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SUBJECT: "Oconee 1, Cycle 11 Startup Testing Rept. Part 1 Zero Power Test & Part II Power Escalation Test."

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DUKE POWER COMPANY

OCONEE NUCLEAR STATION

OCONEE 1, CYCLE 11

STARTUP TESTING REPORT

Part I Zero Power Physics Test

Part II Power Escalation Test

Prepared By: Regis T. Repko

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OCONEE 1 CYCLE 11
Startup Testing Report
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OCONEE 1 CYCLE 11

STARTUP TESTING REPORT

PART I

ZERO POWER PHYSICS TEST

1.0 Introduction and Summary

The Oconee 1 Cycle 11 Zero Power Physics Test (ZPPT) was conducted during 10/30/87 - 11/06/87 per Station Procedure TT/1/A/0711/11. The purpose of this testing was to verify the nuclear parameters upon which the Oconee 1 Cycle 11 safety analysis and Technical Specifications are based.

The ZPPT measurements were made with reactor power controlled between 2.0 x 10^{-10} amps and 9.0 x 10^{-8} amps on the intermediate range instrumentation; reactivity insertions were maintained < ± 1200 μρ. RCS pressure and temperature were maintained at ~ 2150 psig and ~ 532°F, respectively.

The following nuclear parameters were measured:

(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 5.0)

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 11/06/87 at 1130, ZPPT was declared complete. All acceptance criteria were met.

2.0 Approach to Critical

The initial RCS heatup following the refueling outage began on 10/31/87. Hot shutdown was reached on 11/04/87 at 1713. Source range count rates were recorded and 1/M (inverse multiplication) vs RC temperature plots were generated throughout heatup.

Rod withdrawal for the Control Rod Drive Trip Time Test began at 0345 on 11/05/87. 1/M vs. withdrawn rod worth plots were maintained. With the RCS boron concentration adjusted to approximately the all-rods-out critical concentration, the reactor went critical with CR Group 7 at 88% wd. Group 7 was pulled to 100% wd (~ +650 μρ insertion) and Groups 1-7 were tripped at 0836. Due to problems with the plant computer not reading the drop times of some of the rods, the trip time test had to be repeated five times (twice with Groups 1-3 only, three times with only the rod in core location K-9). The test was completed at 1300 hrs. The trip time tests were performed at ~535°F and ~2150 psig, and the maximum rod trip time was 1.380 seconds.

On approach to criticality after the trip time test, power was lost to the control rods. The reactor was manually tripped at 1400 hrs (the reactor was greater than 0.5% Δk/k shutdown at the instant of the trip). Post trip review report was completed at 1540. With a joint on the sequencer board resoldered, rod pulls were begun for the second criticality at 1657. The rods were placed in sequence override at 1720 for the remainder of the test.

3.0 Pre-Physics Measurements

After establishing steady conditions with the reactor critical, NI overlap was observed and recorded, and 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 ± 1200 μp, 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 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 discs.

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 89% wd, and CR Group 8 at 35% wd. The control rods were moved to their all-rods-out position (Gps. 1-7 @ 100% wd, Gp. 8 @ 35% wd) and the associated reactivity change was converted to ppmB. All Rod Out Boron concentration was then calculated.

B. Reactivity Coefficient Measurements

The temperature coefficient measurement was made while maintaining equilibrium boron concentration in the RCS, with CR Group 7 withdrawn to 90% wd and with CR Group 8 at 35% wd. This measurement was made by varying RCS temperature by 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 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 calculated 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 80% 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 differential boron worth was calculated by dividing the total rod worth inserted during the rod worth measurements 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 were approaching steady-state at a rate of less than 80 μp/minute.

