

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 91-24
91-25

Docket Nos. 50-352
50-353

License Nos. NPF-39
NPF-85

Licensee: Philadelphia Electric Company
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Facility Name: Limerick Generating Station, Units 1 and 2

Inspection Period: November 17, 1991 - January 4, 1992

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Approved by: Lawrence T. Doerflein 1/31/92
Lawrence T. Doerflein, Chief Date
Reactor Projects Section No. 2B

Inspection Summary: This inspection report documents routine and reactive inspections during day and backshift hours of station activities including: plant operations; radiation protection; surveillance and maintenance; emergency preparedness; security; engineering and technical support; and safety assessment/quality verification.

EXECUTIVE SUMMARY
Limerick Generating Station
Report No. 91-24 & 91-25

Plant Operations

Operations personnel successfully completed a safe shutdown and startup of Unit 1. The shutdown was required to replace the motor on the High Pressure Coolant Injection (HPCI) system inboard isolation valve. Portions of the start-up and shutdown were witnessed by the inspectors who concluded it was well controlled with excellent use of procedures and supervisory oversight.

Surveillance and Maintenance

The Philadelphia Electric Company (PECo) identified problems with the valve operator torque switch settings on several HPCI motor operated valves. The (HPCI) outboard steam supply valves for both units were declared inoperable due to excessive thrust. The licensee replaced the limiting component, the valve yoke clamps, with ones of higher strength.

Engineering and Technical Support

Engineering review of valve design and test data in preparation for additional valve testing planned for the next refueling outage, identified that the torque switch settings on the outboard steam supply valves of the HPCI system for both units were too high. The higher torque switch settings could have caused higher than designed stem thrusts which could damage the valve yoke clamps.

Safety Assessment and Quality Verification

PECo's response to three violations involving housekeeping in refueling areas, welding, and prompt corrective actions for maintenance were reviewed and found to be thorough. Corrective actions implemented appeared appropriate to prevent recurrence.

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DETAILS

1.0 PLANT OPERATIONS (71707)¹

The inspectors conducted routine entries into the protected areas of the plant, including the control room, reactor enclosure, fuel floor, and drywell (when access is possible). During the inspections, discussions were held with operators, health physics (HP) and instrument and control (I&C) technicians, mechanics, security personnel, supervisors and plant management. The inspections were conducted in accordance with NRC Inspection Procedure 71707 and confirmed PECO's commitments and compliance with 10 CFR, Technical Specifications, License Conditions and Administrative Procedures. During this period 12 hours of deep backshift inspection was conducted.

1.1 Operational Overview

Both units were operating at 100 percent reactor power at the start of this report period.

Unit 1

Power was reduced to 70 percent on December 24 to perform control rod scram tests. Power was returned to 100 percent later in the day.

On December 18, 1991, Unit 1 was shut down and placed in a cold shutdown condition to repair a high pressure coolant injection (HPCI) valve operator motor. Refer to Section 3.1 of this report for details.

On December 30, 1991, the mode switch was placed in startup and the reactor made critical following completion of the maintenance outage. The inspector observed the plant startup, including the approach to criticality, and found it to be very well controlled. Supervisory oversight and use of procedures was excellent. Reactor power was restored to 100 percent on January 2 and the plant remained at full power for the remainder of the inspection period.

Unit 2

On November 17, 1991, power was reduced to 60 percent per plant procedures when control rod 58-43 began drifting into the core during routine weekly control rod testing. The operators fully inserted the drifting rod coincident with the power reduction. Troubleshooting did not identify any equipment problems which could have caused the drifting. The licensee suspects that a small piece of dirt may have prevented one of the directional control valves from closing properly. The foreign material was apparently flushed from the valve during the troubleshooting and no further problems were experienced with the control rod during the remainder of the inspection period. Reactor power was restored to 100 percent on November 18, 1991.

¹ The NRC Inspection Procedures used as guidance are listed parenthetically throughout this report.

On January 4, 1992, a plant shutdown was commenced when a fuse blew which powers several Emergency Core Cooling System (ECCS) instrumentation channels. There were no technicians working on the equipment at the time of the event. The blown fuse resulted in the High Pressure Coolant Injection (HPCI) system, the Division IV Core Spray and Low Pressure Coolant Injection (LPCI) pumps and the D24 emergency diesel generator being inoperable. With these ECCS systems inoperable, plant Technical Specification (TS) 3.0.3 requires a plant shutdown to be commenced within one hour. By the time power had been reduced by approximately 10 MWe, the cause of the blown fuse had been isolated to the HPCI trip unit circuit board PIS-42-2N690H. The board was removed and power restored to the other instrumentation and TS 3.0.3 was exited. Power was then returned to 100 percent. No problems have been experienced since the fuse and circuit board were replaced.

