DUKE POWER COMPANY

OCONEE NUCLEAR STATION

OCONEE 1, CYCLE 9

STARTUP TESTING REPORT

Part I Zero Power Physics Testing

Part II Power Escalation Testing

Prepared By: David S. Compton

8503200260 850308
PDR ADOCK 05000269
P PDR

IE26 1/1

OCONEE 1 CYCLE 9
Startup Testing Report
Table of Contents

OCONEE 1 CYCLE 9

STARTUP TESTING REPORT

PART I

ZERO POWER PHYSICS TEST

1.0 Introduction and Summary

The Oconee 1 Cycle 9 Zero Power Physics Test (ZPPT) program was conducted on 11/28/84 per Station Procedure TT/1/A/0711/09 (Oconee 1 Cycle 9 Zero Power Physics Test). The purpose of this testing was to verify the nuclear parameters upon which the Oconee 1 Cycle 9 safety analysis and Technical Specifications are based.

The ZPPT measurements were made with reactor power controlled between 2.0 x 10^{-10} amps and 2.7 x 10^{-8} amps on the intermediate range instrumentation; reactivity insertions were maintained < ± 1200 μρ. RCS pressure and temperature were maintained at ∿ 2155 PSIG and ∿ 532°F, respectively.

The following nuclear parameters were measured per the ZPPT:

(a) All rods out boron concentration (See Enclosure 1.0)

(b) Integral rod worth for CRA groups 5, 6, and 7 (See Enclosure 2.0)

(c) Differential boron worth (See Enclosure 1.0)

(d) Temperature and moderator coefficients of reactivity (See Enclosure 6.0)

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

On 11/28/84 at 2145, ZPPT was declared complete. All acceptance criteria were met.

2.0 Approach to Critical

The initial RCS heatup following the refueling outage began on 11/21/84. Hot shutdown was reached on 11/27/84 at 0350. Performance ZPPT personnel recorded count rates and generated 1/M (inverse multiplication) vs RC temperature plots throughout heatup.

Rod withdrawal for the Control Rod Drive Trip Time Test began at 0047 on 11/28/84. 1/M vs. withdrawn rod worth plots were maintained. The RCS boron concentration had been adjusted to approximately the all-rods-out critical concentration to achieve criticality near the all-rods-out conditions.

Criticality was not achieved on the initial rod pull. The Control Rod Trip Time Test was performed. The RCS boron concentration was adjusted for criticality. At 0805, initial criticality was established with Group 7 at 100% wd, Group 8 at 55% wd, and the RCS at 532°F.

3.0 Pre-Physics Measurements

After establishing steady conditions with the reactor critical, the NI overlap and Sensible Heat determination measurements were performed. From the sensible heat determination, the upper limit on the intermediate range NIs (as indicated on the Control Room Chart) was established for ZPPT.

An on-line reactimeter checkout* was then performed by making reactivity insertions of about ± 250, ± 750, and ± 1200 μρ and measuring the associated doubling times. These doubling times were input to an off-line reactivity calculation and the results were then compared to the on-line reactivity values.

*NOTE: An "off-line" 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 discs.

4.0 Physics Testing

A. All Rods Out Boron Concentration Measurement

The RCS equilibrium boron concentration was measured with the CR Groups within ± 1200 μρ of the all-rods-out configuration. The control rods were moved to their all-rods-out position and the associated reactivity charge was converted to ppmb. The resultant all-rods-out boron concentration was then calculated.

B. Reactivity Coefficient Measurements

The temperature coefficient measurement was made with the CR Groups within ± 1200 μρ of the all-rods-out configuration while maintaining equilibrium boron concentration in the RCS. This measurement was made by increasing RCS temperature about 10°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 moderator coefficient was calculated by subtracting the isothermal doppler coefficient from the measured temperature coefficient.

