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U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
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Gentlemen:

Re: Turkey Point Unit 4
Docket No. 50-251
Startup Report

The attached Startup Report is provided in accordance with Technical Specification 6.9.1.1. The Unit 4 Cycle XIII Startup Report documents the first use of the Debris Resistant Fuel Assembly (DRFA) design, modified bottom nozzle and snag-resistant intermediate spacer grids. In addition, Cycle XIII startup was performed without source assemblies.

If you have any questions, please contact us.

Very truly yours,

T. F. Plunkett
Vice President
Turkey Point Nuclear

TFP/RJT/rt

Attachment

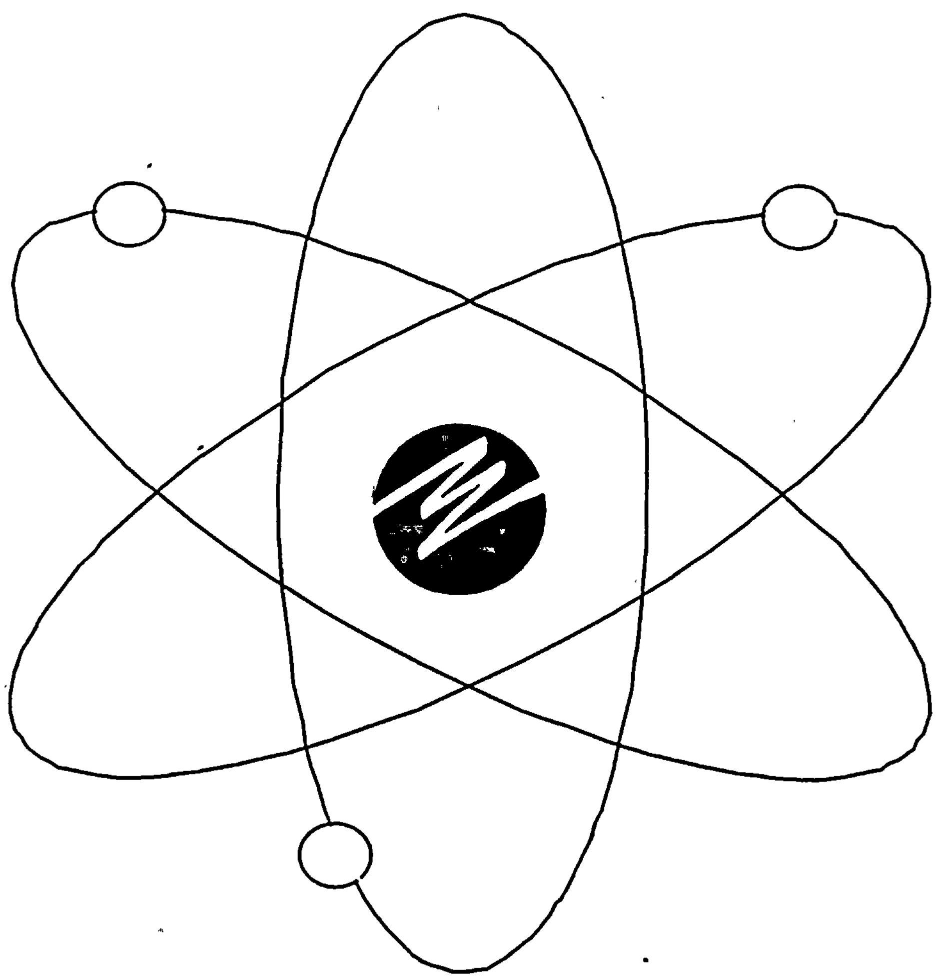
cc: Stewart D. Ebneter, Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant

FLORIDA POWER & LIGHT COMPANY

TURKEY POINT NUCLEAR PLANT

UNIT 4 CYCLE XIII

STARTUP REPORT



INTRODUCTION

This report contains the official summary of the Startup Physics Tests performed on Turkey Point Unit 4 at the beginning of Cycle XIII. The testing program was conducted in accordance with Operating Procedure 0204.3, "Initial Criticality After Refueling", and Operating Procedure 0204.5, "Nuclear Design Check Tests During Startup Sequence After Refueling", and meets the minimum requirements of ANSI/ANS 19.6.1, Revision 0 (12/13/85), "Startup Physics Tests for Pressurized Water Reactors". Testing commenced on October 26, 1991 at 1953 and was completed on October 27, 1991 at 1452.

The Westinghouse Nuclear Design Report for Unit 4, Cycle XIII, (WCAP 13021) is the design data from which deviations were measured for the purpose of verifying that acceptance criteria were met. The acceptance criteria stated are the more conservative of ANSI/ANS 19.6.1, Revision 0 or Operating Procedure 0204.5.