PART II

POWER ESCALATION TEST

1.0 Introduction and Summary

The Oconee 1 Cycle 11 Power Escalation Test was performed between 11/06/87 - and 11/20/87 per Station Procedure TT/1/A/0811/11. Testing was performed at 15%, 72% and 100% Full Power (FP) to verify the nuclear parameters upon which the Oconee 1 Cycle 11 safety analysis and Technical Specifications are based. The following tests and verifications were performed:

(A) Initial Core Symmetry Check @ 15% FP

(B) NSS Heat Balance (including RCS flow measurement at 100% FP) @ 15% FP, 69% FP, and 100% FP (See Enclosure 6.0)

(C) Incore Detector Checkout @ 72% FP and 100% FP

(D) Power Imbalance Detector Correlation Slope Measurement @ 72% FP

(E) Core Power Distribution @ 73% FP and 100% FP (See Enclosures 3.0-3.3 and 4.0)

(F) All Rods Out Critical Boron Concentration @ 100% FP

The unit reached 15% FP at 1550 hrs on 11/6/87. All low power testing was completed that same day. Due to high turbine generator vibrations, the unit went to hot shutdown for turbine generator balancing on 11/7/87.

The generator was returned on line on 11/12/87. The unit reached 72% FP on 11/1/487. Testing at this power level was completed on 11/15/87.

The unit reached 100% FP on 11/15/87. Power Escalation Testing was completed on 11/20/87.

2.0 NSS Heat Balance/RC Flow Verification

Off-line secondary and primary heat balances were performed at 15% (primary only), 72% 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 could cause core lift at 375°F (114.5% design flow).

After establishing the primary flow rate at full power, the plant computer flow constants (used to calculate flow from the primary ΔP instrumentation) were 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 72% 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 Symmetry Check was performed at 15% FP.

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 DPC-RD-2009).

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). This extrapolation was not required for Low Power Testing.

Prior to performing the radial and total peaking factor comparisons, PT/0/A/0302/06 (Review and Control of Incore Neutron Detector Signals) was performed to identify erroneous SPND signals. This test was performed at 15% FP as part of Core Symmetry Verification, and at 72% FP and 100% FP as directed in the Incore Detector Checkout.

The radial and total peaking factors were measured and compared to the predicted values at 72% and 100% FP. The following acceptance criteria were applied:

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

$\leq \pm$ 15% for radial peaking factors

± 20% for total peaking factors (recommended maximum deviation - not an acceptance criterion)

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

$\leq$ + 5.0% for radial peaking factors

+ 7.5% for total peaking factors

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:

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

Where: PP = Predicted radial peaking factor
MP = Measured radial peaking factor
n = Total number of operable incore detector strings (String 38 was inoperable for both 72% and 100%.)

4.0 Power Imbalance Detector Correlation

The Power Imbalance Detector Correlation Test was performed at 72% FP. The purpose of this test was 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 equal to or greater than 0.95.

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. A total of 20 incore imbalance points which ranged between -9.50% and +7.50% were used. All the slopes were verified to be greater than 0.95.

The correlation slopes for all four NI Channels (5-8) were calculated to be 1.10. The differential amp gain settings for NI Channels (5-8) were 4.18, 4.19, 4.11 and 4.22 respectively.

5.0 Reactivity Coefficients 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.

OCONEE 1 CYCLE 11

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 @ 35% wd*	1657 ppmB	1648 ppmB	+9 ppmB	Predicted ± 50 ppmB
Differential Boron Worth	1460 ppmB Average During Measurement Initial: Gp 7 @ 90% wd, Gp 8 @ 35% wd 1651 ppm Final: Gp 4 @ 80% wd, Gp 5 @ 0% wd, Gp 8 @ 35% wd 1273 ppm	- 0.9410% Δk/k per 100 ppmB	- 0.8558% Δk/k per 100 ppmB	- 9.05%	Measured more positive than -1.33% Δk/k per 100 ppmB and ±15% deviation from predicted

*Initial Critical Equilibrium: Gp 7 @ 89% wd, Gp 8 @ 35% wd, 1652 ppmB

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

OCONEE 1 CYCLE 11

STARTUP REPORT

ENCLOSURE 2.0

INTEGRAL GROUP ROD WORTH MEASUREMENTS

PARAMETER	MEASURED VALUE (% Δk/k)	PREDICTED VALUE (% Δk/k)	DEVIATION* (%)	ACCEPTANCE CRITERION
Gp 7 Integral Worth	- 0.9605	- 0.889	- 7.44	± 15% Deviation
Gp 6 Integral Worth	- 0.999	- 0.956	- 4.30	± 15% Deviation
Gp 5 Integral Worth	- 1.468	- 1.272	- 13.35	± 15% Deviation
Gp 5-7 Integral Worth	- 3.4275	- 3.177	- 7.3	± 10% Deviation