C. Control Rod Group Integral Worths and Differential Boron Worth Measurement

The worths of Groups 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 ~ - 800 μρ) the control rods from 100% wd on Group 7 to 0% wd on Group 5 (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 differential boron worth was calculated by dividing the reactivity change by the boron change, resulting from the control rod worth measurements. The initial and final values for reactivity and boron concentration were recorded at critical equilibrium conditions.

PART II

POWER ESCALATION TEST

1.0 Introduction and Summary

The Oconee 1 Cycle 9 Power Escalation Test was performed between 11/29/84 and 2/4/85 per Station Procedure TT/1/A/0811/09. Testing was performed at 15%, 60% and 100% Full Power (FP) to verify the nuclear parameters upon which the Oconee 1 Cycle 9 safety analysis and Technical Specifications are based. The following tests and verifications were performed:

(A) Initial Core Power Distribution Check @ 15% FP

(B) Power Imbalance Detector Correlation @ 60% FP (See Enclosure 5.0)

(C) NSS Heat Balance (including RCS flow measurement at 100% FP) @ 15% FP, 60% FP, and 100% FP (See Enclosure 7.0)

(D) Incore Detector Checkout @ 60% FP and 100% FP

(E) Core Power Distribution @ 60% FP and 100% FP (See Enclosures 3.0-3.3 and 4.0)

(F) Reactivity Coefficients @ 100% FP (See Enclosure 6.0)

The Unit reached 15% FP at 0900 on 11/29/84. Testing at this power level was completed by 1030 that same day.

The Unit achieved 60% FP at 0300 on 12/15/84. Escalation to 60% was delayed by turbine balancing and two reactor trips. The Unit tripped from 43% FP on 12/2/84 at 0417 when a faulty pin connector caused the Generator Lockout Relays and the Generator Field Breaker to open. The Unit tripped again on 12/3/84 at 2207 from 57% FP when the Auxiliary Oil Pump to the one operating Feedwater Pump was secured and the Shaft-Driven Pump failed to pick up the oil loads. These two trips are documented in Oconee Incident Reports 084-043-1 and 084-044-1.

Testing at the 60% FP plateau was completed by 2240 on 12/6/84. The radial/total peaking factor criteria were satisfied for 100% FP at the 60% FP plateau. Intermediate power Testing (70-85% FP) was not required.

The Unit reached 100% FP at 2150 on 12/12/84. Progress toward 100% was slowed due to turbine imbalance and high OTSG level difficulties. Data for the NSS Heat Balance and Incore Detector Checkout was taken on 12/14/84. Core Power Distribution data was obtained on 12/17/84. Reactivity coefficients data was taken on 12/20/84.

Data reduction and analysis for the 100% FP Core Power Distribution Test was completed on 12/17/84 with the one exception noted below. The 100% FP Incore Detector Checkout was completed on 12/19/84. The 100% FP NSS Heat Balance including verification of RC Flow Constants (PT/0/A/0275/03) was completed on 1/16/85. Data reduction and analysis for the Reactivity Coefficient measurements was completed on 2/4/85.

The 100% Core Power Distribution Test includes the calculation of quadrant power tilts from the backup incore recorder outputs. This could not be performed due to a large number of inoperable backup detector signals. As required by Tech. Spec. 3.5.4, if Unit 1 loses its primary computer incore detector indications for 8 hours, power will have to be reduced to 80% FP due to the lack of operable backup recorder indications. Resolution of this situation can be accomplished by patching different inputs to the backup recorders. This is being pursued through the NSM process.

As of 2/4/85, the Oconee 1 Cycle 9 Power Escalation Test was complete with all acceptance criteria met except for the tilt calculation from the backup incore detectors.

2.0 NSS Heat Balance/RC Flow Verification

Off-line secondary and primary heat balances were performed at 15% (primary only), 60% and 100% FP. These tests verified the accuracy of CTPA, the on-line plant computer program which performs primary and secondary heat balances. The plant computer was used to average heat balance data (flows, temperatures, pressures, etc.) for 15 minutes. This data was input into the off-line heat balance programs and the results were compared to CTPA averages for the same period.