All tests included in this report meet their acceptance criteria.

The contents of this report provide the documentation required by Technical Specification 6.9.1.1.

Author: Arlon Costa
Reactor Engineer

Reviewed by: H. P. Hendrickson
Reactor Engineer

Reviewed by: J. L. Perryman
Reactor Support Supervisor

Approved by: G. L. Marsh
Reactor Supervisor PTN

TABLE OF CONTENTS

1.0 UNIT 4 CYCLE XIII CORE

1.1 Fuel Design Changes

The Cycle 13 reload contains the same Westinghouse LOPAR and OFA Fuel Assembly design of Cycle 12 except for fresh fuel.

A variation of the OFA fuel assembly design to increase resistance to debris induced fuel failures was introduced with fresh fuel and includes the following modifications:

- Solid, longer end plug
- End plug radius change
- Modified axial grid positions
- Modified bottom nozzle
- Snag-resistant mid-grids

Cycle 13 uses one Region 13B assembly that has two stainless steel filler rods. This assembly was reconstituted during the Cycle 11/12 reload.

Source assemblies have been removed for Cycle 13.

1.2 Loading Pattern

This section presents the as-loaded core configuration (Figure 1, Page 2).

1.3 Rod Pattern and Rod Drop Times

This section presents the Rod Drop Times for all Rod Bank Locations as measured per Procedure 3-PMI-028.3 RPI Hot Calibration, CRDM Stepping Test, and Rod Drop Test (Figure 2, Page 3). All rods meet the drop time limit of 2.4 seconds as per Technical Specification 3.1.3.4.

FLORIDA POWER & LIGHT
TURKEY POINT UNIT 4
CYCLE 13

FIGURE 1: AS LOADED CORE CONGURATION

N ↑

	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01
R							PP16 HF01	NN51 HF10	PP24 HF11						
P					PP51	RR39 R101	SS31	RR10	SS34	RR33 R51	PP45				
N				PP27	SS36 8P208WZ	SS18 4P136WZ	X15 R52	SS03 8P198WZ	X33 R53	SS20 4P138WZ	SS42 8P205WZ	PP47			
M			PP39	SS45	RR21	Z12 R55	SS06 16P6WZ	Z10 R54	SS08 16P7WZ	Z11 R56	RR22	SS46	PP36		
L		PP55	SS43 8P211WZ	RR14	RR45 R57	RR12	RR28 R58	SS14 20P4WZ	RR18 R59	RR03	RR50 R60	RR09	SS30 8P206WZ	PP26	
K		RR36 R61	SS21 4P134WZ	Z09 R62	RR07	RR30	RR44	PP37 R63	RR42	RR29	RR19	Z04 R64	SS26 4P135WZ	RR34 R65	
J	PP09 HF02	SS44	X20 R66	SS15 16P5WZ	RR17 R67	RR52	PP46	SS27 8P210WZ	PP34	RR43	RR16 R68	SS02 16P2WZ	X27 R69	SS32	PP07 HF20
H	NN52 HF05	RR11	SS16 8P199WZ	Z08 R70	SS04 20P3WZ	PP25 R71	SS17 8P203WZ	K10 R72	SS28 8P200WZ	PP31 R73	SS11 20P1WZ	Z06 R74	SS12 8P191WZ	RR01	NN49 HF15
G	PP12 HF13	SS39	X17 R75	SS09 16P1WZ	RR24 R76	RR51	PP38	SS19 8P201WZ	PP32	RR41	RR25 R77	SS10 16P3WZ	X32 R78	SS40	PP11 HF07
F		RR35 R79	SS24 4P132WZ	Z07 R80	RR05	RR32	RR47	PP49 R81	RR46	RR31	RR13	Z05 R82	SS25 4P137WZ	RR40 R83	
E		PP54	SS37 8P202WZ	RR20	RR48 R85	RR04	RR02 R84	SS05 20P2WZ	RR27 R86	RR06	RR49 R87	RR08	SS38 8P207WZ	PP30	
D			PP53	SS47	RR15	Z03 R88	SS07 16P4WZ	Z02 R89	SS01 16P8WZ	Z01 R90	RR23	SS48	PP56		
C				PP35	SS33 8P209WZ	SS22 4P139WZ	X26 R91	SS13 8P188WZ	X02 R92	SS23 4P133WZ	SS35 8P204WZ	PP52			
B					PP40	RR37 R93	SS29	RR26	SS41	RR38 R95	PP33				
A							PP10 HF06	NN50 HF16	PP08 HF23						