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

OCONEE 1 CYCLE 11

STARTUP REPORTS

ENCLOSURE 3.0

RADIAL PEAKING FACTORS AT 73% FP

	8	9	10	11	12	13	14	15
H	0.82 0.83 1.2	1.24 1.30 4.9%	1.10 1.11 0.6%	1.28 1.34 4.7%	1.14 1.13 -0.8	1.33 1.34 0.7%	1.03 1.03 0.3%	0.44 0.43 -2.7%
K		1.11 1.16 4.6%	1.27 1.34 5.3%	1.08 1.11 2.5%	1.34 1.35 0.7%	1.20 1.16 -3.1%	1.23 1.17 -4.2%	0.51 0.51 -0.8
L			1.10 1.09 -0.8%	1.22 1.19 -2.3%	1.13 1.10 -3.0%	1.30 1.28 -1.3%	0.94 0.95 1.0%	0.38 0.37 -1.8%
M				1.22 1.21 -0.8%	1.33 1.31 -1.0%	1.03 1.02 -1.4%	0.59 0.61 2.9%	
N	MEAS PRED % DEV				1.09 1.08 -1.0%	0.94 0.93 -1.3%	0.33 0.34 2.4%	
0						0.37 0.38 2.4%		

% DEV = ((PRED-MEAS)/MEAS)*100%

Core Conditions

Predicted		Measured	
Power	75.0 %FP	Power	72.5 %FP
Group 5	100 %wd	Group 5	100 %wd
Group 6	100 %wd	Group 6	100 %wd
Group 7	92 %wd	Group 7	91.3 %wd
Group 8	35 %wd	Group 8	35.0 %wd
Imbalance	- 2.44 %FP	Imbalance	- 2.01 %FP
Burnup	3 EFPD	Burnup	1.81 EFPD
RCS Boron	1150 ppmB	RCS Boron	1216 ppmB
		Incore tilt	
		WX: -0.15	XY: +0.52
		YZ: +0.00	ZW: -0.36

The highest % Deviation is 5.3% at location K-10.
The highest measured radial peak is 1.34 at location K-12.
The largest peak % Deviation is -0.7%.
The full core RMS % Deviation is 3.16% with 51 operable detectors.

OCONEE 1 CYCLE 11

STARTUP REPORTS

ENCLOSURE 3.1

TOTAL PEAKING FACTORS AT 73% FP

	8	9	10	11	12	13	14	15
H	0.87 0.91 4.9%	1.37 1.46 6.6%	1.21 1.23 1.5%	1.48 1.51 2.1%	1.27 1.28 0.7%	1.54 1.55 0.6%	1.16 1.20 3.1%	0.49 0.49 0.0%
K	1.20 1.30 8.1%	1.42 1.50 5.6%	1.18 1.22 3.6%	1.52 1.55 1.7%	1.34 1.32 -1.3%	1.41 1.37 -2.5%	0.58 0.59 1.2%	
L	1.21 1.20 -0.7%	1.40 1.33 -4.4%	1.27 1.29 0.9%	1.49 1.49 0.3%	1.09 1.10 0.8%	0.43 0.43 0.2%		
M	1.35 1.37 1.4%	1.53 1.53 -0.6%	1.17 1.17 -0.6%	0.67 0.70 4.0%				
N	1.25 1.25 0.2%	1.07 1.09 1.6%	0.36 0.39 8.1%					
0	0.40 0.44 9.5%							