1.2 Reportable Events

Unit 1

On November 18, 1991, a high toxic chemical concentration alarm annunciated for the main control room. In accordance with plant procedures, a manual isolation of the main control room ventilation system was initiated. The operators in the main control room donned self-contained breathing apparatus (SCBAs) until chemistry personnel sampled the atmosphere and verified no toxic gases were present. The cause of the alarm was a momentary indication of high vinyl chloride on the 'B' toxic gas instrument channel. There were no indications of any high toxic gas concentrations on the 'A' toxic gas analyzer channel.

The 'B' toxic gas analyzer was declared inoperable and diagnostic testing was performed on the instrumentation. The instrumentation lines were purged with dry nitrogen and the sample filters were replaced. Testing results were satisfactory and the analyzer was determined to be operable on November 29, 1991. The inspector found that the I&C personnel did a commendable job troubleshooting the instrument. Their efforts to determine and correct the root cause of the spurious alarm were aggressive and thorough.

The inspector noted there have been several spurious toxic gas alarms in the past. The inspector also noted that, in addition to the above actions, PECO is investigating what additional actions could be taken to minimize the system vulnerability to spurious signal spikes and reduce the number of main control room isolations.

On December 10, 1991, the high pressure coolant injection system was declared inoperable due to improper valve operator torque switch settings. Refer to Section 3.1 of this report for details.

Unit 2

On December 23, 1991, a fuse blew in a Nuclear Steam Supply Shutoff System (NSSS) control circuit resulting in various system isolations on Unit 2. Several Unit 1 containment atmosphere control (CAC) valves were also affected since the standby gas treatment (SBGT) system is a shared system. In the event an accident occurs on either unit, the CAC valves on both units receive an isolation signal to ensure the accident and non-accident units are not cross connected through the common duct work to the SBGT system. Unit 1 was in a cold shutdown condition when the event occurred and the Unit 1 CAC valves were already closed so no immediate action was required.

On Unit 2 the operators immediately verified that a valid isolation signal did not exist and bypassed the isolation as required by procedure to permit restoration of drywell cooling, reactor recirculation pump cooling and primary containment instrument gas. Since these systems were promptly restored there was no significant impact on the plant operation nor was plant safety adversely affected. The blown fuse was replaced and all systems were restored to normal. Subsequent investigations have not determined the root cause of the fuse blowing. The inspector reviewed the results of the troubleshooting with the system engineer and noted that PECO's effort to identify the cause is continuing.

On January 4, 1992, a defective circuit board caused a blown fuse in the Division IV ECCS instrumentation. See Section 1.1 above.

The above events were reported to the NRC via the Emergency Notification System (ENS) and the root cause analysis and corrective action will be reviewed further upon issuance of the Licensee Event Reports as part of the routine inspection program.

2.0 SURVEILLANCE/SPECIAL TEST OBSERVATIONS (61726)

During this inspection period, the inspector reviewed in-progress surveillance testing as well as completed surveillance packages. The inspector verified that surveillances were performed in accordance with PECO approved procedures, plant technical specifications, and NRC regulatory requirements. The inspectors also verified that instruments used were within calibration tolerances and that qualified technicians performed the surveillance tests.

Surveillance testing observed and/or reviewed included:

- | | |
|----------------|---------------------------------------------------------------------------------|
| ST-6-020-234-2 | D24 Emergency Diesel Generator Fuel Oil Transfer Pump; Pump Valve and Flow Test |
| ST-6-107-590-0 | Daily Surveillance Log/Common Plant |
| ST-6-055-231-1 | HPCI Pump Valve and Flow Test |

No problems or concerns were noted by the inspectors.

3.0 MAINTENANCE OBSERVATIONS (62703)

The inspectors reviewed the following safety related maintenance activities to verify that repairs were made in accordance with approved procedures and in compliance with NRC regulations and recognized codes and standards. The inspectors also verified that the replacement parts and quality control utilized on the repairs were in compliance with PECO's QA program.

