.31 0.30 -4.2%	
O						0.44 0.41 -6.4%		

Meas
Pred
% Dev

$$\% \text{ Dev.} = \frac{\text{Predicted - Measured}}{\text{Measured}} * 100$$

Core Conditions

Predicted			Measured		
Power	75.0	%FP	Power	73.0	%FP
Group 5	100	%wd	Group 5	100	%wd
Group 6	100	%wd	Group 6	100	%wd
Group 7	92	%wd	Group 7	93	%wd
Group 8	35	%wd	Group 8	35	%wd
Imbalance	- 0.73	%FP	Imbalance	- 1.02	%FP
Burnup	3	EFPD	Burnup	1.61	EFPD
RCS Boron	1232	ppmB	RCS Boron	1253	ppmB
			Incore tilt		
			WX: -1.57	XY: +1.88	
			YZ: +1.96	ZW: -2.27	

The highest % Deviation is +8.8% at location K-10.
The highest measured radial peak is 1.39 at location M-12.
The largest peak % Deviation is +1.2%.
The full core RMS % Deviation is 4.31% with 48 operable detectors.

**** The Detector in this location is inoperable.

OCONEE 1 CYCLE 13

STARTUP REPORT

ENCLOSURE 4.1

TOTAL PEAKING FACTORS AT IMPT

	8	9	10	11	12	13	14	15
H	1.04 1.12 8.0%	1.31 1.42 8.4%	1.27 1.29 1.7%	1.49 1.57 5.4%	1.21 1.21 -0.4%	1.37 1.38 1.0%	0.89 0.92 3.1%	0.37 0.38 2.4%
K		1.37 1.49 9.1%	1.32 1.46 10.6%	1.17 1.24 6.2%	1.58 1.58 -0.3%	1.57 1.55 -1.1%	1.41 1.37 -3.3%	0.46 0.43 -6.1%
L			1.46 1.54 5.3%	1.57 1.57 -0.1%	1.17 1.17 -0.2%	1.54 1.56 1.3%	1.07 1.08 0.9%	0.29 0.30 2.8%
M				1.26 1.20 -4.8%	1.63 1.55 -5.1%	1.28 1.27 -0.7%	0.51 0.54 5.7%	
N					**** 1.44 ****	1.28 1.33 4.1%	0.34 0.35 2.4%	
O						0.49 0.48 -1.4%		

Meas
Pred
% Dev

$$\% \text{ Dev.} = \frac{\text{Predicted - Measured}}{\text{Measured}} * 100$$

Core Conditions

	Predicted		Measured	
Power	75.0	%FP	73.0	%FP
Group 5	100	%wd	100	%wd
Group 6	100	%wd	100	%wd
Group 7	92	%wd	93	%wd
Group 8	35	%wd	35	%wd
Imbalance	- 0.73	%FP	- 1.02	%FP
Burnup	3	EFPD	1.61	EFPD
RCS Boron	1232	ppmB	1253	ppmB
Incore tilt				
			WX: -1.57	XY: +1.88
			YZ: +1.96	ZW: -2.27

The highest % Deviation is +10.6% at location K-10.
The highest measured total peak is 1.63 at location M-12.
The largest peak % Deviation is +3.4%.
The full core RMS % Deviation is 5.83% with 48 operable detectors.

**** The Detector in this location is inoperable.

OCONEE 1 CYCLE 13

STARTUP REPORT

ENCLOSURE 4.2

RADIAL PEAKING FACTORS AT FPT

	8	9	10	11	12	13	14	15
H	0.93 0.97 4.3%	1.17 1.22 4.3%	1.11 1.12 0.9%	1.31 1.36 3.8%	1.08 1.05 -2.8%	1.20 1.19 -0.8%	0.80 0.80 0.0%	0.33 0.34 3.0%
K		1.23 1.27 3.3%	1.17 1.25 6.4%	1.05 1.09 3.4%	1.39 1.37 -1.8%	1.36 1.34 -1.5%	1.21 1.16 -3.7%	0.39 0.38 -2.6%
L			1.29 1.33 3.1%	1.39 1.37 -1.4%	1.03 1.01 -2.4%	1.33 1.34 0.7%	0.94 0.93 -0.5%	0.27 0.26 -3.7%
M				1.12 1.06 -5.4%	1.38 1.33 -4.0%	1.10 1.09 -0.9%	0.46 0.47 2.2%	
N					1.23 1.22 -0.8%	1.07 1.12 4.7%	0.31 0.30 -3.2%	
O						0.44 0.42 -4.5%		