At full power, an off-line program was used to calculate RC flow based on a secondary heat balance and measured primary loop enthalpy changes. This demonstrated that the RC flow rate was above that assumed in the core design (106.5% design flow) and below that which would cause core lift at 430°F (111.2% design flow).

After establishing the primary flow rate at full power, the plant computer flow constant (used to calculate flow from the primary ΔP instrumentation) was normalized. Slope and reference flow constants for the ΔT power indication were then normalized, based on secondary heat balance.

3.0 Core Power Distribution

Core Power Distribution tests were conducted at 60% and 100% FP. These tests verified that reactor power imbalance, quadrant power tilt, minimum DNBR, maximum LHR and radial/total power peaks did not exceed their respective specified limits. An initial Core Power Distribution was performed at 15% FP. However, due to the low power, only reactor power imbalance and quadrant power tilt were verified to be within limits.

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. 3.5.2.7).

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 maximum LHR was verified to be within the LOCA limit maximum allowable heat rate (per Reload Report BAW 1841).

The worst case minimum DNBR and maximum LHR, when extrapolated to the overpower trip, were verified to be within the fuel melt limits (per Technical Specification 2.1).

The radial and total peaking factors were measured and compared to the predicted values. The following acceptance criteria were applied:

(a) $\% \text{ Deviation} = \frac{(\text{Predicted} - \text{Measured})}{\text{Measured}} \times 100 \leq \pm 20\%$

(b) $\frac{\text{LMP} - \text{LPP}}{\text{LMP}} \times 100 \leq$

	Radial	Total
	8.0%	12.0% @ 60% FP
	5.0%	7.5% @ 100% FP

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

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

$$\text{RMS} = \sum_{i=1}^{N} \left[(PP_i - MP_i)^2/(N-1)\right]^{\frac{1}{2}} \leq \begin{matrix} 0.100 \text{ @ } 60\% \text{ FP} \\ 0.075 \text{ @ } 100\% \text{ FP} \end{matrix}$$

Where: PP = Predicted radial peaking factor
MP = Measured radial peaking factor
N = Total number of operable incore detector strings
(String 34, 44, and 47 were inoperable at 60% FP)
(String 34, 44, and 47 were inoperable at 100% FP)

Per the "Oconee Generic Startup Test Program", the following criteria were verified at 60% FP to allow deletion of the Intermediate Power (70% to 85% FP) Testing:

a) $\frac{\text{LMP} - \text{LPP}}{\text{LMP}} \times 100 <$ Radial 5.0%, Total 7.5%

b) RMS < 0.075

At 100% FP, imbalance was calculated using the backup incore recorder outputs and then compared to the full incore values. Tilt could not be calculated from the backup recorders due to a large number of inoperable backup detector signals.

4.0 Power Imbalance Detector Correlation

The Power Imbalance Detector Correlation test was performed at 60% FP. The purposes of this test were:

a) to measure the outcore to full incore power imbalance correlation slopes for NI Channels 5, 6, 7, and 8, and to verify these slopes to be conservative with respect to the FSAR,

b) to verify reasonable power imbalance agreement between the backup incore detector recorder system and the full incore detector system,

c) to verify the adequacy of the RPS flux/flow/imbalance and overpower trip envelope by demonstrating that the extrapolated values of minimum DNBR and maximum LHR were within the fuel melt limits of Technical Specification 2.1, and

d) to verify the adequacy of the LOCA imbalance limit curve by demonstrating that the extrapolated values of LHR were within the LOCA limits listed in the Reload Report.

Each of these parameters were measured or calculated at incore imbalance levels of +5.8, +2.9, +0.1, -2.8, -4.4, and -11.6% FP.

The incore/outcore imbalance correlation slope for each NI Channel (5-8) was determined by a least squares fit of outcore to incore imbalance indications for the six imbalance levels. All the slopes were verified to be greater than 1.15.

