

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-293/85-18

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: June 24-28, 1985

Inspectors: H. I. Gregg
H. I. Gregg, Lead Reactor Engineer

7/24/85
date

Approved by: J. Wiggins
J. Wiggins, Chief, Materials and
Processes Section, DRS

7/25/85
date

Inspection Summary: Inspection on June 24-28, 1985 (Report No. 50-293/85-18)

Areas Inspected: Routine unannounced inspection of licensee's activities related to recent HPCI water hammer events, QC snubber inspection findings due to the events, and the licensee's program and results of Technical Specification visual surveillance of snubbers. The inspection involved 37 hours on site by one region based inspector.

Results: No violations were identified.

DETAILS

1.0 Persons Contacted

Boston Edison Company (BECo)

- *M. Brossee, Chief Maintenance Engineer
- *J. Crowder, Senior Compliance Engineer
- J. Dwyer, Senior QC Engineer, Mechanical
- R. Fairbanks, Deputy Manager, NED
- P. Hamilton, Senior Compliance Engineer
- J. Jerz, Senior Structural Engineer, NED
- E. Larson, QA Engineer
- *P. Mastrangelo, Chief Operations Engineer
- *C. Mathis, Nuclear Operations Manager
- P. Moraites, I&C Engineer
- L. Namer, Senior I&C Engineer
- L. Namer, Senior I&C Engineer, NED
- J. Roberts, Principal Mechanical Engineer, NED
- *D. Rydman, Engineering
- R. Sherry, Assistant Chief, Maintenance Engineer
- L. Vallee, Senior Structural Engineer
- *M. Williams, Senior Mechanical Engineer

Teledyne Engineering Services

R. Enos, Senior Engineer

U. S. Nuclear Regulatory Commission

*M. McBride, Resident Inspector

*Denotes those present at the exit meeting

2.0 HPCI Turbine Exhaust Water Hammer

The inspector reviewed the licensee's data relating to the water hammer events of March 31, 1985, and May 18, 1985. Discussions were held with cognizant site personnel and corporate engineering personnel regarding these events, subsequent testing, GE report information, corrective actions taken thus far and tentative work plan schedule for long term fix.

Data Reviewed included:

- LER's 85-008 and 85-012
- BECo office memorandums of April 5, 6, and June 12, 1985
- Teledyne letter of April 5, 1985
- HPCI Turbine speed traces of testing on June 7 and 9, 1985

- General Electric, HPCI Exhaust Line Problem Report of June 4, 1985, and curve trace of testing on May 23, 1985
- HPCI System P&ID, Drawing M 243
- HPCI Turbine Exhaust Steam, Drawing ISI-I-23-3
- Teledyne HPCI Turbine Exhaust Drawing D-9052
- GE Sil 30 of October 31, 1973, related to HPCI/RCIC exhaust vacuum breakers, GE Sil No. 351 of February 18, 1981, related to HPCI/RCIC turbine control system calibration, and GE FDDR of March 8, 1985 related to a hydraulic by-pass around the EG-R actuator at Limerick (also mentions installation at 3 other sites)
- BECO Safety Evaluation 1830
- BECO Engineering Service Request #85-193 with attachment Work Plan

The inspector determined from discussions with plant and NED personnel and review of data including LER 85-008-00 that the water hammer went event of 03/31/85 and the damage to two snubbers recently installed for the Mk 1 Torus modification was thought to be initiated by a HPCI turbine over-speed trip caused by a faulty connector, and the possibility of a drainage problem in the exhaust line between the stop check valve and the torus. The corrective actions were to replace the connector, snubbers and base plates, and to institute longer daily exhaust line blowdowns and perform visual surveillances of the pipe hangers and snubbers after each HPCI operation.