Verified by: [signature] Date: 11 DEC 91

TURKEY POINT NUCLEAR PLANT

UNIT 4 – CYCLE 13

Figure 2: Control Rod Bank Location and Rod Drop Times

N ↑

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
R															
P						CB 1.433 1.983				CB 1.367 1.933					
N							SDA 1.333 1.800		SDA 1.333 1.867						
M						CC 1.333 1.833		CD 1.317 1.850		CC 1.333 1.833					
L					SDB 1.333 1.917		CA 1.367 1.933		CA 1.367 1.900		SDB 1.350 1.900				
K		CB 1.400 1.950		CC 1.300 1.800				SDB 1.367 1.983				CC 1.283 1.850		CB 1.367 1.900	
J			SDA 1.333 1.833		CA 1.383 1.983						CA 1.367 1.933		SDA 1.317 1.850		
H				CD 1.300 1.800		SDB 1.367 1.967		CD 1.350 1.900		SDB 1.333 1.983		CD 1.317 1.917			
G			SDA 1.317 1.850		CA 1.367 1.917						CA 1.383 1.967		SDA 1.300 1.800		
F		CB 1.367 1.900		CC 1.333 1.783				SDB 1.350 1.967				CC 1.317 1.783		CB 1.383 1.950	
E					SDB 1.350 1.917		CA 1.400 1.983		CA 1.350 1.917		SDB 1.350 1.917				
D						CC 1.334 1.800		CD 1.300 1.783		CC 1.350 1.833					
C							SDA 1.333 1.833		SDA 1.317 1.833						
B						CB 1.367 1.900				CB 1.417 1.967					
A															

Function:	# of Clusters
Control Bank D	5
Control Bank C	8
Control Bank B	8
Control Bank A	8
Shutdown Bank A	8
Shutdown Bank B	8

LEGEND:

- --- BANK
- --- TIME TO DASHPOT (sec)
- --- TIME TO BOTTOM (sec)

2.0 INITIAL CRITICALITY

The approach to criticality began October 26, 1991 at 1954 hours in accordance with Operating Procedure 0204.3, "Initial Criticality After Refueling". Criticality was achieved October 27, 1991 at 0101 hours by withdrawing control rods to 160 steps on Bank D and diluting the RCS with 16,340 gallons of water. Figure 3 (page 5) is a plot of the Inverse Count Rate Ratio (ICRR) during the approach to criticality.

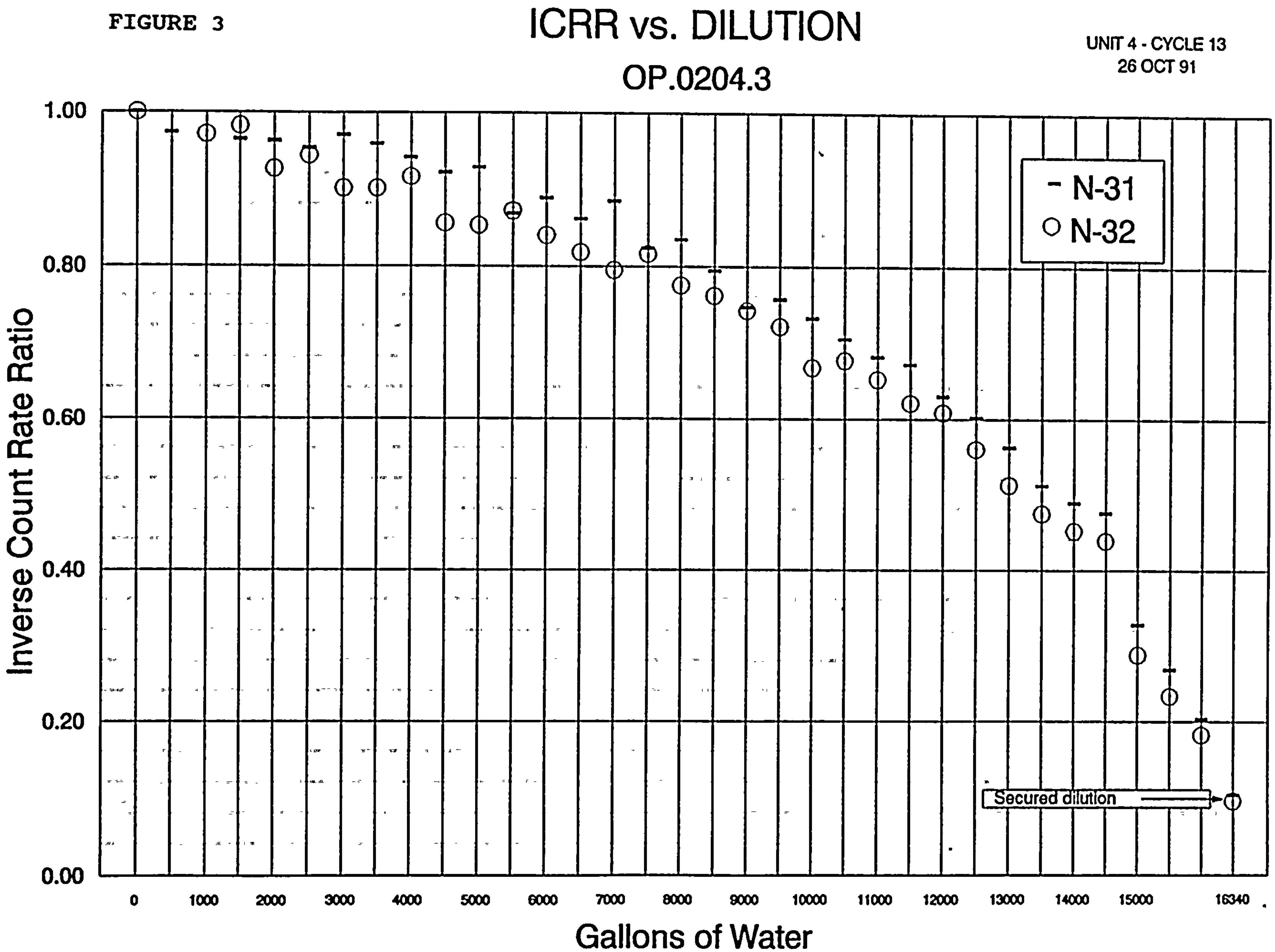
Upon attaining criticality, the flux level was increased to 1×10^{-8} amps on the intermediate range to obtain critical data, as follows:

TABLE 2.1: CRITICAL DATA

Tavg	=	546.7°F
Control Bank D	=	174 Steps
RCS Boron	=	1520 ppm
Picoammeter Flux	=	0.6×10^{-8} A
N35 Flux	=	1.0×10^{-8} A
N36 Flux	=	1.0×10^{-8} A

FIGURE 3

UNIT 4 - CYCLE 13
26 OCT 91



3.0 SUMMARY OF TESTS

This section provides a summary of the results of the low power physics tests for Unit 4, Cycle XIII along with the Westinghouse design data. For each test, the acceptance criteria is listed at the bottom of the table. This report compares design and measured data using Difference and Percent Difference, as follows:

Difference = Predicted - Measured

For calculating Percent Difference, the equation is:

$$\%Diff = [\frac{PredictedValue}{MeasuredValue} - 1] x100$$

3.1 Nuclear Heating

The point of adding Nuclear Heat was determined in accordance with Operating Procedure 0204.3, "Initial Criticality After Refueling", Step 8.15 and Appendix A. This is performed by establishing a small positive startup rate and measuring the point (flux level) at which T_{avg} departs from its established steady value. Nuclear Heating was measured to first occur at values presented on Table 3.1.1.

TABLE 3.1.1: FLUX LEVEL (Amperes)

Picoammeter	N-35	N-36
2.6×10^{-7}	4.3×10^{-8}	4.3×10^{-8}

All physics tests were conducted at or below 1×10^{-7} amps on the picoammeter connected to N-44 to assure Nuclear Heating did not occur.

3.2 Reactivity vs. Period

Reactivity Computer checkout was done in accordance with Operating Procedure 0204.3, "Initial Criticality After Refueling, Step 8.17 and Appendix B. This checkout is performed by inserting small positive and negative reactivities using rod motion, measuring the period generated and the indicated worth, and then comparing design worths to measured worths for the given period.

TABLE 3.2.1: REACTIVITY VS. PERIOD

PERIOD (sec)	MEASURED REACTIVITY (pcm)	DESIGN REACTIVITY (pcm)	%DIFF*
+172.5	+34.5	+33.5	-2.9
-232.3	-36.0	-37.2	+3.3
+251.3	+24.5	+24.9	+1.6
-264.9	-31.0	-31.5	+1.6

*Acceptance Criteria is ± 4% for positive period and ± 6% for negative period.

3.3 Boron Endpoints (ppm)

The Boron Endpoints noted below are determined as per Operating Procedure 0204.5, Appendix A. A just-critical condition is established as near as practicable to the required rod configuration (i.e., ARO and Control Bank A in). The RCS boron concentration was determined and then adjusted analytically for the ppm worth of the reactivity (measured in pcm) by which the actual critical state deviated from the design condition. Appendix A was performed for the ARO boron endpoint and later for the CBA in boron endpoint.