Maintenance activities observed and/or reviewed included:

<u>Work Order</u>	<u>Description</u>
C0078048	Unit 1 HPCI Steam Supply Line Outboard Isolation Valve (HV55-1F003) Yoke Clamp Replacement
C0078062	Unit 2 HPCI Steam Supply Line Outboard Isolation Valve (HV55-2F003) Yoke Clamp Replacement
C0078358	Unit 1 HPCI Steam Supply Line Inboard Isolation Valve (HV55-1F002) Motor Replacement and Retest
TCF 91-1814	Troubleshooting for valve HV55-1F002 Failure to Open

3.1 Incorrect Torque Switch Settings in Valve Operators

On December 8 and 9, 1991, nonconformance reports (NCRs) were written to document problems with the torque switch (TS) settings on several Unit 1 and 2 high pressure coolant injection (HPCI) system motorized valve operators. The problems were identified by a member of the PECO maintenance technical staff during a review of valve design and test data in preparation for additional valve testing planned for the next refueling outage. The condition identified was that with the existing torque switch settings, stem thrusts were developed which were in excess of the maximum that the valve components could withstand according to the design calculations. Specifically, for the Unit 1 and 2 HPCI outboard isolation valves, the developed thrusts, as previously measured with the Motor Operated Valve Analysis and Test System (MOVATs), exceeded the calculated yield strength for the valve yoke clamps.

On December 10, 1991, PECO reperformed the thrust measurement on both HPCI outboard isolation valves using the Valve Operation, Testing and Evaluation System (VOTES). The test results confirmed that the torque switch settings were too high. PECO then declared both the Unit 1 and Unit 2 HPCI outboard isolation valves inoperable. In accordance with the plant technical specifications, the HPCI steam supply lines were isolated by shutting the operable inboard isolation valves. This resulted in both Unit 1 and 2 HPCI systems being inoperable, thereby placing both units in a 14 day limiting condition of operation.

PECo decided to resolve the torque switch setting problem by replacing the yoke clamps with clamps of a higher strength. The new clamps were designed by the valve manufacturer, Anchor-Darling, and fabricated and installed by PECO. This resulted in the Unit 2 valve being repaired and returned to an operable condition on December 18, 1991. The Unit 1 valve was also repaired on December 18, 1991, however, when attempting to restore the system lineup to normal, the inboard HPCI isolation valve would not open. Subsequent troubleshooting determined that the motor operator motor windings had failed.

Unit 1 was shut down on December 18, 1991, to replace the motor on the HPCI inboard isolation valve. The cause of the failure of the Unit 1 HPCI inboard isolation valve operator motor was that the torque switch failed to de-energize the motor when the valve was initially closed due to the mechanical binding in the spring pack assembly. In accordance with plant technical specifications the thermal overloads in the valve motor controller are bypassed which removes the motor overcurrent protection. The inspector noted that the maintenance staff performed a very thorough failure analysis in an effort to ascertain the root cause of the failure. The licensee suspects the binding was caused by the Belleville Washers which provide the spring portion of the spring pack. The licensee sent the assembly to Limitorque for further evaluation.

The motor was replaced and VOTES testing was performed on the valve. Following this work and various other maintenance items the plant was restarted on December 30 and reached full power on January 2, 1992. Several aspects of this event are still under review and will be inspected in greater depth by the NRC Motor Operated Valve Inspection Team during the week of January 8, 1992. Areas of concern include:

- process for ensuring revisions to design calculations are evaluated for the immediate affect on plant hardware
- technical adequacy of MOV calculations
- selection of motor operator size to ensure single failure of a torque or limit switch does not result in a valve or operator failure.

4.0 ENGINEERING AND TECHNICAL SUPPORT (37700)

4.1 NRC Information Notice 90-51, Supplement 1: Failures of Voltage Dropping Resistors in the Power Supply Circuitry of Electric Governor Systems

NRC Information Notice (IN) 90-51, dated August 8, 1990, discussed failures of voltage dropping resistors in the power supplies for the electronic control modules for emergency diesel generators (EDGs). The cause of the resistor failures was attributed to normal aging. Supplement 1 to the IN was issued on October 24, 1991 and discussed an additional failure which occurred after only 15 months of operation.

The inspector reviewed PECO's evaluation of the initial notice to determine if the subject resistors were used at the Limerick Generating Station. By a review of the PECO documentation and through discussions with the system engineer the inspector determined that dropping resistors were not used in the EDG governors. The control power is supplied from the output of the EDG through potential transformers thus eliminating the need for voltage dropping resistors.

PECO also evaluated the governors for the turbines in the Reactor Core Isolation Cooling and High Pressure Coolant Injection systems. Although voltage dropping resistors are used in these applications, they are not the same type as discussed in the IN. There have been no resistor failures experienced to date on either unit with these turbine control systems. A visual inspection of the resistors, performed by PECO, determined there was no signs of overheating.