The backup incore/full incore correlation was determined by plotting hand-calculated imbalance from backup incore recorder outputs versus the full incore imbalance value obtained from the plant computer. These points were required to be within a specified range.

Values for the minimum DNBR and maximum LHR were obtained from the plant computer. These values were extrapolated to the maximum allowable trip*, and were verified to be within the fuel melt limits of Tech. Spec. 2.1.

*The maximum allowable trip is either the maximum allowable overpower trip (105.5% FP) or the maximum allowable flux/flow/imbalance trip (Tech. Spec. Figure 2.3-2A), whichever is lower.

Measured values of LHR were extrapolated to the LOCA imbalance window and verified to be less than the LOCA limits specified in the Reload Report.

5.0 Reactivity Coefficients at Power

Data for calculating the doppler and temperature coefficients was taken at ∿ 100% FP. This test verified that the measured and extrapolated reactivity coefficients were conservative relative to the specified values in the FSAR.

The reactivity coefficients were calculated in the following manner:

Group 7 differential rod worth measurements were made over the range of rod motion encountered in the test. The B&W "push/pull" differential rod worth measurement technique and the B&W "fuel power correction" calculation were used to determine the differential rod worths.

The temperature coefficient of reactivity was determined by varying the average RC temperature (thermal power was held as steady as possible) and measuring the resulting change in Group 7 position. The power doppler coefficient of reactivity was determined by varying reactor power level (average RC temperature was held as steady as possible) and measuring the resulting change in Group 7 position.

The measured differential rod worths were used with the temperature change and power changes to calculate the temperature and the power doppler coefficients, respectively. Corrections for xenon and temperature/power variations were also made.

OCONEE 1 CYCLE 9

STARTUP REPORT

ENCLOSURE 1.0

ARO AND DIFFERENTIAL BORON WORTH RESULTS

PARAMETER	CONDITIONS	MEASURED VALUE	PREDICTED VALUE	DEVIATION	ACCEPTANCE CRITERIA
All Rods Out Boron Conc.	Gp 7 @ 100% wd Gp 8 at 25% wd*	1636 ppm	1678 ppm	-42 ppm	Predicted ±50 ppm
Differential Boron Worth	1448 ppm Average During Measurement Initial: Gp 7 @ 95.0, Gp 8 @ 25.5 1636 ppm Final: GP 4 @ 82.0, Gp 8 @ 25.5 1259 ppm	-0.887 ΔK/K per 100 ppm	-0.820% ΔK/K per 100 ppm	-7.6%**	Measured <-1.33% ΔK/K per 100 ppm and ±15% Deviation

*Actual Equilibrium Conditions: Gp 7 @ 93.1% wd, Gp 8 @ 25.5% wd, B_{10} @ 1634 ppm

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

OCONEE 1 CYCLE 9

STARTUP REPORT

ENCLOSURE 2.0

INTEGRAL GROUP ROD WORTH MEASUREMENTS

PARAMETER	MEASURED VALUE (% $\Delta K/K$)	PREDICTED VALUE (% $\Delta K/K$)	DEVIATION* (%)	ACCEPTANCE CRITERION
Gp 7 Integral Worth	-0.88	-0.85	-3.4	± 15% Deviation
Gp 6 Integral Worth	-1.06	-1.01	-4.6	± 15% Deviation
Gp 5 Integral Worth	-1.33	-1.33	-0.5	± 15% Deviation
Gp 5-7 Integral Worth	-3.27	-3.18	-2.6	± 10% Deviation

