Docket No. 50-443

SEABROOK STATION

UNIT NO. 1

STARTUP TEST REPORT

CYCLE 3

INDEX

1.0 CHRONOLOGICAL SUMMARY

Cycle 3 Fuel Load was completed October 13, 1992. Subsequent operation/testing milestones were completed as follows:

INITIAL CRITICALITY	11/11/92
LPPT COMPLETED	11/13/92
ON LINE	11/13/92
30% PAT COMPLETED	11/16/92
50% PAT COMPLETED	11/19/92
75% PAT COMPLETED	11/20/92
90% PAT COMPLETED	11/21/92
FULL POWER	11/21/92
100% PAT COMPLETED	12/01/92

2.0 CORE DESIGN SUMMARY

Cycle 3 will be Seabrook Station's first 18-month fuel cycle. The Cycle 3 core is designed to operate for 16950 MWD/MTU (444 Effective Full Power Days). The principal change necessary to achieve the 18-month fuel cycle was an increase in both the number and enrichment of the reload fuel assemblies. 76 fresh fuel assemblies were loaded into the Cycle 3 core with 36 having an enrichment of 4.0 w/o and 40 having an enrichment of 4.4 w/o. By comparison, Cycle 2 utilized 60 fresh fuel assemblies with an enrichment of 3.4 w/o.

The reload fuel mechanical design is identical to that used in Cycle 2. The operating features of these fuel assemblies are a removable top nozzle, debris filter bottom nozzle, integral fuel burnable absorber, extended burnup capability and anti-snag grids. Two new secondary sources were added to the core bringing the total in the core to four. These new sources are located 90° from the existing sources and are intended to provide an increase in source counts to the Gammametrics Shutdown Monitors.

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 Initial Criticality: Criticality was achieved using a controlled dilution once shutdown and control banks had been withdrawn.

2. Zero Power Test Range Determination: This was determined after the point of adding heat had been demonstrated. Additional emphasis was placed on this measurement to prevent testing too low in the test range, thus minimizing gamma contribution to the excore signal.

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 Worth Measurements: 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%, 75%, 90% and 100% Rated Thermal Power (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 performed at 30%, 50% and 100% using the Movable Incore Detector System. The resultant peaking factors were compared to Technical Specification limits, to verify that the core was operating within its design limits.

Thermal-hydraulic parameters, nuclear parameters and related instrumentation were monitored throughout the Power Ascension. Data was compared to previous cycles' power ascension data to identify any calibration or system problems. The major areas analyzed 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.

2. RCS Delta-T Indication: During the second refueling, the Resistance Temperature Detector (RTD) bypass piping was removed. RCS temperature indication is now being accomplished by means of RTD's directly inserted in the RCS hot and cold leg piping. The initial scaling of RCS ΔT was set conservatively with respect to power indication. A value of 53°F was chosen. At the 75% power plateau, actual full power ΔT was extrapolated out using data from 30%, 50% and 75% power and ΔT rescaled accordingly. Final adjustments were performed at 100% power and the values provided in Table 3.

3. Upper Plenum Anomaly: In early 1992, Westinghouse notified North Atlantic that Seabrook Station may be susceptible to a phenomenon known as the Upper Plenum Anomaly (UPA). The UPA is primarily characterized by aperiodic step changes of 1°F to 2°F in hot leg temperature. A Design Document was written to implement a number of operating contingencies should the UPA be present in Cycle 3. An additional plateau at 75% power was added to the power ascension test program to determine the UPA presence in Cycle 3 and, if so, implement the necessary contingency actions. No Upper Plenum Anomaly was identified.

4. RCS Temperatures: Data was obtained for all Narrow Range Loop temperatures. Evaluations of Delta-T (°F) and Tavg/Tref Indication were performed.

5. Steam and Feedwater Flows: Data was obtained to evaluate flows for individual loop agreement between transmitters and loop steam flow/feed flow deviations.

6. Steam Pressures: Data was btained to evaluate steam generator pressures for inaividual loop agreement between transmitters as well as individual turbine impulse pressures.

7. Incore/Excore Calibration: The core was operated at a variety of axial power shapes during flux mapping at 50% 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.

8. RCS Flow: A primary heat balance was performed at 90% RTP to determine total RCS flow.

Other than the considerations of RCS ΔT and the UPA mentioned above, the power ascension test program required no changes from Cycle 2.

5.0 RESULTS

1. Low Power Physics Testing: All acceptance criteria were met. All review criteria were met. 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. No Upper Plenum Anomaly was identified. Total RCS flow was determined to be 102.6% of the allowable Technical Specification limit. See Table 3 for results.

TABLE 1

LOW POWER PHYSICS RESULTS: CYCLE 3

ITEM	MEASURED	PREDICTED	ERROR	CRITERIA
RCS BORON AT CRITICALITY (ppm) CBD @ 15[illegible] STEPS)	1522	1566	44	± 66
BORON END POINTS: (ppm)				
ALL RODS OUT	1551	1590	39	± 50
CONTROL BANKS INSERTED	1117	1136	19	± 50
ARO ITC (pcm/°F)	-3.26	-3.20	0.06	± 3*
ARO MTC (pcm/°F)	-1.55	N/A	N/A	< 0
CONTROL BANK ROD WORTHS: (pcm)				
D	5[illegible]	530	1	± 100*
C	882	970	88	± 146*
B	871	906	35	± 136*
A	960	1017	57	± 153*
OVERLAP	3219	3423	206	± 342

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

TABLE 2

POWER ASCENSION FLUX MAP RESULTS: CYCLE 3

ITEM	MAP 1	MAP 2	MAP 3
DATE OF MAP	11/16/92	11/19/92	11/25/92
POWER LEVEL (%)	30.2	48.1	100
CBD POSITION (STEPS)	175	207	214
RCS BORON (ppm)	1307	1197	1020
F_{XY} (UNRODDED/RODDED)	1.7537/1.6945	1.6201	1.5588
$F_{\Delta H}$	1.5205	1.4678	1.4141
INCORE TILT	1.0156	1.0114	1.0071

TABLE 3

FULL POWER THERMAL-HYDRAULIC DATA: CYCLE 3

ITEM	VALUE
RCS T_{AVG}	586.0
RCS DELTA-T	
Loop 1	56.91°F
2	57.12°F
3	55.08°F
4	56.13°F
RCS FLOWS	
LOOP 1	99794 GPM
2	99893 GPM
3	104198 GPM
4	100222 GPM
TOTAL	404107 GPM
AUCTIONEERED HIGH T_{AVG}	586.75°F
T_{REF}	586.95°F
IMPULSE PRESSURE	665.9 PSIG
SG PRESSURES	
A	973.0 PSIG
B	973.3 PSIG
C	974.3 PSIG
D	971.3 PSIG