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REGION I

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Licensee:	Philadelphia Electric Company Correspondence Control Desk P.O. Box 195 Wayne, Pa 19087-0195
Facility Name:	Limerick Generating Station, Units 1 and 2
Inspection Period:	October 4 - November 14, 1992
Inspectors:	T. J. Kenny, Senior Resident Inspector L. L. Scholl, Resident Inspector

Approved by: Clifford J. Anderson, Chief — Date: 12/4/92
Reactor Projects Section No. 2B

EXECUTIVE SUMMARY
Limerick Generating Station
Report No. 92-27 & 92-27

Plant Operations

Both units operated at or near 100 percent power throughout this inspection period. There was one reportable event involving wrong train/wrong unit performance during a scheduled surveillance test. No adverse effect resulted from the event. PECo corrective actions included increased training and Unit enhancement through color coding.

Surveillance and Maintenance

The discussion of a violation of failure to take appropriate corrective action regarding procedural adherence is provided in Section 3.1. Although the safety significance is low, this procedural noncompliance was similar to the misuse of other procedures documented in previous inspection reports issued during the past two years. (See Section 6.1 for additional details.)

Engineering and Technical Support

When check valves in the RCIC (Reactor Core Isolation Cooling) system failed on several documented occasions, the PECo system manager failed to identify the need to take corrective actions to ensure system operability. This action resulted in a violation against 10 CFR 50 Appendix B, XVI, "Corrective Actions." (Section 4.1)

Safety Assessment and Quality Verification

Section 6.1 discusses a two year history of maintenance procedural non-compliance deficiencies, and the potential casual links that have led to a violation of failure to take appropriate corrective actions to prevent recurrence of these deficiencies. A review conducted by the resident inspector has identified that two of the potential causes of the procedure non-compliance are that some workers lack experience, and procedures do not fully describe the task in progress. The combination of these factors appear to have led to a number of procedural non-compliances.

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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 was possible). During the inspections, discussions were held with operators, health physics (HP) and instrumentation and control (I&C) technicians, mechanics, security personnel, supervisors and plant management. The inspections were conducted in accordance with NRC Inspection Procedure 71707 and evaluated the licensee's compliance with 10 CFR, Technical Specifications, License Conditions and Administrative Procedures. During this period, the inspectors performed 4 hours of deep backshift inspections.

1.1 Operational Overview

At the start of this report period Unit 1 was operating at full power and continued to operate at full power for the remainder of the inspection period except for minor power reductions during surveillance testing.

Unit 2 was operating at full power at the start of the inspection period and was in the end-of-cycle power coast-down. By the end of this report period power was reduced to 85.7 percent as a result of fuel burn-up.

1.2 Reportable Events

Unit 1

On October 12, 1992 while performing a functional test on the Unit 2 Refuel Area Ventilation Exhaust Hi Radiation Monitors (ST-2-026-624-2) an Instrumentation and Controls (I&C) technician mistakenly caused a Unit 1 "C" Channel Refuel Floor isolation signal. The I&C technician, who was in the auxiliary equipment room (AER), immediately realized he was in the wrong unit and notified the Main Control Room (MCR). The Hi Radiation signal resulted in a Nuclear Steam Supply Shutoff System (NSSSS) Group VI "C" Channel isolation signal. The MCR personnel verified that all appropriate NSSSS isolation valves actuated to their isolated positions.

The technician immediately terminated the test. After verifying that no high radiation condition existed, the MCR operators reset the isolation signal per procedure GP-8, "Primary and Secondary Containment Isolation Verification and Reset," and restored the systems to their normal configurations.

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

There were no significant adverse effects on the plant resulting from this event. PECo concluded that the cause of this personnel error was the failure of the technician to perform a self-check. PECo took the following corrective actions:

- The I&C technician was counseled on the importance of attention to detail and self-checking.

- An all-hands training session was conducted with I&C department technicians to emphasize management's expectations for self-checking, communication, and support during surveillance procedure performance.

