New Hampshire
Yankee

Ted C. Feigenbaum
President and
Chief Executive Officer

NYN-92009

January 29, 1992

Un..ed States Nuc.ear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

References: Fa.ility Operating License No. NPF-86, Docket No. 50-443

Subject: Cycle 2 Startup Report

Gentlemen:

In accordance with the requirements of Technical Specification 6.8.1.1, enclosed is the Cycle 2 Startup Report for Seabrook Station.

Should you have any questions, please contact Mr. Terry L. Harpster, Director of Licensing Services, at (603) 474-9521, extension 2765.

Very truly yours,

Ted C. Feigenbaum

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SEABROOK STATION

UNIT NO. 1

FACILITY OPERATING LICENSE NPF-86

Docket No. 50-443

STARTUP TEST REPORT

CYCLE 2

INDEX

1.0 CHRONOLOGICAL SUMMARY

Cycle 2 Fuel Load was completed September 9, 1991. Subsequent operation/testing milestones were completed as follows:

INITIAL CRITICALITY	10/09/91
LPPT COMPLETED	10/12/91
ON LINE	10/16/91
30% PAT COMPLETED	10/19/91
50% PAT COMPLETED	10/23/91
90% PAT COMPLETED	10/25/91
FULL POWER	10/29/91
100% PAT COMPLETED	11/14/91

2.0 CORE DESIGN SUMMARY

The Cycle 2 Core is designed to operate for 11550 MWD/MTU (302.7 EFPD). This cycle utilized 60 reload fuel assemblies with an enrichment of 3.4 w/o U-235 arranged in a low leakage loading pattern. The reload fuel assemblies for cycle 2 incorporated a number of mechanical design changes to improve the overall operation of the fuel. These changes are:

1. Reconstitutable Top Nozzle: This change allows for easier removal and replacement of fuel rods.

2. Debris Filter Bottom Nozzle: This change minimizes the possibility of fuel damage due to debris in the Reactor Coolant System by preventing any foreign material from entering the active fuel region of the core.

3. Integral Fuel Burnable Absorber (IFBA): Burnable poisons for Cycle 2 utilize the IFBA design in place of the burnable poison rod assemblies used in Cycle 1. There are a total of 3712 IFBA rods in Cycle 2.

4. Extended Burnup Capability: The fuel rod plenum was enlarged slightly to accommodate more fission gas buildup from longer operating cycles.

5. Anti-Snag Grids: Anti-Snag grids are used to minimize the potential for grid strap damage during fuel handling operations.

3.0 LOW POWER PHYSICS TESTING SUMMARY

Testing was performed in accordance with the following general sequence:

1. Initial Criticality: Criticality was achieved using a controlled dilution once shutdown and control banks had been withdrawn (CBD @ 140 steps).

2. Zero Power Test Range Determination: This was determined after the point of adding heat had been demonstrated.

3. On-line verification of the Reactivity Computer: This was determined using stable startup rates during flux doubling measurements.

4. Boron endpoint measurements: Data was obtained with all rods out and control banks inserted.

5. Isothermal Temperature Coefficient Measurement (ITC): ITC was based on the reactivity change resulting from an RCS temperature change. The Moderator Temperature Coefficient (MTC) was calculated from the ITC Data.

6. Rod measurement: Individual Control Bank worths were measured during rod insertion. Total Control Bank worth was measured during withdrawal in overlap.

4.0 POWER ASCENSION TESTING SUMMARY

Testing was performed at specified power plateaus of 30%, 50%, 90% and 100% RTP. Power changes were governed by operating procedures and Fuel Preconditioning Guidelines specified by the fuel vendor, Westinghouse.

In order to determine steady state core power distribution, flux mapping was done at 30%, 50% and 100% using the Movable Incore Detector System. The resultant peaking factors were compared to Technical Specification limits, to determine any limitations on further power ascension.

