U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-293/84-42

Docket No. 50-293

License No. DPR-35 Priority - Category C

Licensee: Boston Edison Company M/C Nuclear
800 Boylston Street
Boston, Massachusetts 02199

Facility Name: Pilgrim Nuclear Power Station

Inspection At: Plymouth, Massachusetts

Inspection Conducted: December 17-20, 1984

Inspector: L H Bettenhausen for — 1/17/85
C. Petrone, Lead Reactor Engineer — date

Approved by: L H Bettenhausen — 1/17/85
L. Bettenhausen, Chief, Test Program Section — date

Inspection Summary:

Areas Inspected: Routine, unannounced inspection of the Cycle 7 Startup Physics Test Procedures, review of a control rod malfunction, and QA/QC interface during startup physics testing. The inspection involved 29 hours onsite by one region-based inspector.

Results: No violations or deviations were identified.

DETAILS

1.0 Persons Contacted

BECO

J. Aboltin, Senior Reactor Engineer
H. Brannan, Quality Assurance Manager
J. Coughlin, Electrical Engineer
*J. Crowder, Senior Compliance Engineer
*W. Deacon, Assistant to SUP Nuclear
L. Darsney, Reactor Engineer
*E. Graham, Compliance Group Leader
E. Larsson, Senior Quality Assurance Engineer
*C. Mathis, Nuclear Operations Manager
*P. Mastrangelo, Chief Operations Engineer
J. Poorbaugh, Quality Assurance Engineer
E. Ziemianski, Nuclear Operations Support Manager

NRC

J. Johnson, Senior Resident Inspector
*M. McBride, Resident Inspector

The inspector also contacted other licensee employees during the inspection.

*Denotes those present at the exit meeting on December 20, 1984.

2.0 Startup Physics Test Procedures

The Startup Physics Test Procedures were reviewed by the inspector to ensure that applicable Technical Specification requirements had been incorporated and that appropriate prerequisites, precautions and acceptance criteria had been included. The following procedures were reviewed:

- TP 84 257-01 Restart Test Program Following Recirculation Pipe Changeout. This procedure describes and sequences the major startup tests to be performed following the pipe replacement outage. The inspector verified that the startup physics tests such as Control Rod System Checks, Local Power Range Monitor (LPRM) Calibration, Average Power Range Monitor (APRM) Calibration, Reactor Heat Balance and Core Performance (MAPLHGR, LHGR, and MCPR) were scheduled to be performed at appropriate power levels during startup.

- PNPS 9.1, APRM Calibration, Revision 8, dated March 14, 1984. This procedure contains instructions for two methods of calibration, one using the process computer program OD-3, and the other using a hand calculation. Precautions against bypassing more than one APRM channel per Reactor Protection System bus are included. The procedure also contains instructions to adjust the APRMs to read calculated percent of rated power, and to record the "as left" APRM readings.

- PNPS 9.3, Core Thermal Power Evaluation, Revision 9, dated April 4, 1984. This procedure provides several methods for calculating core thermal power including the Process Computer (NSS and BOP Heat Balance), which is generally used; the Long Form Heat Balance, which is used by the Reactor Engineer when the process computer is not available; and the Short Form and Nomograms, which are used by operations personnel for quick power checks when the process computer is not available.

- PNPS 9.5, LPRM Calibration, Revision 14, dated December 5, 1984. This procedure describes three methods of calibration, one using the process computer, one using the Backup Core Limit Evaluation (BUCLE) code, and finally, hand calculations. The procedure includes the requirement to recalibrate at a frequency not to exceed the 1000 EFPH (Effective Full Power Hours) specified in the Technical Specifications. It also requires recalibration following major control rod pattern exchanges after a change to a significantly different operating mode or, following a refueling. It requires the performance of a full core flux map by means of the Traversing Incore Probe (TIP) system. It contains instructions to perform TIP intermachine calibration and TIP amplifier sensitivity checks. It also requires that a P-1 "Periodic Core Evaluation" be performed and that the applicable APRM channels be recalibrated.

- PNPS 9.7, Fuel Assembly Relative Power Factor Determination, Revision 12, dated April 27, 1984. This procedure presents a method to determine, by hand calculation, the relative power factor for each fuel assembly in the core. It is used when the process computer is not available.