TABLE 3.3.1: BORON ENDPOINTS (ppm)

	MEASURED (ppm)	WESTINGHOUSE (ppm)	DIFFERENCE** (ppm)
ARO	1554	1571	+17
CBA	1401	1422	+21

**Acceptance Criteria is +/- 50 ppm.

3.4 Rod Worth (ppm), Most Reactive Bank

Rod worths were measured as per Operating Procedure 0204.5, Appendices D and F. The Reference Bank (highest predicted worth) was diluted into the core. The boron concentration prior to and subsequent to this insertion was determined and the difference in the two boron concentrations is defined as the boron (Rod) worth of the Bank (Table 3.4.1). The differential and integral worth of Control Bank A was measured and plotted (Figure 4, Page 9).

TABLE 3.4.1: ROD WORTH (ppm)

	MEASURED	WESTINGHOUSE
CBA	153	149

3.5 Rod Worth (pcm)

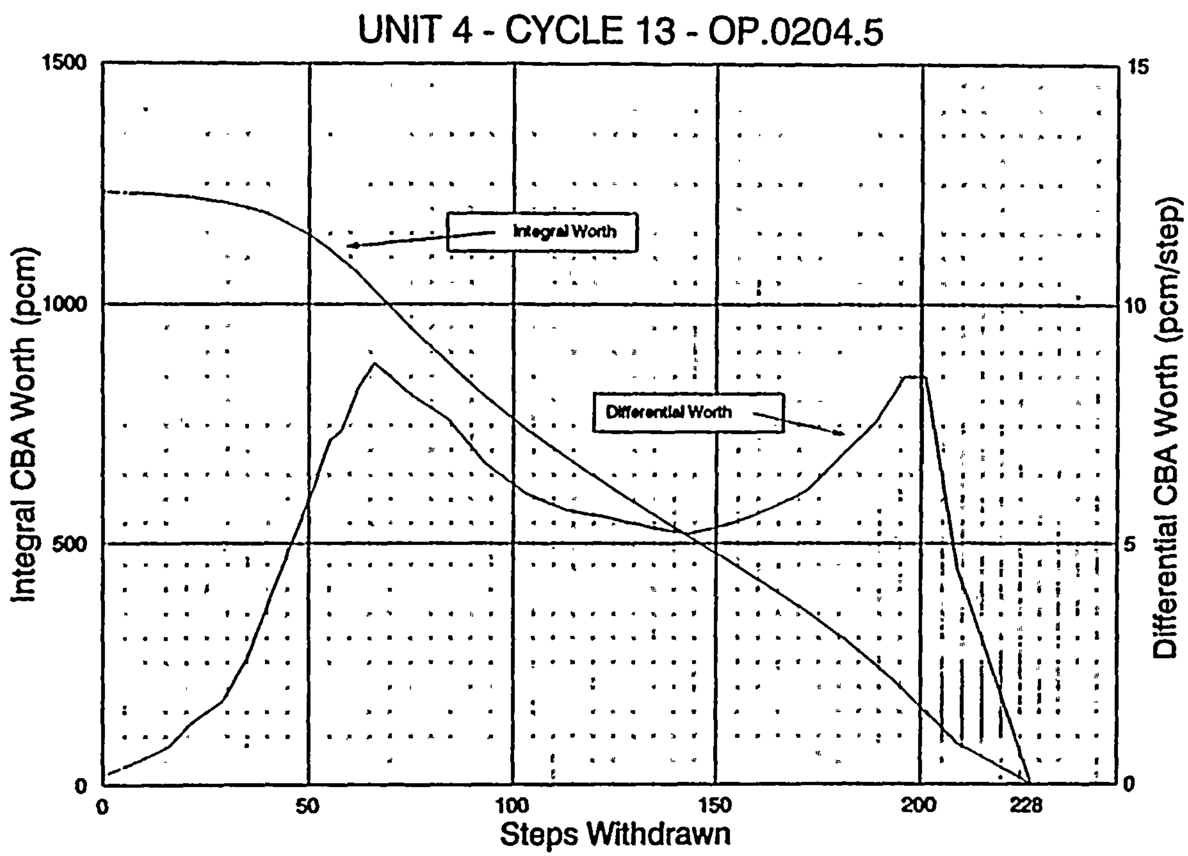
The remaining rod bank worths were measured using the rod swap technique, "swapping" negative reactivity insertions on the bank being measured with positive reactivity insertions from the Reference Bank.

