North Atlantic

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The Northeast Utilities System

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United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Seabrook Station
Cycle 8 Startup Report

In accordance with the requirements of Technical Specification 6.8.1.1, enclosed is the Cycle 8 Startup Report for Seabrook Station.

Should you require further information regarding this matter, please contact Mr. James M. Peschel, Manager - Regulatory Programs, at (603) 773-7194.

Very truly yours,

NORTH ATLANTIC ENERGY SERVICE CORP.

G.F. St. Pierre
Station Director

cc: H. J. Miller, NRC Region I Administrator
V. Nerses, NRC Project Manager, Project Directorate I-2
NRC Senior Resident Inspector

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ENCLOSURE TO NYN-01022

SEABROOK STATION

UNIT NO. 1

STARTUP TEST REPORT

CYCLE 8

INDEX

1.0 CHRONOLOGICAL SUMMARY

Cycle 8 Fuel Load was completed November 30, 2000. Subsequent operation/testing milestones were completed as follows:

INITIAL CRITICALITY	01/27/01
LPPT COMPLETED	01/27/01
ON LINE	01/29/01
30% PAT COMPLETED	01/29/01
50% PAT COMPLETED	01/30/01
80% PAT COMPLETED	01/31/01
94% PAT COMPLETED	01/31/01
FULL POWER	02/01/01

2.0 CORE DESIGN SUMMARY

The Cycle 8 core is designed to operate for 18,575 MWD/MTU with a coastdown to 20,377 MWD/MTU. Eighty-eight (88) fresh fuel assemblies were loaded into the Cycle 8 core. Sixty-four have an enrichment of 3.80 w/o and twenty-four have an enrichment of 4.20 w/o. In addition, the top and bottom 6 inches have an enrichment of 2.6 w/o creating an axial annular blanket. By comparison, Cycle 7 utilized 80 fresh fuel assemblies, 76 with enrichments of 4.00 w/o with a similar 2.6 w/o axial annular blanket configuration and the remaining 4 at 4.95 w/o with a similar 2.6 w/o axial annular blanket configuration.

Fresh assemblies for this cycle are Vantage 5H ZIRLO. This design utilizes ZIRLO for fuel clad, control rod guide tubes and instrument thimbles and ZIRLO for the six low pressure drop mid grids. The mechanical design is identical to the Cycle 7 design, which utilized the Inconel protective bottom grid, with the exception that a total of three ZIRLO intermediate flow mixers grids have been added.

3.0 LOW POWER PHYSICS TESTING SUMMARY

Testing was performed in accordance with the following general sequence:

1. Initial Criticality: Criticality was achieved by withdrawing all shutdown and control banks and diluting to critical.

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 by examining the output of the Advanced Digital Reactivity Computer (ADRC) during rod withdrawal and the determination of the point of adding heat.

4. Boron Endpoint Measurement: This was determined with all the Control and Shutdown banks withdrawn using the ADRC.

5. Isothermal Temperature Coefficient Measurement (ITC): This was determined using the ADRC during a Reactor Coolant temperature change. The Moderator Temperature Coefficient (MTC) was calculated from the ITC Data.

6. Rod Worth Measurement: Individual control bank and shutdown bank worths were measured using the Dynamic Rod Worth Measurement (DRWM) technique with the ADRC.

4.0 POWER ASCENSION TESTING SUMMARY

Testing was performed at specified power plateaus of 30%, 50%, 80%, 94% and 100% Rated Thermal Power (RTP). Power changes were governed by operating procedures and fuel preconditioning guidelines.

In order to determine the core power distribution, flux mapping was performed at 30%, 50% and 100% RTP using the Fixed 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 cycle power ascension data at each test plateau to identify calibration or system problems. The major areas analyzed were:

1. Nuclear Instrumentation Indication: Overlap data was obtained between the Intermediate Range and Power Range channels. Secondary plant heat balance calculations were performed to verify the Nuclear Instrumentation indications.

2. RCS Delta-T Indication: The initial scaling of RCS ΔT was left the same as Cycle 7. At 80% and 94% RTP, actual full power ΔT was extrapolated out using data from 30%, 50%, 80%, and 94% and ΔT was rescaled accordingly. Final adjustments were performed at 100% RTP.