- PNPS 9.8, Reactivity Follow, Revision 11, dated May 4, 1984. This procedure provides a method to check for possible reactivity anomalies as the core excess reactivity changes with exposure. This procedure is used to satisfy the Technical Specification 4.3.E surveillance requirement that the reactivity equivalent of the difference between the actual critical rod configuration, and the expected (or predicted) configuration not exceed 1% ΔK.

- PNPS 9.9, Control Rod Scram Time Evaluation, Revision 10, dated May 4, 1984. This procedure contained appropriate instructions to verify that the control rods meet the scram insertion times specified in Technical Specification 3.3.C.

Results:

The startup procedures were generally clear and well written. However, the inspector did note that a prerequisite for many of the startup physics test procedures is that the reactor be established at a steady state power level. In most of these procedures, steady state is not well defined. PNPS 9.1 stated "control rod position and recirculation flow shall be held as constant as possible" while PNPS 9.3 states that "all parameters to be measured should be as constant as possible" and "power transients should not be present." The inspector requested that the licensee better define how much of a power change would be tolerated before the test results would be invalidated. At the exit meeting, the Reactor Engineer committed to revise the appropriate procedures to better define the steady state power level by specifying that no control rod movement or recirculation flow changes were permitted. This will be reviewed during a future inspection and is designated an Inspector Follow Item (84-42-01).

3.0 Control Rod Testing

During performance of control rod checkout testing, the licensee was unable to pull control rod 42-39 past position 46 to the full out position, 48. The exact cause is unknown but is thought to be an improper coupling between the control blade and the rod drive mechanism. The licensee plans to leave this rod and its three symmetric partners (42-15, 10-39, and 10-15) fully inserted for the Cycle 7 run. In a letter dated December 13, 1984, the fuel vendor (G.E.) provided a revised startup rod pattern, withdrawal sequence, and rod group definitions to accommodate operation with these rods left fully inserted.

The inspector questioned the licensee's Reactor Engineer about any additional changes which might result from this change in control rod pattern. He stated that the only significant difference would be a slightly shorter Cycle 7 power run. In a letter dated December 14, 1984, the licensee requested that the fuel vendor review all previous documentation for Cycle 7 such as the Reload Licensing submittal, Cycle Management Report, etc., to insure the validity of those documents in view of the revised control rod pattern.

The inspector reviewed one-third of the licensee's control rod pull sheets (9.13-1, Revision 7) and the Rod Worth Minimizer control rod group assignment printout and verified that the fuel vendor's revised recommendations for control rod group assignment and withdrawal sequence had been implemented. No errors were identified.

4.0 Quality Assurance (QA) and Quality Control (QC) Interface During Startup Physics Testing

The inspector examined the planned involvement of the licensee's QA and QC Departments' personnel during startup physics testing and noted that the QC Department had no plans to examine this area; all audits would be performed by the Quality Assurance Department.

The inspector reviewed the Technical Specification Audit Matrix issued by the Quality Assurance Department Audit Group which established a four-year schedule for auditing all Technical Specification requirements. This matrix includes planned audits of Technical Specification requirements for fuel cladding, reactivity limitations, control rods, and scram insertion time. The QA Department also audits the various BECO Nuclear Departments; this includes an annual audit of the Reactor Engineering Department. The last audit (84-21) was performed in June 1984, and the next is scheduled for May 1985. The inspector reviewed Audit Report 84-21 and noted that it evaluated the adequacy, affectiveness, and implementation of the Reactor Engineering Department procedures. These procedures included LPRM Calibration, TIP System Operational Checkout and Calibration, Fuel Assembly Relative Power Factor Determination, and Control Rod Pattern Exchange, Minimum Critical Power Ratio Evaluation, and others. The audit was performed by a Quality Assurance Engineer and a Senior Nuclear Engineer from the corporate Nuclear Engineering Department. The report concluded the Reactor Engineering activities and responsibilities were adequately defined and controlled by existing procedures. The audit was thorough and the inspector agrees with the conclusion that the Reactor Engineering activities and responsibilities were adequately defined and controlled by existing procedures. However, the inspector expressed his concern that no audits or inspections were planned during the performance of the startup physics test program. At the exit meeting, the licensee's Quality Assurance Manager agreed to assign auditors to witness performance of the startup physics tests. This will be reviewed during future inspections.

5.0 Exit Meeting

The inspector discussed the inspection findings at an exit meeting on December 20, 1984.

No written material was provided to the licensee by the inspector at any time during this inspection.