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

Radial Peaking Factor Comparison 60 % FP

Each cell: Predicted Peak / Measured Peak / % Deviation

Row	H	G	F	E	D	C	B	A
8	H-8: 0.83 / 0.85 / -2.35	G-8: 1.02 / 1.07 / -4.67	F-8: 1.06 / 1.09 / -2.75	E-8: 1.23 / 1.23 / 0.00	D-8: 1.05 / 1.07 / -1.87	C-8: 1.19 / 1.20 / -0.83	B-8: 1.10 / 1.14 / -3.51	A-8: 0.81 / 0.82 / -1.22
9		G-9: 1.01 / 1.01 / 0.00	F-9: 1.22 / 1.22 / 0.00	E-9: 1.10 / 1.10 / 0.00	D-9: 1.23 / 1.21 / 1.65	C-9: 1.06 / 1.12 / -5.36	B-9: 1.21 / 1.23 / -1.62	A-9: 0.60 / 0.59 / 1.69
10			F-10: 1.09 / 1.04 / 4.81	E-10: 1.25 / 1.21 / 3.31	D-10: 1.09 / 1.10 / -0.91	C-10: 1.29 / 1.28 / 0.78	B-10: 0.96 / 1.00 / -4.00	A-10: 0.40 / 0.42 / -4.76
11				E-11: 1.11 / 1.08 / 2.78	D-11: 1.22 / 1.23 / -0.81	C-11: 1.07 / 1.07 / 0.00	B-11: 0.66 / 0.68 / -2.94	
12					D-12: 1.02 / 1.01 / 0.99	C-12: 1.07 / 0.98 / 9.18	B-12: 0.44 / 0.44 / 0.00	
13						C-13: 0.54 / 0.54 / 0.00		

INCORE TILT

W-X	0.95
X-Y	0.53
Y-Z	-0.43
Z-W	-1.05

	ASSUMED CONDITIONS FOR PEAKING PREDICTIONS	ACTUAL MEASUREMENT CONDITIONS
BURNUP	2 EFPD	2 EFPD
GP 5	100 % wd.	100 % wd.
GP 6	100 % wd.	100 % wd.
GP 7	93.5 % wd.	94.1 % wd.
GP 8	41.7 % wd.	41.6 % wd.
IMB.	- 0.37% imb.	- 1.82% imb.
POWER	60 % FP	59.78 % FP
BORON		1219 ppm

KEY

Core Location

Predicted Peak / Measured Peak

% Deviation $\left(\frac{\text{pred.-meas.}}{\text{meas.}}\right) \times 100$

HIGHEST % DEVIATION = 9.18 % in 1/8th Core Location C-12
RMS RADIAL PEAKING FACTOR DEVIATION = 0.03
HIGHEST MEASURED RADIAL PEAK = 1.28 in 1/8th core location C-10

$\frac{LMP - LPP}{LMP} \times 100 =$ -0.78 %

OCONEE 1 CYCLE 9
STARTUP REPORT
ENCLOSURE 3.1

Total Peaking Factor Comparison 60 % FP

Core Location	Predicted Peak	Measured Peak	% Deviation
H-8	0.99	0.99	0.00
G-8	1.23	1.27	-3.15
F-8	1.27	1.31	-3.05
E-8	1.47	1.46	0.68
D-8	1.25	1.23	1.63
C-8	1.42	1.40	1.43
B-8	1.33	1.37	-2.92
A-8	1.00	1.00	0.00
G-9	1.22	1.19	2.52
F-9	1.45	1.44	1.40
E-9	1. 29	1.27	1.57
D-9	1.46	1.42	2.82
C-9	1.25	1.30	-3.85
B-9	1.47	1.47	0.00
A-9	0.75	0.70	7.14
F-10	1.29	1.19	8.40
E-10	1.49	1.42	4.93
D-10	1.31	1.31	0.00
C-10	1.55	1.54	0.65
B-10	1.15	1.20	-4.17
A-10	0.49	0.50	-2.00
E-11	1.34	1.26	6.35
D-11	1.48	1.46	1.37
C-11	1.29	1.27	1.57
B-11	0.79	0.81	-2.47
D-12	1.25	1.21	3.31
C-12	1.32	1.18	11.86
B-12	0.55	0.52	5.77
C-13	0.67	0.66	1.52