TABLE 3.5.1: ROD WORTH (pcm)

	Measured	Westinghouse	Diff (pcm)	% Diff
CBD[2]	640.5	664	23.5	+3.7
CBC[2]	1021.5	1035	13.5	+1.3
CBB[2]	434.7	462	23.7	+6.3
CBA[1]	1231.5	1247	15.5	+1.3
SBA[2]	826.2	843	16.8	+2.0
SBB[2]	1183.3	1213	29.7	+2.5
Total[3]	5338	5464	--	+2.4

The acceptance criteria for rod worth measurements are:
[1]Reference bank within +/- 10% of design, and
[2]Individual banks within +/- 15% or +/- 100 pcm of design, whichever is greater, and
[3]Sum of all measured banks within +/- 7% of design.

FIGURE 4
HOT ZERO POWER
DIFFERENTIAL AND INTEGRAL BANK A WORTH
VS.
BANK POSITION



UNIT: 4
CYCLE: XIII
EXPOSURE: 0.0 MWD/MTU
BANK: CBA

BANK POSITIONS

	OUT	IN	MOVING
SBA	■	□	□
SBB	■	□	□
CBA	□	□	■
CBB	■	□	□
CBC	■	□	□
CBD	■	□	□

TEST METHOD

DILUTION	■
BORATION	□

3.6 Temperature Coefficient

The isothermal and moderator temperature coefficients were determined using Appendix B in Operating Procedure 0204.5, "Nuclear Design Check Tests During Startup Sequence After Refueling". The values determined for this testing sequence are presented on Tables 3.6.1 and 3.6.2 below:

TABLE 3.6.1: ISOTHERMAL TEMPERATURE COEFFICIENT (pcm/°F)

RODS	MEASURED[1]	WESTINGHOUSE	DIFF*
D/200.5	-1.66	-2.04	-0.38

*Acceptance Criteria is +/-2pcm/°F of design.

TABLE 3.6.2: MODERATOR TEMPERATURE COEFFICIENT (pcm/°F)

RODS	MEASURED[1]	WESTINGHOUSE[2]	DIFF**
D/200.5	0.24	-0.14	+0.38

**Acceptance Criteria is ≤ + 5 pcm/°F.
[1]This is the average of one heat up and one cool down measurement.
[2]This value has been adjusted for boron and temperature sensitivity.

3.7 HZP Differential Boron Worth

The Hot Zero Power (HZP) Differential Boron worth was measured using Control Bank A, which had a bank worth of 1231.5 pcm. The value obtained for this test is presented on Table 3.7.1.

TABLE 3.7.1: HZP DIFFERENTIAL BORON WORTH (pcm/ppm)

MEASURED	WESTINGHOUSE	DIFFERENCE***
8.05	8.39	4.2%

***Acceptance Criteria ≤ +/- 15%.

4.0 SHUTDOWN MARGIN

The Shutdown Margin was calculated prior to power escalation to verify adequate shutdown capability. For this calculation, the total of the design rod worths (minus the most reactive stuck rod) were reduced by 7%. The results show adequate shutdown margin at BOL and EOL. The following is a summary of the data used*:

TABLE 4.1: UNIT 4, CYCLE XIII SHUTDOWN DATA

	BOL	EOL
HZP Control Rod Worth Requirement (%Δρ)		
All Rods Inserted Less Most Reactive Stuck Rod	6.01	6.03
(1) Less 7%	5.59	5.61
HFP to HZP Reactivity Insertion (%Δρ)		
Reactivity Defects (Doppler, T_{avg}, Void, Redistribution)	1.67	2.65
Rod Insertion Allowance	0.50	0.50
(2) Total Requirements	2.17	3.15
Shutdown Margin (1) - (2)%Δρ	3.42	2.46
Required Shutdown Margin (%Δρ)	1.00	1.77

*Source: WCAP 13021

5.0 POWER DISTRIBUTION MAPS

The core was mapped using incore instrumentation for power levels of approximately 30%, 50% and 100%. A summary of the results are presented on Pages 12 through 14.