MEAS
PRED
% DEV

% DEV = ((PRED-MEAS)/MEAS)*100%

Core Conditions

Predicted			Measured		
Power	75.0	%FP	Power	72.5	%FP
Group 5	100	%wd	Group 5	100	%wd
Group 6	100	%wd	Group 6	100	%wd
Group 7	92	%wd	Group 7	91.3	%wd
Group 8	35	%wd	Group 8	35.0	%wd
Imbalance	- 2.44	%FP	Imbalance	- 2.01	%FP
Burnup	3	EFPD	Burnup	1.81	EFPD
RCS Boron	1150	ppmB	RCS Boron	1216	ppmB
			Incore tilt		
			WX: -0.15	XY: +0.52	
			YZ: +0.00	ZW: -0.36	

The highest % Deviation is 9.5% at location 0-13.
The highest measured total peak is 1.54 at location H-13.
The largest peak % Deviation is -0.7%.
The full core RMS % Deviation is 4.13% with 51 operable detectors.

OCONEE 1 CYCLE 11

STARTUP REPORTS

ENCLOSURE 3.2

RADIAL PEAKING FACTORS AT 100% FP

	8	9	10	11	12	13	14	15
H	0.83 0.83 0.2%	1.24 1.29 4.4%	1.10 1.11 0.5%	1.29 1.33 3.3%	1.15 1.13 -1.7%	1.32 1.33 1.0%	1.03 1.03 0.5%	0.44 0.43 -1.4%
K		1.11 1.06 4.3%	1.27 1.33 4.6%	1.08 1.11 2.1%	1.33 1.34 1.0%	1.19 1.16 -2.4%	1.22 1.17 -3.9%	.51 .51 0.6%
L			1.11 1.09 -1.8%	1.22 1.18 -2.6%	1.13 1.10 -3.0%	1.29 1.28 -1.0%	.94 .95 1.4%	.38 .38 -0.3%
M				1.22 1.21 -1.1%	1.32 1.31 -1.0%	1.03 1.02 -1.1%	0.59 0.61 3.9%	
N					1.10 1.08 -1.7%	0.94 0.93 -0.7%	0.34 0.34 1.2%	
0						0.38 0.38 1.3%		

MEAS
PRED
% DEV

% DEV = ((PRED-MEAS)/MEAS)*100%

Core Conditions

Predicted			Measured		
Power	100.0	%FP	Power	100.1	%FP
Group 5	100	%wd	Group 5	100	%wd
Group 6	100	%wd	Group 6	99.8	%wd
Group 7	92	%wd	Group 7	94.6	%wd
Group 8	35	%wd	Group 8	35.0	%wd
Imbalance	- 5.87	%FP	Imbalance	+ 0.54	%FP
Burnup	4	EFPD	Burnup	3.7	EFPD
RCS Boron	1088	ppmB	RCS Boron	1146	ppmB
			Incore tilt		
			WX: -0.21	XY: +0.56	
			YZ: -0.04	ZW: -0.31	

The highest % Deviation is 4.6% at location K-10.
The highest measured radial peak is 1.33 at location K-12.
The largest peak % Deviation is -1.0%.
The full core RMS % Deviation is 2.88% with 51 operable detectors.

OCONEE 1 CYCLE 11

STARTUP REPORTS

ENCLOSURE 3.3

TOTAL PEAKING FACTORS AT 100% FP

	8	9	10	11	12	13	14	15
H	0.92 0.91 -1.0%	1.41 1.46 3.8%	1.23 1.23 -0.3%	1.47 1.53 3.9%	1.28 1.30 1.3%	1.50 1.57 4.5%	1.16 1.21 4.3%	0.50 0.50 -1.0%
K		1.23 1.29 5.2%	1.43 1.52 6.1%	1.20 1.24 2.8%	1.50 1.57 4.5%	1.35 1.34 -0.4%	1.41 1.39 -1.5%	0.59 0.60 1.0%
L			1.22 1.22 -0.3%	1.39 1.35 -3.1%	1.22 1.31 7.7%	1.46 1.52 3.7%	1.08 1.12 3.6%	.43 .44 1.9%
M				1.35 1.39 2.8%	1.50 1.55 3.3%	1.15 1.19 3.4%	0.66 0.71 7.1%	
N					1.22 1.27 4.4%	1.08 1.11 2.5%	0.37 0.40 6.8%	
0						0.42 0.44 5.7%		