The inspector concluded that the potential for a safety system failure similar to those discussed in IN 90-51 and Supplement 1 is not likely to occur at Limerick. The inspector also found that the PECO system engineers did a thorough evaluation of the information provided in the IN.

5.0 RADIOLOGICAL PROTECTION (71707)

During the report period, the inspectors examined work in progress in both units and included health physics procedures and controls, ALARA implementation, dosimetry and badging, protective clothing use, adherence to RWP requirements, radiation surveys, radiation protection instrument use, and handling of potentially contaminated equipment and materials.

The inspector observed individuals frisking in accordance with HP procedures. A sampling of high radiation area doors was verified to be locked as required. Compliance with RWP requirements was reviewed during plant tours. RWP line entries were reviewed to verify that personnel had provided the required information and people working in RWP areas were observed to be meeting the applicable requirements. No unacceptable conditions were identified.

6.0 SAFETY ASSESSMENT/QUALITY VERIFICATION

6.1 Replacement of Superintendent-Technical

The Limerick Generation Station Superintendent-Technical (a Technical Specification required position) was replaced on December 28, 1991 by Mr. James A. Muntz. The former Superintendent, Mr. Garrett D. Edwards, was promoted to a Manager of Electrical Systems in the corporate engineering office. Mr. Muntz vacates the position of Independent Safety Engineering Group (ISEG) Superintendent, at Limerick (also required by Technical Specification), which will be filled in the interim by Mr. Thomas P. Mundy. The resident

inspector reviewed the qualifications for both Mr. Muntz, and Mr. Mundy and determined that they meet the respective requirements delineated by Technical Specifications.

7.0 REVIEW OF LICENSEE EVENT REPORTS (LERs), ROUTINE AND SPECIAL REPORTS (90712, 92700)

7.1 Licensee Event Reports (LERs)

LERs are 30 day reports submitted to the NRC, by PECO, as required by 10 CFR 50.73. These reports document: the major occurrences present during an event, including all component or system failures; a clear specific, narrative description of what occurred; plant operating conditions before the event; status of contributors to the event; dates and approximate times of contributing factors; the causes and failure modes; personnel errors if applicable; procedural deficiencies if applicable and the short term and long term corrective actions taken to prevent recurrence. The resident inspector routinely reviews these documents and performs followup to PECO's actions regarding the disposition of corrective initiatives. In his review, the inspector validates the above and determines that events are described accurately and that corrective and compensatory action have been properly addressed. Unless otherwise delineated below the following LERs meet all the requirements discussed above.

LER 1-91-024, Event Date: October 25, 1991, Report Date: November 27, 1991
Emergency Service Water System Inoperable as a Result of Equipment Failure and Personnel Error. This event was reviewed and discussed in inspection report nos. 50-352/91-22; 50-353/91-23.

LER 1-91-025, Event Date: November 3 and 18, 1991, Report Date: December 3, 1991
Main Control Room Isolations in Response to a High Toxic Chemical Concentration Alarm. These events were reviewed and discussed in inspection report nos. 50-352/91-22; 50-353/91-23 and section 1.2 of this report, respectively.

LER 1-91-026, Event Date: November 12, 1991, Report Date: November 27, 1991
Partial Engineered Safety Feature (ESF) Actuation Due to a Blown Fuse Caused by Technician Grounding a Lifted Lead. This event was reviewed and discussed in inspection report nos. 50-352/91-22; 50-353/91-23.

LER 1-91-027, Event Date: November 12, 1991, Report Date: November 27, 1991
An ESF Actuation for an Isolation Valve Associated with a Primary Containment H₂/O₂ Combustible Gas Analyzer.

LER 2-91-017, Event Date: November 15, 1991, Report Date: December 16, 1991
High Pressure Coolant Injection System Discovered in a Degraded Condition Because of a Leak in an Oil Line to the Turbine Stop Valve. This event was reviewed and discussed in inspection report nos. 50-352/91-22; 50-353/91-23.

7.2 Routine and Special Reports

Routine and special reports are submitted by PECO to inform the NRC of routine operating conditions and other noteworthy occurrences that are reportable due to requirements in 10 CFR 20, technical specifications and other regulatory documents. The inspector reviews these reports for information and confirms the accuracy of the reports. The following reports were reviewed and unless otherwise delineated below, satisfied the requirements for which they were reported.