FLORIDA POWER & LIGHT COMPANY
TURKEY POINT PLANT UNIT 4
FLUX MAP SUMMARY

MEASURED ASSEMBLY POWER AND PERCENT DIFF. TO EXPECTED POWER - INSTR. LOC. ONLY

(N →)

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R
15							0.249	0.267	0.264						
14					0.421	0.856	1.195	0.953	1.195	0.884	0.435 6.8				
13				0.451	1.151	1.295	0.986	1.310	0.986	1.337	1.190	0.465			
12			0.450	1.095 3.4	1.174	1.007	1.203	0.811	1.202 0.7	1.000	1.158	1.128	0.464 6.6		
11		0.404	1.107	1.154	1.389 2.6	1.279 0.8	1.255	1.219 1.3	1.241	1.256	1.333	1.076	1.042	0.380	
10		0.821 -0.2	1.255	0.950 -3.8	1.267	1.326	1.364	1.048	1.330 -2.9	1.296	1.248	0.886	1.041 -18.7	0.668	
9	0.245	1.158	0.954	1.153	1.224	1.377 0.3	1.018 -3.6	1.233	1.026	1.383	1.224 -1.6	1.200	0.961	1.140	0.230
8	0.264	0.929 -1.3	1.257 -3.5	0.798	1.214	1.075	1.252	0.837	1.227	1.074	1.279 6.2	0.836	1.503 15.4	0.955	0.246 -6.6
7	0.247	1.208 2.6	0.973	1.207 1.1	1.257	1.322	1.018 -3.6	1.232	1.010 -4.4	1.353	1.245	1.226	0.926 -5.0	1.193	0.230
6		0.849	1.316	1.021	1.311	1.277	1.329	1.042 -2.2	1.332	1.290	1.179 -7.0	0.976	1.278	0.821	
5		0.421 3.9	1.151	1.187 3.5	1.426 5.3	1.300	1.227	1.182	1.226 -1.5	1.256	1.388 2.5	1.153	1.161 4.6	0.424	
4			0.450	1.101	1.180	0.986 -0.4	1.179	0.795	1.174	1.000	1.170 1.9	1.102	0.461		
3				0.449 3.0	1.141	1.316	0.986	1.274 -2.1	0.957	1.313	1.166	0.468 7.5			
2					0.423	0.868 4.8	1.202	0.924	1.158	0.889	0.437				
1							0.259	0.258	0.241						

Key: MEAS / DIFF

ROD POSITION

Bank	Location in Steps
SBA	228
SBB	228
CBA	228
CBB	228
CBC	228
CBD	105

Classification

Map No. FM4XII1

Power 28.91%

Axial Offset . -0.193%

Max $F^N_{\Delta H}$ 1.6084

Max F^N_Q 2.1497*

*F^N_Q adjusted for K(Z), F^U_Q and L(Z).

MAXIMUM INCORE TILT

N

0.9899	0.9831
1.0183	1.0087

FLORIDA POWER & LIGHT COMPANY
TURKEY POINT PLANT UNIT 4
FLUX MAP SUMMARY

MEASURED ASSEMBLY POWER AND PERCENT DIFF. TO EXPECTED POWER - INSTR. LOC. ONLY

--->N

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R
15							0.250	0.267	0.245						
14					0.409	0.838	1.207	0.959	1.207	0.819	0.403 -0.4				
13				0.435	1.124	1.295	0.987	1.315 1.7	0.975	1.266	1.106	0.433			
12			0.434	1.051 1.1	1.156	0.997	1.233	0.874	1.208 -0.2	0.971	1.128	1.057	0.437 1.7		
11		0.401	1.112	1.153	1.374 1.9	1.289 1.8	1.277	1.259 2.4	1.257	1.259	1.321	1.141	1.112	0.404	
10		0.815 -0.3	1.262	0.995	1.289	1.333	1.379	1.064	1.365 -0.7	1.313	1.241	0.963	1.257 -0.8	0.811	
9	0.242 -0.4	1.176	0.967	1.219	1.268	1.396	1.031 -2.8	1.264	1.051	1.361	1.230 -1.7	1.203	0.963	1.172	0.241
8	0.261	0.936 -0.1	1.301 0.5	0.872	1.254	1.086 1.2	1.281	0.904	1.271	1.055	1.214	0.847	1.293 -0.1	0.922	0.261
7	0.246	1.192 1.3	0.979	1.246 2.8	1.267	1.374	1.044 -1.5	1.266	1.041 -1.8	1.364	1.247	1.196	0.935 -3.3	1.157	0.235
6		0.818	1.280	0.996	1.282	1.321 -0.7	1.355	1.048 -1.9	1.349	1.318	1.262 -0.3	0.970	1.255	0.810	
5		0.398 -1.1	1.106	1.148 1.0	1.374 1.9	1.269	1.228	1.195	1.227	1.268	1.334 -1.0	1.141	1.124 1.5	0.409	
4			0.432	1.056	1.150	0.972 -0.7	1.195	0.828 -3.6	1.190	0.974	1.154 1.5	1.048	0.436		
3				0.439 2.2	1.118	1.263	0.957	1.309 1.2	0.948 -2.2	1.267	1.125	0.435 1.2			
2					0.413	0.816	1.204	0.945	1.189	0.805	0.409				
1							0.250	0.267 2.0	0.250						

