U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-352/84-74

Docket No. 50-352

License No. NPF-22 Priority -- Category C

Licensee: Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Facility Name: Limerick Generating Station

Inspection At: Limerick Generating Station

Inspection Conducted: December 28, 1984 - January 11, 1985

Inspectors: D. Florek
D. Florek, Lead Reactor Engineer — 2/13/85 date

D. Florek for
S. Kucharski, Reactor Engineer — 2/13/85 date

D. Florek for
D. Vito, Reactor Engineer — 2/13/85 date

Approved by: L. Bettenhausen
L. Bettenhausen, Chief,
Test Programs Section — 2/26/85 date

Inspection Summary: Inspection on December 28, 1984 - January 11, 1985
Inspection Report No. 50-352/84-74

Areas Inspected: Routine, unannounced inspection on startup test program including procedure review, pre-op procedure review, test results evaluation, test witnessing, containment integrated leakage rate report review, QA/QC interfaces; and tours of the facility. The inspection involved 75 hours on site and 2 hours in office by 3 region based inspectors.

Results: No violations were identified.

DETAILS

1. Persons Contacted

Philadelphia Electric Company and Contractors

*J. Doering, Operations Engineer
*J. Frantz, Assistant Plant Superintendent
*G. Gilbody, QA Engineer
*M. Held, Quality Engineer
*A. Jenkins, Startup Test Program Supervisor
*G. Leitch, Plant Superintendent
*A. MacAinsh, QA Site Supervisor
*W. McElwain, QA Auditor
*J. Murphy, BOP Test Supervisor
P. Pagano, NSSS Test Supervisor
*W. Rekito, Regulator Coordinator
L. Wink, Lead Shift Test Coordinator

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*W. Borchardt, Reactor Engineer
*J. Wiggins, Resident Inspector

*Denotes those present at exit meeting conducted on January 11, 1985.

The inspector also contacted several other licensee and contractor personnel in the course of the inspection including shift supervisors, reactor operators and startup test engineers.

2. Startup Program

References

- Regulatory Guide 1.68, Revision 2, "Initial Test Program for Water-Cooled Nuclear Power Reactors"
- ANSI 18.7 - 1976, "Administrative Controls and Quality Assurance for the Operational Phase of the Nuclear Power Plants"
- Limerick Generating Station (LGS) Technical Specification
- LGS Final Safety Analysis Report
- LGS Safety Evaluation Report
- NEBO 23A1918, Revision 0, "Limerick 1 & 2 Startup Test Specification"
- LGS Startup Program Schedule

- Administrative Procedure A-200, "Startup Test Procedure Format and Content"
- Administrative Procedure A-201, "Startup Test Procedure Control"
- Administrative Procedure A-202, "Startup Test Implementation
- Administrative Procedure A-203, "Startup Test Program Personnel Training and Qualification"

2.1 Startup Test Results Evaluation

Scope

The 11 startup tests in Appendix A were reviewed for the attributes identified in Inspection Report 50-352/84-70 Section 3.3.

Findings

Except as noted below all startup test reports were found to meet the attributes listed above. A summary of each startup test result follows:

- STP 1.2 Chemistry Data: All acceptance criteria were satisifed. A summary of reactor water chemistry was:

	Parameter	Limit
Conductivity uhmo/cm	.4	<10
Chloride ppb	<20	<500
pH	7.8	5.3-8.6

One test exception was identified and was properly processed.

- STP-4.1 Insequence Critical: All acceptance criteria were met. Initial criticality was achieved on RWM Step 81, rod 30-51, notch 8 (2260 notches withdrawn). The shutdown margin determination was 2.3%. The inspector independently calculated shutdown margin and verified the 2.3% value. The band of notches withdrawn to satisfy the ±1% $\Delta k/k$ criterion at 150°F was 1378-2326. Initial criticality was achieved within this band.

- STP-5.3 Zero Pressure Scram Testing: All acceptance criteria were satisfied. Three test exceptions were identified regarding indications on a reed switch, scram light and accumulator light not operating on two rods and an improper interpretation of scram time data resulting in a .01 sec error in timing. These TERs were acceptably resolved. The average scram time of all rods was:

Average Time to Notch	Time (Sec)
45	.26
39	.44
25	.89
05	1.60

- STP-5.4 Scram Testing of Selected Rods: All acceptance criteria were satisfied.

- STP-6.1 SRM Signal to Noise Ratio: All acceptance criteria were satisifed. The calculated signal to noise ratios were:

SRM	Signal/Noise Ratio
A	139
B	149
C	179
D	139

- STP-6.2 SRM Response to Control Rod Movement: All data was taken.

- STP-6.3 SRM Non Saturation Demonstration: Data was acceptable.