Meas
Pred
% Dev

$$\% \text{ Dev.} = \frac{\text{Predicted - Measured}}{\text{Measured}} * 100$$

Core Conditions

	Predicted		Measured	
Power	100.0	%FP	93	%FP
Group 5	100	%wd	100	%wd
Group 6	100	%wd	99.4	%wd
Group 7	92	%wd	95.4	%wd
Group 8	35	%wd	35	%wd
Imbalance	- 4.12	%FP	-0.84	%FP
Burnup	4	EFPD	4.3	EFPD
RCS Boron	1166	ppmB	1211	ppmB
Incore tilt				
			WX: -1.63	XY: +2.22
			YZ: +1.86	ZW: -2.46

The highest % Deviation is +6.4% at location K-10.
The highest measured radial peak is 1.39 at location K-12.
The largest peak % Deviation is +1.8%.
The full core RMS % Deviation is 3.88% with 49 operable detectors.

*Computer substitutions for failed detectors were used to ensure all core locations were accurately modelled by the Nuclear Applications Software.

OCONEE 1 CYCLE 13

STARTUP REPORT

ENCLOSURE 4.3

TOTAL PEAKING FACTORS AT FPT

	8	9	10	11	12	13	14	15
H	1.06 1.11 4.7%	1.35 1.40 3.7%	1.31 1.28 -2.3%	1.49 1.56 4.7%	1.24 1.20 -3.2%	1.37 1.38 0.7%	0.90 0.92 2.2%	0.37 0.38 2.7%
K		1.40 1.47 5.0%	1.34 1.44 7.9%	1.18 1.23 3.9%	1.59 1.60 0.9%	1.58 1.56 -1.0%	1.41 1.38 -2.5%	0.46 0.44 -4.3%
L			1.47 1.52 3.4%	1.59 1.58 -0.3%	1.17 1.19 1.3%	1.54 1.58 2.3%	1.09 1.09 0.5%	0.30 0.30 0.0%
M				1.28 1.20 -6.2%	1.61 1.57 -2.5%	1.27 1.28 0.4%	0.51 0.54 5.9%	
N					1.41 1.44 2.1%	1.23 1.34 8.9%	0.35 0.35 0.0%	
0						0.49 0.49 0.0%		

Meas
Pred
% Dev

$$\% \text{ Dev.} = \frac{\text{Predicted - Measured}}{\text{Measured}} * 100$$

Core Conditions

Predicted			Measured		
Power	100.0	%FP	Power	93	%FP
Group 5	100	%wd	Group 5	100	%wd
Group 6	100	%wd	Group 6	99.4	%wd
Group 7	92	%wd	Group 7	95.4	%wd
Group 8	35	%wd	Group 8	35	%wd
Imbalance	-4.12	%FP	Imbalance	-0.84	%FP
Burnup	4	EFPD	Burnup	4.3	EFPD
RCS Boron	1166	ppmB	RCS Boron	1211	ppmB
			Incore tilt		
			WX: -1.63	XY: +2.22	
			YZ: +1.86	ZW: -2.46	

The highest % Deviation is + 8.9% at location N-13.
The highest measured total peak is 1.61 at location M-12.
The largest peak % Deviation is +0.6%.
The full core RMS % Deviation is 4.88% with 49 operable detectors.

*Computer substitutions for failed detectors were used to ensure all core locations were accurately modelled by the Nuclear Applications Software.

OCONEE 1 CYCLE 13

STARTUP REPORT

ENCLOSURE 5.0

CORE POWER DISTRIBUTION DATA SUMMARY AT
LPT, IMPT AND FPT PLATEAUS

	LPT	IMPT	FPT
Power Level (% FP)	14.5	50.9	93
Burnup (EFPD)	0.016	0.3	4.34
Group 6/7/8 Positions (% wd)	55/0/35	99/60/50	99.4/95.4/35
RCS Boron Concentration (ppmB)	1478	1446	1211
Incore Imbalance (% FP)	- 2.91	- 7.79	- 0.84
Incore Tilt WX/XY YZ/ZW	-2.68/+1.42 +2.91/-1.65	-1.82/+1.32 +2.33/-1.83	-1.63/+2.22 +1.86/-2.46
Minimum DNBR	21.41	5.30	2.86
Extrapolated* Worst Case Minimum DNBR	3.88	1.86	2.02
Maximum Linear Heat Rate (kW/ft)	2.15	8.45	11.31
Extrapolated* Worst Case Linear Heat Rate (kW/ft)	12.29	17.17	12.58

* Extrapolated to 85% FP for LPT, 105.5% FP for IMPT and FPT