MEAS
DIFF

ROD POSITION

Bank	Location in Steps	Classification	
SBA	228	Map No. FM4XII2	
SBB	228	Power	48.79%
CBA	228	Axial Offset	2.366%
CBB	228	Max $F^N_{\Delta H}$ . .	1.5330
CBC	228		
CBD	156	Max F^N_Q . .	2.0761*

MAXIMUM INCORE TILT

N

1.0142	0.9766
1.0181	0.9912

*F^N_Q adjusted for K(Z), F^U_Q and L(Z).

FLORIDA POWER & LIGHT COMPANY
TURKEY POINT PLANT UNIT 4
FLUX MAP SUMMARY

MEASURED ASSEMBLY POWER AND PERCENT DIFF. TO EXPECTED POWER - INSTR. LOC. ONLY

	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R
15							0.254	0.275	0.254 -0.2						
14					0.423	0.840	1.195	0.955	1.174	0.811	0.409				
13				0.397	1.047	1.277 3.7	1.014	1.269 -2.2	0.950	1.117	0.972	0.430			
12			0.397	0.988 -2.8	1.119	1.021	1.281	0.982	1.223 -0.5	0.891	1.009	1.005	0.430 -1.2		
11		0.407	1.040	1.097	1.316 0.1	1.303 3.9	1.316	1.255 0.3	1.255	1.214	1.167	1.106	1.064	0.405	
10		0.807 0.0	1.230	1.004 2.2	1.289	1.356	1.417	1.126	1.427 4.3	1.263	1.114	0.929	1.230 0.1	0.808	
9	0.254	1.168	0.992	1.258	1.299	1.425	1.130 3.6	1.356	1.122	1.353	1.210 -3.8	1.226	1.002	1.151	0.243
8	0.280	0.960	1.345 3.4	1.024	1.322	1.126 3.1	1.372	1.071	1.323	1.068	1.220 -2.7	0.942	1.236 -5.0	0.889	0.263 -4.3
7	0.258	1.177 2.6	1.011	1.284 4.2	1.314	1.417	1.090 -0.1	1.282	1.035 -5.1	1.398	1.299	1.215	0.915 -6.4	1.087	0.243
6		0.779	1.219	1.037	1.313	1.360 3.3	1.337	1.066 -2.0	1.335	1.341	1.284 2.3	0.957	1.134	0.745	
5		0.373 -8.4	0.979	1.186	1.362 3.6	1.297	1.234	1.223	1.233 -1.9	1.287	1.343 2.2	1.132	1.000 1.0	0.411	
4			0.417	1.050	1.141	1.018 3.6	1.247	1.002 2.2	1.258	1.000	1.130 1.6	1.031	0.437		
3				0.435 -0.1	1.083	1.250	0.994	1.322 1.9	0.996 1.8	1.254	1.081	0.439 0.7			
2					0.412	0.827 2.1	1.127	0.914	1.126	0.826	0.408				
1							0.240	0.240 -13.1	0.221						

MEAS
DIFF

N

ROD POSITION

Bank	Location in Steps
SBA	228
SBB	228
CBA	228
CBB	228
CBC	228
CBD	225

Classification

Map No. FM4XII3

Power 99.8%

Axial Offset . 6.996%

Max $F^N_{\Delta H}$ 1.5513

Max F^N_Q 2.1090*

*F^N_Q adjusted for K(Z), F^U_Q and L(Z).

MAXIMUM INCORE TILT

N

1.0186	0.9796
1.0134	0.9884

6.0 CRITICAL BORON CONCENTRATION

The HZP critical boron concentration was calculated by adjusting a measured boron concentration to the equilibrium hot full power, all rods out condition, as per Operating Procedure 1009.6, "Critical Boron Concentration-Full Power". For Unit 4, Cycle XIII, this calculation was performed at 532 MWD/MTU. The following is a summary of the results.

TABLE 6.1: SUMMARY OF HZP CRITICAL BORON CONCENTRATION (ppm)

MEASURED[1]	WESTINGHOUSE	DIFFERENCE*
1540	1534	-6

*Acceptance Criteria +/- 50 ppm.

[1]Actual boron concentration (adjusted to equilibrium, HFP, ARO condition) + 17 ppm (Predicted HZP, ARO C_B - Measured HZP, ARO C_B).