- STP-10.1 SRM/IRM Overlap: Test acceptance criteria were satisified. The IRM values for all rods inserted and the IRM and normalized SRM values at overlap were:

IRM	Rods in	Overlap	SRM	Value
A	1.5	3.5	A	3.24E4
B	2.0	3.0	B	4.29E4
C	1.5	4.0	C	1.35E4
D	1.0	2.5	D	2.07E4
E	1.5	3.6		
F	1.5	3.5		
G	2.0	5.0		
H	1.5	4.5		

- STP-12.1 Heatup Rate ARPM Calibation: One test exception was identified following QA audit review of test results regarding setting of one rod block value. The following settings were the desired and as-left setting on the APRM. The APRMs are reading higher than actual power which is conservative:

APRM	Value Desired	Value Left
A	.94	1.0
B	.74	1.05
C	.82	1.05
D	.84	1.4
E	.80	1.15
F	.85	1.3

The inspector witnessed portions of STP-12-1 as discussed in Section 2.2 and independently calculated core thermal power using recirculation loop temperature changes and determined a heatup rate of 58°F/hr which agrees with STP-12.1 using reactor water inlet temperature. The inspector also verified, using the coolant volumes contained in FSAR Section 5.1, that the value of heat capacity of reactor coolant is a conservative value. The inspector concluded that the licensee had established APRM settings that assure that APRM's read greater than or equal to actual power.

- STP-13.1 Static System Test Case: Management acceptance of the test was noted. No test exceptions were identified.

- STP-17.2 Pipe Displacements, Feedwater System: Management acceptance of test was noted. No test exceptions were identified.

2.2 Startup Test Witnessing

The inspector witnessed portions of the following startup tests:

- STP-12.1, Constant Heatup Rate APRM Calibration,

- STP-14.1, RCIC Functional Demonstration CST to CST at 150 psig,

- STP-15.1, HPCI Functional Demonstration CST to CST at 150 psig,

- STP-14.2, RCIC Functional Demonstration and Controller Optimization at Rated Pressure CST to CST

The tests were witnessed to assess: procedure of appropriate revision is available and in use by all crew members; minimum crew requirements were met; prerequisites and initial conditions were met; test equipment was calibrated and operable per procedure; procedures were technically correct; crew actions were correct and timely; coordination was adequate; and, there was a quick summary analysis of all data collected subsequent to test.

Findings

Except as noted below, the attributes as discussed above were found to be satisfactory. The specifics of each STP witnessed follows:

- STP-12.1, Heatup Rate APRM Calibration. This test was conducted on January 2, 1985. Initial conditions noted were:

Reactor Pressure	10 psig
Total Core Flow	18 MLB/hr
Recirc Loop Temp	250°F
Recirc A Speed	25%
Recirc B Speed	26%
APRM Readings:	A - .5
	B - 1.5
	C - Bypassed
	D - .7
	E - .5
	F - .3

During this test the inspector monitored recirculation loop temperature and observed the licensee properly recording data as required per the STP. The inspector recorded values approximately every 5 minutes.

During the heatup, operations personnel were also recording temperature data to be used to confirm adherence to technical specifications and to determine extent of control rod withdrawal according to the approved rod pull sheets. During the rod pulls, rod accumulator trouble alarm 18-11 was annunciated, which momentarily suspended rod pulls. Sufficient data was obtained however.

The inspector observed the licensee reactor engineering personnel independently assessing the test data while the startup personnel were assessing the data immediately following termination of the heatup.

- STP-14.1 RCIC testing was performed on January 3, 1985. The reactor was at 155 psig with two turbine bypass valves fully opened and one valve at approximately 60% open. The inspector observed that RCIC achieved greater than 600 gpm in less that 30 seconds during a quick start and that the controller responded to the demanded changes. The licensee reported a small steam leak from the RCIC turbine and indicated that a test exception would be prepared. Steady state operation of the turbine at 2200 rpm produced 600 gpm flow. The inspector will review the completed test results in a subsequent inspection.

- STP-14.2, RCIC Testing was performed on January 11, 1985. The reactor was at 920 psig with one turbine bypass valve at approximately 75% open. The test was a functional demonstration and controller optimization at rated pressure pumping from CST to CST. The inspector witnessed a limited portion of the test and will review the complete test results in a subsequent inspection.

- STP-15.1 The inspector observed several attempts to perform STP-15.1. The HPCI turbine/pump was observed to have problems with the vacuum pump tripping on overload resulting in steam leakage into the HPCI room. This leakage does not impact on pump operability; it does however result in a level 2 test exception. HPCI operation was also observed to cause the HPCI suction to be transfered from the condensate storage tank to the suppression pool. This resulted from the indication of CST level located on the seismically supported HPCI suction line. When HPCI is operated, flow in the suction line causes pressure changes which result in large indicated changes in level. When the indicated low level reaches the low level setpoint, HPCI suction transfers to the suppression pool. To perform the test, the licensee temporarily throttled the root valve in the level transmitter to damp out the flow oscillations. The licensee was observed taking data to obtain a permanent solution to avoid this transfer on fluid transients; the solution will be assessed in a subsequent inspection. The inspector observed that when this problem was overcome, HPCI did achieve greater than 5600 gpm in less than 25 seconds as required with discharge pressures at least 100 psi above reactor pressure of 200 psig.