Thermal - hydraulic parameters, nuclear parameters and related instrumentation were monitored throughout the Power Ascension. The major areas of concern were:

1. Nuclear Instrumentation Indication: Overlap data was obtained between Intermediate Range and Power Range channels. Secondary plant heat balance calculations were performed to verify the Nuclear Instrumentation indications at 30% and 90% RTP. Precision Heat Balance Calculations were performed at 50% and 100% RTP.

2. RCS Temperatures: Data was obtained for all Narrow Range Loop temperatures. Evaluation of Delta T and Tavg Indication were performed.

3. RCS Flow: A precision heat balance was performed at 50% RTP using primary and secondary data to determine total RCS flow.

4. Steam and Feedwater Flows: Data was obtained to determine the full power values for individual loop agreement between transmitters, loop steam flow, feed flow deviations and steam flow normalization factors.

5. Tref Program Parameters: Data was obtained to determine the full power values for steam generator pressures, turbine impulse pressures and Tref indication.

6. Incore/Excore Calibration: The core was operated at a variety of axial power shapes during flux mapping at 50% (48%) and 100% RTP. This was accomplished through rod motion and subsequent xenon oscillations. Scaling factors were calculated and then used to recalibrate the Nuclear Instrumentation System..

5.0 <u>RESULTS</u>

1 Low Power Physics testing: All acceptance criteria were met. All review criteria were met with the exception of the individual worth of Control Bank B. The fuel vendor, Westinghouse, evaluated the data and attributed it to testing too low in the Zero Power Test Range (Gramma contribution to excore signal). Control rod worth measurements (Overlap) were done at a higher power level with acceptable results. See Table 1 for results.

2. Flux Mapping: No problems were identified during the flux maps at 30%, 50% and 100% RTP. See Table 2 for results.

3. Full Power Thermal/Hydraulic evaluation: No problems were encountered with any instrumentation. Only loop Delta T indication required minor rescaling. Total RCS flow was determined to be 103% of the allowable Technical Specification limit. See Table 3 for results.

TABLE 1

LOW POWER PHYSICS RESULTS: CYCLE 2

ITEM	MEASURED	PREDICTED	ERROR	CRITERIA
RCS BORON AT CRITICALITY (ppm) CBD @ 140 steps)	1297	1304	7	± 5.
BORON END POINTS:(ppm)				
ARO	1341	1335	6	± 50
CONTROL BANKS INSERTED	911	905	6	± 50
ARO ITC (ppm/°F)	-2.73	-3.69	.96	±3*
ARO MTC (ppm/°F)	- .94	N/A	N/A	<0
CONTROL BANK ROD WORTHS :(pcm)				
D	373	418	45	± 100*
C	984	1118	134	± 168*
B	756	907	151	± 136*
A	1365	1438	73	± 216*
OVERLAP	3752	3881	129	± 388

NOTE: * Review criteria, all others are acceptance criteria.

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TABLE 2

POWER ASCENSION FLUX MAP RESULTS: CYCLE 2

ITEM	MAP 1	MAP 2	MAP 3
Date of Map	10/19/91	10/21/91	11/01/91
Power level (%)	29.7	48.3	100
CBD Position (Steps)	148	164	192
RCS Boron (ppm)	1055	993	838
F_{XY}(unrodded/rodded)	1.5424/1.6762	1.5215/1.6536	1.5859
$F_{\Delta H}$	1.4262	1.4042	1.4059
Incore Tilt	1.0094	1.0088	1.0049

TABLE 3

FULL POWER THERMAL-HYDRAULIC DATA: CYCLE 2

ITEM	VALUE
RCS Average Temperature	587.2°F
RCS Delta T	
Loop 1	55.64 °F
2	55.46 °F
3	55.23 °F
4	55.80 °F
RCS Flows	
Loop 1	100748 gpm
2	99995 gpm
3	104392 gpm
4	98725 gpm
Total	403860 gpm
Tref	587.25°F
Impulse Pressure	672.6 psig
SG Pressures	
A	984.2 psig
B	980.4 psig
C	982.2 psig
D	979.9 psig