- Monthly Operating Report for November 1991, dated December 6, 1991

The resident inspector had no further concerns or questions regarding the above listed reports and LERs.

8.0 FOLLOWUP OF PREVIOUS INSPECTION FINDINGS (92702)

8.1 (Closed) Violation (50-352/91-18-02).

This violation was written when PECO welders were observed performing repair weld on a high pressure coolant injection (HPCI) system joint with water dripping from the joint. The welding procedure in use was not approved for welding wet joints nor was the welder qualified to weld under these conditions.

The weld was subsequently performed satisfactorily after additional measures were taken to stop the water from reaching the weld area.

PECO has taken or plans to implement the following actions to prevent recurrence:

- Maintenance Team Meetings have been conducted to discuss the importance of not welding in the presence of foreign material (i.e., water). The purpose of these meetings was to clearly convey management's expectation that in the presence of wetted conditions maintenance technicians will not attempt to fit up pipe to be welded and welders will not commence welding.
- On December 6, 1991, training was initiated to provide all currently qualified welders and welders to be newly qualified with a read and sign training package. This training package clarifies that no welding is to be performed on surfaces when moisture, water, or other fluids are present. This training will be completed by each welder during their next biannual welder maintenance of qualification training.
- The General Weld Procedure (GWP) will be revised by February 21, 1991. This revision, in part, will clarify that no welding is to be performed on surfaces when moisture or water are present.

- Formal training on the GWP will be developed for initial welder qualification and for welder maintenance of qualification training programs. This training will be implemented during the second quarter of 1992 following completion of the revision to the GWP.

The inspector determined the corrective actions were adequate and had no further questions on this issue.

8.2 (Closed) Violation 50-352/91-18-01.

This violation was written as a result of PECO failing to take prompt corrective action when a residual heat removal (RHR) valve stuck in the closed position. The valve had to be manually taken off of the closed seat before it could be fully opened remotely using the motor operator. During a design basis accident, remote operation capability is essential since the postulated high radiation fields in the vicinity of the valve would preclude manual operation. If the valve could not be opened, cooling water to the RHR heat exchanger would be blocked, thereby, rendering one loop of shutdown cooling and suppression pool cooling inoperable.

The valve subsequently failed a second time before corrective maintenance was performed. The motor operator torque switch bypass limit switch required adjustment to correct premature activation of the torque switch during valve unseating.

PECO took the following actions to ensure that operations personnel promptly initiate appropriate corrective actions for all equipment anomalies:

- A recorded phone message was distributed to all operations shift supervision and the Shift Technical Advisors emphasizing the importance of promptly initiating corrective actions.
- A letter from the Plant Manager to all licensed Senior Reactor Operators was issued reiterating management's expectations of initial response to equipment malfunctions.
- An Operations Shift Supervision meeting was held to discuss the reasons why corrective actions were not taken in a timely manner. This meeting emphasized management's expectations to initiate immediate corrective actions in response to equipment malfunctions.

To ensure that all site personnel promptly initiate corrective actions, a For Your Information (FYI) notice was developed and distributed to first line supervision. This notice provided a clear and concise set of written management expectations regarding the corrective actions required to be implemented upon discovery of deficient plant equipment. First line supervision then disseminated the expectations of management in this FYI to appropriate station personnel.

The inspectors have observed an increased awareness among station workers and management concerning the need to promptly initiate corrective actions for equipment problems. The inspector determined these corrective actions were adequate and had no further questions on this issue.

8.3 (Closed) Violation 50-352/91-16-01.

Failure to implement effective corrective action regarding material accountability on the refuel floor. The inspector reviewed PECO's response to the violation dated November 18, 1991, and also reviewed some of the corrective actions including the procedure revisions, training conducted, postings and current refuel floor cleanliness. The inspector determined the corrective actions were adequate and had no further questions on this issue.

9.0 MANAGEMENT MEETINGS

9.1 Exit Interviews

The NRC resident inspectors discussed the issues in this report with the licensee throughout the inspection period, and summarized the findings at an exit meeting held with the Plant Manager, Mr. Jay Doering on January 10, 1992. No written inspection material was provided to licensee representatives during the inspection period.

9.2 Additional NRC Inspections this Period

The following inspector exit interview was attended during the report period:

<u>Date</u>	<u>Inspector</u>	<u>Report</u>	<u>Subject</u>
December 23, 1991	Mr. R. McBrearty Ms. C. Beardslee	50-352/91-25 50-353/91-26	Inservice and Primary and Secondary Chemistry Inspections