  The inspector observed that senior licensee management was directly involved in the resolution of the problems to test HPCI.

  Licensee personnel, GE startup personnel, and the HPCI turbine vendor were utilized in the resolution of the HPCI problem.

3. Containment Integrated Leakage Rate Report Review

The inspector reviewed the Limerick Generating Station Unit 1 Primary Reactor Containment Integrated Leakage Rate Test Final Report issued on November 30, 1984 for technical adequacy and for compliance with the regulatory requirements of Appendix J to 10 CFR 50 and applicable industry standards. The inspector found the summary report of the pre-operational CILRT performed on August 1-3, 1984 to be in compliance with the reporting requirements of 10 CFR 50, Appendix J, Sections V.A and V.B. The report was also written to be in conformance with the reporting guidelines contained in ANSI/ANS 56.8-1981, Containment System Leakage Testing Requirements. The inspector found the report to be technically accurate and comprehensive.

4. Preoperational Test Results Review

4.1 Scope

The inspector reviewed Test Procedure 93.2, Main Turbine Control System, Revision 0, during this inspection to verify that adequate testing had been conducted to satisfy regulatory guidance, licensee commitments and FSAR requirements and to verify that uniform criteria are being applied for evaluation of completed test results in order

to assure technical and administrative adequacy. The inspector reviewed the test results and verified the licensee's evaluation of test results by review of test changes, test exceptions, "As-Run" copy of the test procedure, acceptance criteria, performance verification, recording conduct of test, QC inspection records, independent verification of critical steps, identification of personnel conducting and evaluating test data and verification that the test results have been approved.

No unacceptable conditions were identified.

5. Surveillance Test Review

5.1 Scope

Two completed surveillance test procedures were reviewed during this inspection:

- ST-5-050-760-1, ADS Valve Operability Check
- ST-6-060-760-1, Suppression Pool/Drywell Vacuum Breaker Valve Cycling Test

5.2 Observation

During the cycling of the safety/relief valves in ST-5-050-760-1 there was an increase in tail pipe temperature of approximately 100°F. The licensee was concerned with this increase and contacted the valve vendor. Based on conversations with the valve vendor representatives and information about similar plants, it was discovered to be a common occurance during the initial heatup phase. The temperature increase was due to the location of the thermocouple and heat conduction.

No unacceptable conditions were identified.

6. Surveillance Test Witnessing

6.1 Scope

The inspector witnessed ST-6-055-230-1-HPCI Pump, Valve, and Flow Test during the course of this inspection. The purpose of this test was to demonstrate the operability and performance of HPCI pump 10P204 and associated valves to satisfy the inservice testing requirements.

6.2 Observations

The licensee had to make three attempts to perform this test before it was successful. The problem with HPCI suction transfer discussed in Section 2.2 occurred in this test. After adjustment to the level transmitter, the test was successfully completed.

No unacceptable conditions were identified.

7. QA/QC Interfaces

The inspector observed that both QC and QA organizations were conducting surveillances during testing of HPCI. QC surveillance was observed during RCIC testing. QA review of the results of STP-12.1 identified a failure of the test director to prepare a test exception for a rod block setpoint which was above the procedure acceptance value. The test director provided information in the procedure as to why the obtained value was technically acceptable even though it was above the procedure acceptance value, but did not identify this as a test exception. Subsequent to the QA review a test exception report was prepared.

8. Plant Tours

The inspector made several tours of the facility during the course of the inspection including the reactor building, turbine building, control structure and control room. The inspector observed work in progress, housekeeping and cleanliness. No unacceptable conditions were noted.

9. Exit Interview

An exit meeting was held on January 11, 1985 to discuss the inspection scope and findings as detailed in this report (See paragraph 1 for attendees). At no time during the inspection was written material given to the licensee.

Appendix A

Startup Test Results Evaluation

1. STP 1.2, "Chemistry Data" Revision 0, Test implemented December 3, 1984

2. STP-4.1, "In-Sequence Critical" Revision 1, Test Implemented December 21, 1984

3. STP-5.3, "Zero Reactor Pressure Scram Testing" Revision 0, Test Implemented November 16, 1984

4. STP-5.4, "Scram Testing of Selected Rods" Revision 0, Test Implemented (date not obtained)

5. STP-6.1, "SRM Signal to Noise Ratio and Minimum Count Rate Determination" Revision 1, Test Implemented December 19, 1984

6. STP-6.2, "Approach to Criticality - SRM Response to Control Rod Movement", Revision 1, Test Implemented December 20, 1984

7. STP-6.3, "SRM Non Saturation Demonstration", Revision 1, Test Implemented December 22, 1984

8. STP-10.1, "SRM/IRM Overlap" Revision 1, Test Implemented December 21, 1984

9. STP-12.1, "Constant Heatup Rate APRM Calibration" Revision 0, Test Implemented December 31, 1984

10. STP-13.1, "Static System Test Case" Revision 1, Test Implemented November 29, 1984

11. STP-17.2, "Measured Pipe Displacement - Feedwater System", Revision 1, Test Implemented (date not obtained)