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 a periodic step changes of 1°F to 2°F in hot leg temperature. Cycle 8 data collected at 100% RTP identified an increase in the magnitude of UPA in RCS loops 2 and 3.

4. RCS Temperatures: Data was obtained for the Narrow Range Loop temperatures. Evaluations for Delta-T (°F), T_{AVG} Deviation Alarm Setpoint and T_{AVG} / T_{REF} Indication were performed.

4.0 POWER ASCENSION TESTING SUMMARY (Continued)

5. Steam and Feedwater Flows: Data was obtained for the steam and feedwater flows. Evaluations for deviations between redundant channels on individual steam generators were performed.

6. Steam Generator Pressures: Data was obtained for the steam generator pressures. Evaluations for deviations between redundant channels on individual steam generators were performed.

7. Turbine Impulse Pressure (T_{REF}): The initial scaling of impulse pressure was left the same as Cycle 7. Impulse pressure was evaluated at the 80% and 94% RTP plateaus to determine if the existing scaling would support continued power increase. The Cycle 8 full power value was within 15 PSIG of the initial scaling value. This meets the allowed deviation criteria.

8. Incore/Excore Calibration: Scaling factors were calculated from flux map data using the single point calibration methodology. The nuclear instrumentation power range channels were rescaled at 50% and 100% RTP.

9. RCS Flow: The RCS flow was measured at the 94% RTP plateau using elbow tap measurements to minimize the effects of observed hot leg streaming.

The power ascension test program differed from Cycle 7 by changing the 75% and 90% power plateaus to 80% and 94%, and the RCS flow measurement technique.

5.0 RESULTS

1. Low Power Physics Testing: Acceptance criteria and 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 the instrumentation. An Upper Plenum Anomaly of increased magnitude in reference to cycle 7 was identified in Loops 2 and 3. See Table 3 for results.

TABLE 1
LOW POWER PHYSICS RESULTS: CYCLE 8

ITEM	MEASURED	PREDICTED	ERROR	CRITERIA
BORON END POINTS: • HZP ALL RODS OUT	1816 ppm	1828 ppm	84 pcm	± 1000 pcm ± 500 pcm *
ALL RODS OUT ITC (pcm/°F) ALL RODS OUT MTC (pcm/°F)	-1.62 -0.10	-1.46 -0.55	0.16 N/A	± 2* <+ 2.77**
CONTROL BANK ROD WORTHS: (pcm) • A • B • C • D • SA • SB • SC • SD • SE • TOTAL	 894.8 570.1 833.4 575.3 228.1 783.2 386.8 394.2 512.7 5178.6	 880.6 557.7 834.6 540.8 222.1 789.9 376.7 375.8 516.2 5094.4	 14.2 12.4 -1.2 34.5 6.0 -6.7 10.1 18.4 -3.5 84.2	 100 or 15% *

NOTE: * Review criteria, all others are acceptance criteria.
** COLR limit is 2.77 at BOC.

TABLE 2

POWER ASCENSION FLUX MAP RESULTS: CYCLE 8

ITEM	MAP 1	MAP 2	MAP 3
DATE OF MAP	01/29/01	01/30/01	02/01/01
POWER LEVEL (%)	29.72	49.95	99.93
CONTROL BANK D POSITION (steps)	170	195	226
RCS BORON (ppm)	1658	1516	1303
F_Q	2.0187	2.0031	1.7782
$F\Delta_H$	1.5252	1.4849	1.4171
$F\Delta_H$ with IFM's	1.4989	1.4478	1.4360
INCORE TILT	1.0090	1.0085	1.0075

TABLE 3

FULL POWER THERMAL-HYDRAULIC DATA: CYCLE 8

ITEM	VALUE
REACTOR COOLANT T_{AVG}	586.67 °F
REACTOR COOLANT DELTA-T: • LOOP 1 • LOOP 2 • LOOP 3 • LOOP 4	 58.61 °F 58.19 °F 58.06 °F 58.82 °F
REACTOR COOLANT FLOW: TOTAL	(Based on elbow tap measurements) 407856 GPM
AUCTIONEERED HIGH T_{AVG} T_{REF}	587.39 °F 587.51 °F
TURBINE IMPULSE PRESSURE	670.91 PSIG
STEAM GENERATOR PRESSURES: • A • B • C • D	 969.01 PSIG 970.41 PSIG 969.11 PSIG 967.43 PSIG