INCORE TILT

W-X	0.95
X-Y	0.53
Y-Z	-0.43
Z-W	-1.05

	ASSUMED CONDITIONS FOR PEAKING PREDICTIONS	ACTUAL MEASUREMENT CONDITIONS
BURNUP	2 EFPD	2 EFPD
GP 5	100 % wd.	100 % wd.
GP 6	100 % wd.	100 % wd.
GP 7	93.5 % wd.	94.1 % wd.
GP 8	41.7 % wd.	41.6 % wd.
IMB.	- 0.37 % imb.	- 1.82 % imb.
POWER	60 % FP	59.78 % FP
BORON		1219 ppm

KEY

Core Location

Predicted Peak / Measured Peak

% Deviation

$\left(\frac{\text{pred.} - \text{meas.}}{\text{meas.}}\right) \times 100$

HIGHEST % DEVIATION = 11.86 % in 1/8th Core Location C-12

HIGHEST MEASURED TOTAL PEAK = 1.54 in 1/8th core location C-10

$\frac{\text{LMP} - \text{LPP}}{\text{LMP}} \times 100 =$ 0.65 %

Radial Peaking Factor Comparison 100 % FP

Row	Value	H	G	F	E	D	C	B	A
8	Predicted Peak	0.85	1.03	1.06	1.22	1.05	1.19	1.10	0.83
8	Measured Peak	0.87	1.08	1.09	1.24	1.07	1.20	1.14	0.83
8	% Deviation	-2.30	-4.63	-2.75	-1.61	-1.87	-0.83	-3.51	0.00
9	Predicted Peak		1.02	1.21	1.10	1.22	1.06	1.20	0.62
9	Measured Peak		1.03	1.22	1.10	1.21	1.11	1.22	0.60
9	% Deviation		-0.97	-0.82	0.00	0.83	-4.50	-1.64	3.33
10	Predicted Peak			1.09	1.24	1.09	1.27	0.96	0.42
10	Measured Peak			1.06	1.20	1.09	1.27	1.00	0.43
10	% Deviation			2.83	3.33	0.00	0.00	-4.00	-2.33
11	Predicted Peak				1.11	1.21	1.07	0.67	
11	Measured Peak				1.07	1.22	1.06	0.69	
11	% Deviation				3.74	-0.82	0.94	-2.90	
12	Predicted Peak					1.02	1.07	0.46	
12	Measured Peak					1.00	0.97	0.45	
12	% Deviation					2.00	10.31	2.22	
13	Predicted Peak						0.56		
13	Measured Peak						0.55		
13	% Deviation						1.82		

INCORE TILT

W-X	0.91
X-Y	0.74
Y-Z	-0.79
Z-W	-0.86

	ASSUMED CONDITIONS FOR PEAKING PREDICTIONS	ACTUAL MEASUREMENT CONDITIONS
BURNUP	4 EFPD	9.60 EFPD
GP 5	100.00 % wd.	100.00 % wd.
GP 6	100.00 % wd.	100.00 % wd.
GP 7	93.50 % wd.	93.2 % wd.
GP 8	32.00 % wd.	31.6 % wd.
IMB.	- 3.47 % imb.	- 5.71 % imb.
POWER	100.00 % FP	99.68 % FP
BORON		1072 ppm

KEY

Core Location (top box); Predicted Peak (upper left of diagonal); Measured Peak (lower right of diagonal); % Deviation (bottom box)

$$\% \text{ Deviation} = \left(\frac{\text{pred.} - \text{meas.}}{\text{meas.}}\right) \times 100$$

