

Prairie Island
Startup Physics Test Report
Unit 2 Cycle 16

1.0 INTRODUCTION:

The Prairie Island Unit 2 reactor had 48 reload fuel assemblies manufactured by Westinghouse installed during the November 1993 refueling outage. The core design uses the VANTAGE+ fuel assemblies enriched to 4.95 w/o U235. For peaking and ITC control this design uses 336 pins with 6 w/o gadolinium and 64 pins with 8 w/o gadolinium. The 8 w/o gadolinium pins are located in 8 demonstration assemblies.

2.0 STARTUP PHYSICS TESTING - INTRODUCTION:

This report provides test results for the tests conducted during the startup of Prairie Island Nuclear Generating Plant, Unit 2. The procedures used in the startup test program were the most recent revision reviewed by the Plant Operations Committee. The tests performed included the following:

- (a) Zero Power Isothermal Temperature Coefficient
- (b) Control Banks' Worth
- (c) Critical Boron Concentration
- (d) Power Distribution Measurement

3.0 STARTUP PHYSICS TESTING - RESULTS:

Table 1 summarizes the following data for each test performed.

- (a) Test
- (b) Procedure/Effective Revision
- (c) Parameter
- (d) Measured Value
- (e) Acceptance Criteria

4.0 SUMMARY:

The data in Table 1 shows agreement with the acceptance criteria.

TABLE 1

Startup Physics Testing Results
Unit 2 Cycle 16

1.0 HZP ISOTHERMAL TEMPERATURE COEFFICIENT:

Procedure: D32
Revision: 5 (6/25/93)

<u>Test Condition</u>	<u>Measured Value</u>	<u>Acceptance Criteria</u>
ARO	+1.86 pcm/°F	<5 pcm/°F

2.0 CONTROL BANKS' WORTH MEASUREMENTS:
(using the Rod Swap method)*

Procedure: D30
Revision: 23 (9/17/92)

<u>Test Condition</u>	<u>Measured Value</u>	<u>Acceptance Criteria</u>
Control Bank A (reference)	1125.1 pcm	1201 pcm ± 10% (1081-1321 pcm)
Control Bank B	495.0 pcm	510 pcm ± 15% (434-587 pcm)
Control Bank C	832.5 pcm	900 pcm ± 15% (765-1035 pcm)
Control Bank D	603.5 pcm	684 pcm ± 15% (581-787 pcm)
Shutdown Bank A	744.0 pcm	839 pcm ± 15% (713-965 pcm)
Shutdown Bank B	762.5 pcm	847 pcm ± 15% (720-974 pcm)
Total Banks	4562.6 pcm	4981 pcm ± 10% (4483-5479 pcm)

3.0 CRITICAL BORON CONCENTRATION:

Procedure: D34
Revision: 4 (6/29/93)

<u>Test Condition</u>	<u>Measured Value</u>	<u>Acceptance Criteria</u>
ARO	1816 ppm	1840 ± 122 ppm
Bank A IN, ORO	1684 ppm	1670 ± 122 ppm

* See report NSPNAD-88408-A, Rev 1, "Prairie Island Units 1 and 2 Rod Swap Methodology", September 1985.

TABLE 1 (Continued)

5.0 POWER DISTRIBUTION MEASUREMENTS:

Procedure: SP2116
 Revision: 21 (12/6/93)

<u>Plant Condition</u>	<u>Parameter</u>	<u>Value</u>	<u>Acceptance Criteria</u>
30% Power:			
	$\text{MAX}(\text{RRI}_m - \text{RRI}_p) / \text{RRI}_p$		
	$p_i \geq 0.9$	+8.1%	$\pm 10\%$
	$p_i < 0.9$	+8.5%	$\pm 15\%$
	$F_0^N \times 1.03 \times 1.05^*$	2.72	$< 4.73^{**}$
	$F\Delta H \times 1.04$	1.84	$< 2.12^\#$
	QPTR	0.982	≤ 1.02 and ≥ 0.98
100% Power:			
	$\text{MAX}(\text{RRI}_m - \text{RRI}_p) / \text{RRI}_p$		
	$p_i \geq 0.9$	+4.6%	$\pm 10\%$
	$p_i < 0.9$	+5.2%	$\pm 15\%$
	$F_0^N \times 1.03 \times 1.05$	2.12	$< 2.21^\&$
	$F\Delta H \times 1.04$	1.68	$< 1.75^\#$
	QPTR	0.994	≤ 1.02 and ≥ 0.98

* The $V(z)$ function is not applied since this is a non-equilibrium map.

** Acceptance criteria is $(2.40/P) \times K(z)$.

Acceptance criteria is $1.75 \times [1 + 0.3(1-P)]$.

& Acceptance criteria is $[2.40/P \times V(z)] \times K(z)$.

LEGEND:

HZP	Hot Zero Power
ARO	All Rods Out
RRI_m	Reaction Rate Integral - Measured
RRI_p	Reaction Rate Integral - Predicted
P_i	Relative Assembly Power
QPTR	Quadrant Power Tilt Ratio
ORO	Other Rods Out