Docket No. 50-245

Millstone Nuclear Power Station, Unit No. 1

Summary Report

Startup Physics Testing Program For Cycle 9

February, 1983

SUMMARY REPORT

Startup Physics Testing Program for Cycle 9

Cold Control Rod Drive Testing

At the completion of the fuel shuffle and the reactor core verification, each control rod was friction and function tested and timed with a stopwatch. No abnormalities were noted.

Hot Control Rod Drive Scram Time Test

After the reactor achieved hot operating conditions, each control rod was scrammed and timed using the Brush recorder. The following results were obtained:

Table 1

% Inserted	Tech. Spec. Time (Sec)	Actual Time (Sec)
5	.375	.323
20	.900	.710
50	2.00	1.43
90	3.50	2.55

The 20% scram insertion time was found to be acceptable for use of ODYN Option B MCPR operating limits.

The average scram times for 5%, 20%, 50% and 90% for the three fastest control rods in a two-by-two array were also compared to Technical Specification limits. No discrepancies were noted.

Shutdown Margin Test

The Shutdown Margin Test was performed using the In Sequence Critical Data method. The results indicated that the reactor core had a shutdown margin at BOC 9 of 1.586% $\Delta K/K$. The Technical Specification limit is R+.33% $\Delta K/K$, resulting in a BOC 9 shutdown margin limit of 0.95% $\Delta K/K$.

Non-Voided Critical Eigen Value Comparison for a Fixed Control Rod Pattern

The expected critical control rod pattern was compared to the actual critical control rod pattern. The actual control rod pattern required an additional 66 notches to be withdrawn from the core as compared to the predicted critical control rod pattern. These additional notches are not considered an abnormality.

Critical Rod Configuration Comparison at Steady-State Full Power

The expected full power equilibrium control rod pattern was compared to the actual control rod pattern. The actual control rod pattern required 20 fewer notches to be withdrawn from the core as compared to the predicted full power equilibrium control rod pattern. This difference is not considered to be an abnormality.

Power Distribution Comparison at a Given Control Rod Pattern and Power Level at 100% Rated Power

At 100% power, the following parameters were compared to the predicted values:

Relative Axial Power Shape Node	Predicted	As Found
1	0.60	0.51
2	1.25	1.04
3	1.30	1.21
4	1.33	1.25
5	1.33	1.23
6	1.26	1.24
7	1.16	1.16
8	1.04	1.13
9	0.95	1.09
10	0.83	1.01
11	0.60	0.79
12	0.20	0.36
Notches in Core	600	580
Max. LHGR, KW/FT	10.69	10.31
Max. APLHGR Ratio	0.83	0.782
Min. Critical PWR Ratio	1.63	1.618

Differences in these parameters are considered to be acceptable.

Tip Assymetry Test at 100% Rated Power

The Tip Uncertainty Test was performed at 100% power when Xenon had stabilized. The results were as follows:

Total Tip Uncertainty	5.798%
Tip Random Noise Uncertainty	1.572%
Tip Geometric Uncertainty	5.581%

Symmetric pairs of LPRM's were observed for symmetry. No abnormal conditions exist in the reactor core with the present 100% control rod pattern.

Reactor Core Verification

At the completion of fuel reloading, the reactor core was verified. The verification was recorded on video tape and then reconstructed by QC by viewing these recordings. No loading errors were noted.