HIGHEST % DEVIATION = 10.31 % in 1/8th Core Location C-12
RMS RADIAL PEAKING FACTOR DEVIATION = 0.0289
HIGHEST MEASURED RADIAL PEAK = 1.27 in 1/8th core location C-10

$$\frac{LMP - LPP}{LMP} \times 100 = 0.00 \%$$

Total Peaking Factor Comparison 100 % FP

Core Location	Predicted Peak	Measured Peak	% Deviation
H-8	1.00	1.01	-0.99
G-8	1.23	1.28	-3.91
F-8	1.27	1.30	-2.31
E-8	1.44	1.47	-2.04
D-8	1.24	1.21	2.48
C-8	1.41	1.40	0.71
B-8	1.33	1.35	-1.48
A-8	1.03	1.01	1.98
G-9	1.22	1.20	1.67
F-9	1.43	1.43	0.00
E-9	1.28	1.25	2.40
D-9	1.44	1.41	2.13
C-9	1.25	1.29	-3.10
B-9	1.48	1.47	0.68
A-9	0.76	0.72	5.56
F-10	1.27	1.18	7.63
E-10	1.47	1.42	3.52
D-10	1.27	1.26	0.79
C-10	1.54	1.51	1.99
B-10	1.16	1.20	-3.33
A-10	0.50	0.51	-1.96
E-11	1.32	1.23	7.32
D-11	1.46	1.44	1.39
C-11	1.29	1.26	2.38
B-11	0.80	0.82	-2.44
D-12	1.25	1.18	5.93
C-12	1.33	1.18	12.71
B-12	0.56	0.53	5.66
C-13	0.69	0.65	6.15

INCORE TILT

W-X	0.91
X-Y	0.74
Y-Z	-0.79
Z-W	-0.86

	ASSUMED CONDITIONS FOR PEAKING PREDICTIONS	ACTUAL MEASUREMENT CONDITIONS
BURNUP	4 EFPD	9.60 EFPD
GP 5	100.00 % wd.	100.00 % wd.
GP 6	100.00 % wd.	100.00 % wd.
GP 7	93.5 % wd.	93.2 % wd.
GP 8	32.0 % wd.	31.6 % wd.
IMB.	-3.47 % imb.	-5.71 % imb.
POWER	100.00 % FP	99.68 % FP
BORON		1072 ppm

KEY

Core Location

Predicted Peak / Measured Peak

% Deviation $\left(\frac{\text{pred.} - \text{meas.}}{\text{meas.}}\right) \times 100$

HIGHEST % DEVIATION = 12.71% in 1/8th Core Location C-12

HIGHEST MEASURED TOTAL PEAK = 1.51 in 1/8th core location C-10

$\frac{\text{LMP} - \text{LPP}}{\text{LMP}} \times 100 = 1.99\ \%$

OCONEE 1 CYCLE 9

STARTUP REPORT

ENCLOSURE 4.0

CORE POWER DISTRIBUTION DATA SUMMARY AT

60% AND 100% FP TEST PLATEAUS

Power Level	Burnup (EFPD)	Gp6/7/8 Positions (% WD)	Boron CONC (PPM)	Incore Imbalance (% F.P)	Incore Tilt WX/XY YZ/ZW (%)	MDNBR	Extrapolated Worst Case MDNBR	MLHR (KW/FT)	Extrapolated Worse Case MLHR (KW/FT)
60	2.0	100/94.1/41.6	1219	-1.82	0.95/0.53 -0.43/-1.05	6.65	3.60	6.59	11.36
100	9.6	100/93.2/31.6	1072	-5.71	0.91/0.74 -0.79/-0.86	3.50	N/A	10.84	N/A

NOTE: The 60% FP case was extrapolated to 105.5% FP. The 100% F.P case was not extrapolated.

OCONEE 1 CYCLE 9
STARTUP REPORT
ENCLOSURE 5.0
60% FP PIDC THERMAL CALCULATION AND CORRELATION SLOPE RESULTS

Full Incore Imbalance (% FP)	MLHR (KW/ft.)	Worst Case Extrapolated MLHR (KW/ft.)	MDNBR	Extrapolated MDNBR
+5.80	6.87	12.24	6.00	2.90
+2.86	6.41	11.31	6.31	2.96
+0.09	6.49	11.30	6.50	3.39
-2.80	6.94	12.09	6.29	3.37
-4.42	7.17	12.44	6.11	3.33
-11.61	7.71	13.27	5.78	3.10

NOTE: All extrapolations are to 105.5% FP, except for the -11.61% FP imbalance plateau where Φ/flux/imbalance reduces the maximum allowable trip setpoint to 104.6% FP.