MEAS
PRED
% DEV

% DEV = ((PRED-MEAS)/MEAS)*100%

Core Conditions

	Predicted		Measured	
Power	100.0	%FP	100.1	%FP
Group 5	100	%wd	100	%wd
Group 6	100	%wd	99.8	%wd
Group 7	92	%wd	94.6	%wd
Group 8	35	%wd	35.0	%wd
Imbalance	- 5.87	%FP	+ 0.54	%FP
Burnup	4	EFPD	3.7	EFPD
RCS Boron	1088	ppmB	1146	ppmB

Incore tilt
WX: - 0.21 XY: +0.56
YZ: - 0.04 ZW: -0.31

The highest % Deviation is 7.7% at location L-12.
The highest measured total peak is 1.50 at location K-12.
The largest peak % Deviation is -4.50%.
The full core RMS % Deviation is 5.03% with 51 operable detectors.

OCONEE 1 CYCLE 11

STARTUP REPORT

ENCLOSURE 4.0

CORE POWER DISTRIBUTION DATA SUMMARY AT

IMPT AND FPT PLATEAUS

Power Level (% FP)	Burnup (EFPD)	Gp6/7/8 Positions (% wd)	Boron CONC (ppmB)	Incore Imbalance (% FP)	Incore Tilt WX/XY YZ/ZW (%)	Min. DNBR	Extrapolated* Worst Case Min. DNBR	Max. LHR (kw/ft)	Extrapolated* Worst Case Max. LHR (kw/ft)
72	1.8	100/91/35	1291	-2.01	-0.15/0.52 0.00/-0.36	5.21	3.34	8.344	11.85
100	2.8	100/95/35	1169	+1.06	-0.02/0.63 -0.14/-0.47	3.28	2.42	11.232	11.91

*NOTE: Extrapolated to 105.5% FP

OCONEE 1 CYCLE 11
STARTUP REPORT
ENCLOSURE 5.0 REACTIVITY COEFFICIENTS

PARAMETER	CONDITIONS	MEASURED VALUE	PREDICTED VALUE	ACCEPTANCE CRITERION
Hot Zero Power Temperature Coefficient (ARO)	T_{av} = 537°F Gp 7 @ 90% wd Gp 8 @ 35% wd 1651 ppmB	$+7.73 \times 10^{-6}$ Δk/k/°F	$+2.27 \times 10^{-6}$ Δk/k/°F	Predicted ± 0.3×10^{-4} Δk/k per °F
Hot Zero Power Moderator Temperature Coefficient (ARO)	T_{av} = 537°F Gp 7 @ 90% wd Gp 8 @ 35% wd 1651 ppmB	$+2.37 \times 10^{-5}$ Δk/k/°F	$+1.86 \times 10^{-5}$ Δk/k/°F	Predicted ± 0.3×10^{-4} Δk/k per °F and Measured $\leq$ + 0.5×10^{-4} Δk/k per °F

OCONEE 1 CYCLE 11

STARTUP REPORT

ENCLOSURE 6.0

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
LPT	14.9	N/A	14.9	14.9	N/A	112.3% D.F.
IMPT	67.3	69.5	66.9	67.3	69.5	111.30% D.F. 114.98% D.F.*
FPT	96.5	99.5	95.8	96.5	99.5	110.77% D.F. 114.24% D.F.*
FPT (after adjusting constants)	99.1	99.2	98.8	99.2	99.2	114.13% D.F. 114.27% D.F.*

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

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VICE PRESIDENT
NUCLEAR PRODUCTION

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February 4, 1988

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

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
Unit 1 Cycle 11 Startup Testing Report

Gentlemen:

Pursuant to Oconee Nuclear Station Technical Specification 6.6.1.1 please find attached the Startup Test Report for Oconee Unit 1, Cycle 11. Part I of the report contains Zero Power Physics Test information. Part II contains Power Escalation Test results.

Very truly yours,

Hal B. Tucker

Hal B. Tucker

PJN/1315/sbn

Attachment

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