After the event, a conservative worst case analyses was performed by Teledyne Engineering Services. The licensee stated the Teledyne conclusions were:

- the piping stresses were within allowable limits
- the load on the two failed snubbers were as predicted and sufficient to fail these snubber
- loading of other snubbers and supports were not high enough to cause them to fail
- the most critical point in the system was at the exhaust piping to torus penetration

On 5/18/85 during the HPCI system operability test there was a second water hammer event (the previous 2 snubbers failed again) which the licensee described in LER-85-012-00. The licensee's recount of the sequence of events - an automatic quick cold start followed by a HPCI turbine trip followed by an automatic restart within approximately 3 seconds - was recognized to be similar to the first event. General Electric was contacted and came on site to perform a review and provide recommendations. Terry Turbine was also contacted and was on site to work with the licensee. The GE representative advised that the quick restart following the trip was a significant factor. Additionally it was determined that the turbine reaches too high a speed on start. The licensee readjusted the control circuitry to lower turbine speed and the snubbers

were replaced. GE and the licensee also discussed GE Sil 30 which dealt with installing vacuum breakers in the exhaust line between the stop check valve and the torus (the licensee does not have them) and other recent data relating to other plants installing a by pass line around the EG-R actuator to reduce the severity of quick starts.

Subsequent to the event of 5/18/85 there were other HPCI testing problems relating to a high flow isolation trip due to an incorrect instrument signal on 5/23/85 and an instrumentation linkage interference problem on 6/6/85. These problems were corrected and the licensee also installed the EG-R actuator by pass and went to manual start for testing.

The inspector reviewed the licensee's tentative ESR 85-193 work plan which includes development of Plant Design Change to install vacuum breakers and a completed final analyses of system and supports.

This item remains unresolved pending the licensee's disposition and close out of LER 85-008-00 and 85-012-00 and the licensee's final analyses and design modification commitments and formal NED work plan for complete solution of problem (50-293/85-18-01).

3.0 QC Non Conformance Reports (NCRs)

The inspector reviewed the NCRs written by QC after the HPCI water hammer event (NCRs 85-08 through 85-11). The inspector also reviewed the acceptance criteria used for the QC inspection. The inspector determined the NCRs were appropriately written.

The inspector had a problem with the accept as is disposition of NCR 85-10 which dealt with a bent snubber paddle. This was resolved when the licensee brought Teledyne Engineering personnel on site to provide addition calculations and details of the disposition to relieve the inspectors concerns. This matter is discussed further in paragraph 6.0 of this report.

No violations were identified.

4.0 T.S. Visual Snubber Surveillance

The inspector reviewed the licensee's maintenance department records of snubber visual surveillance performed 12/21/84. The licensee's procedure 3.M.4-28 used to perform the visual inspection was also reviewed. The inspector determined that the visual surveillance results were 0 inoperable snubbers therefore, the next visual surveillance interval is 18 months.

The inspector had a concern that the surveillance procedure for hydraulic snubbers did not contain the requirement that there should be no visible indications of damage or impaired operability and that attachments are

secure etc., as stated in the TS and in the mechanical snubber inspection procedure. However, the inspector noted the licensee's inspection chart did have a column headed "Physical Condition".

The licensee committed to add definitive words to procedure 3.M.4-28 for visual inspection of hydraulic snubbers to include the general provision related to visual indications of damage and impaired operability by end of July 1985.

No violations were identified.

5.0 QA/QC Interface

The inspector verified that QC was involved in inspections after the water hammer events, and in snubber functional testing and reinstallation. The inspector also reviewed QA Surveillance Report 84-1.4-10 which monitored the surveillance of hydraulic snubbers and the testing program for compliance with TS and procedure requirements.

The inspector verified there was a QA/QC interface with the items covered during this inspection.

No violations were identified.

6.0 Independent Calculations

During the inspectors review of NCR 85-10 which related to a bent snubber paddle, the inspector made an independent calculation of the effects of a combined axial and eccentric load applied to the snubber. The inspector also questioned the licensee's calculation which did not include the axial load or a section modulus that accounted for the pin connection hole.

The licensee's contractor provided the inspector actual photographs which showed the bent paddle to have less eccentricity than the NCR sketch. The licensee's contractor also provided additional calculations which were similar to the inspectors.

No violations were identified.

7.0 Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, violations or deviations. An unresolved item is discussed in paragraph 2.0 of this report.

8.0 Exit Meeting

The inspector met with the licensee's representative (identified in paragraph 1.0) at the conclusion of the inspection on June 28, 1985, to summarize the findings of this inspection. The NRC Resident inspector, M. McBride, was also in attendance.

At no time during this inspection was written material provided to the licensee by the inspector.