	NI 5	NI 6	NI 7	NI 8
Correlation Slope	1.38	1.37	1.41	1.37
Differential Amp. Gain Setting	4.80	4.80	4.80	4.80

OCONEE 1 CYCLE 9
STARTUP REPORT
ENCLOSURE 6.0 REACTIVITY COEFFICIENTS

PARAMETER	CONDITIONS	MEASURED VALUE	PREDICTED VALUE	ACCEPTANCE CRITERION
Hot Zero Power Temperature Coefficient (ARO)	T_{av} = 535°F Gp 7 @ 93.1% wd Gp 8 @ 25.5% wd 1634 ppm	-0.07×10^{-4} ΔK/K per °F	-0.06×10^{-4} ΔK/K per °F	Predicted $\pm 0.3 \times 10^{-4}$ ΔK/K per °F
Hot Zero Power Moderator Coefficient (ARO)	T_{av} = 535°F Gp 7 @ 93.1% wd Gp 8 = 25.5% WD 1634 ppm	$+0.12 \times 10^{-4}$ ΔK/K per °F	$+0.12 \times 10^{-4}$ ΔK/K per °F	Predicted $\pm 0.3 \times 10^{-4}$ ΔK/K per °F and Measured $\leq +0.5 \times 10^{-4}$ ΔK/K per °F
Hot Full Power BOC Temperature Coefficient Extrapolated to 95% FP	T_{av} = 579°F	-0.89×10^{-4} ΔK/K per °F	-1.06×10^{-4} ΔK/K per °F	Temperature Coefficient more negative than -0.15×10^{-4} ΔK/K per °F at 95% FP
Hot Full Power BOC Temperature Coefficient Extrapolated to 100% FP	T_{av} = 579°F	-0.91×10^{-4} ΔK/K per °F	-1.08×10^{-4} ΔK/K per °F	N/A
Hot Full Power BOC Temperature Coefficient Extrapolated to 100% FP at EOC	T_{av} = 579°F	-2.67×10^{-4} ΔK/K per °F	-2.85×10^{-4} ΔK/K per °F	Temperature Coefficient more positive than -3.17×10^{-4} ΔK/K per °F at 100% FP
Hot Full Power BOC Power Doppler Coefficient Extrapolated to 100% FP	T_{av} = 579°F	-0.68×10^{-4} ΔK/K per %FP	-1.05×10^{-4} ΔK/K per %FP	Power Doppler Coefficient more negative than -0.55×10^{-4} ΔK/K per %FP at 100% FP

OCONEE 1 CYCLE 9

STARTUP REPORT

ENCLOSURE 7.0

NSS HEAT BALANCE/RC FLOW VERIFICATION

Test Plateau	Plant Computer On Line Primary Power Level	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	RC Flow
15% FP	13.4	N/A	13.4	13.2	N/A	N/A
60% FP	58.4	60.6	58.4	58.4	60.5	N/A
100% FP	99.2	99.0	98.7	99.1	99.0	*107.9% D.F.
100% FP (after adjusting constants)	100.1	100.1	99.6	N/A	N/A	107.5% D.F.

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

DUKE POWER COMPANY
P.O. BOX 33189
CHARLOTTE, N.C. 28242

HAL B. TUCKER
VICE PRESIDENT
NUCLEAR PRODUCTION

TELEPHONE
(704) 373-4531

March 8, 1985

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

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

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

Dear Sir:

Please find attached the Startup Test Report for Oconee 1, Cycle 9.

Very truly yours,

H.B. Tucker / [signature]

Hal B. Tucker

RFH:slb

Attachment

cc: Dr. J. Nelson Grace, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

IE26
1/1