- Human factors improvements were accomplished in Unit 1 by color-coding equipment and panels in the AER. This is expected to be completed by January 1, 1993. The color-coding of Unit 2 panels in the AER is expected to be completed by April 30, 1993.

Unit 2

There were no reportable events for Unit 2 during this inspection period.

The NRC received reports of the above event via the Emergency Notification System (ENS). The inspectors determined that the licensee's initial response and corrective actions were appropriate. The root cause analysis and the need for additional/long-term corrective action will be reviewed 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 and completed surveillance packages. The inspector verified that surveillances were done according to PECo approved procedures and plant Technical Specification requirements. The inspector also verified that the instruments used were within calibration tolerance and that qualified technicians did the surveillances.

Surveillance testing observed and/or reviewed included:

ST-6-049-200-1	RCIC Valve Test
ST-6-049-230-2	RCIC Pump, Valve and Flow Test
ST-6-051-231-2	A RHR Pump, Valve and Flow Test

The activities observed by the inspectors were acceptable.

3.0 MAINTENANCE OBSERVATIONS (62703)

The inspector 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 inspector also verified that the replacement parts and quality control used on the repairs were in compliance with PECo's Quality Assurance (QA) program.

The inspector reviewed the following procedures used during this evolution:

R00265783 SGTS Actuator, HV-76-011B, Preventive Maintenance

R00265785 SGTS Actuator, HV-76-012B, Preventive Maintenance

C0133487 Repair 2A Residual Heat Removal Pump Motor

C0133713 Repair Leak and Charge Accumulator in the Control Room Emergency Fresh Air System Valve HV-78-20B Operator.

C0133664 Repair RCIC Valve 49-2F081

C0131465 Repair RCIC Valve 49-2018

The activities observed by the inspectors were acceptable.

3.1 Standby Gas Treatment System Preventive Maintenance

The inspector observed the performance of Preventive Maintenance (PM) being performed on the Paul Monroe Electro-Hydraulically Operated Butterfly Valve, HV-76-011B. The work was performed in accordance with procedure IC-11-00093, which specified the performance of:

- A visual examination for hydraulic leaks or defects
- A check of the nitrogen accumulator precharge
- A check that the accumulator maintains a stable pressure after valve stroking
- A check that the valve strokes properly

The inspector subsequently reviewed the data from the same work performed on valve HV-76-012B. During the review, the inspector noted that the accumulator precharge pressure was higher than that specified by procedure IC-11-00093. The procedure specifics that the precharge pressure shall be set within 20 psi of the pressure/temperature graph provided by the manufacturer. The graph showed that the precharge should be approximately 608 pounds per square inch gauge (psig) for the existing ambient temperature of 85°F. Thus the maximum pressure should have been 628 psig when the procedure specified tolerance is

applied. The data sheet indicated that the precharge pressure was 636 psig. This condition was identified to the maintenance technician and his foreman. After a review of the data, the technician indicated the error was a result of his difficulty in interpolating the desired pressure for 85°F from the graph. The procedure was reperformed to correct the precharge pressure prior to returning the system to service.

The maintenance supervisor subsequently performed a root cause analysis of the event and determined that the technician's unfamiliarity with the procedure (this was previously an I&C task) and the format of the temperature versus pressure graph were the primary causal factors. As a result, PECo is changing procedure IC-11-00093 to a Maintenance procedure by November 1, 1992 or prior to its future performance. This revision shall include elimination of the graph and subsequent replacement with a digital chart ranging from approximately 65 to 104 degrees to eliminate the ambiguity associated with interpretation of the graph. Also, a training module for Paul Monroe Actuators will be developed that will emphasize the importance of over and under pressurization of the actuators.

While these corrective actions should aid in preventing the recurrence of this event, the inspector questioned why the technician did not stop the work when a procedural ambiguity was encountered. The maintenance department has a technical staff available to resolve procedural questions. The maintenance supervisor agreed that this was a valid question and stated that this event will be reviewed with maintenance personnel to reinforce procedural use expectations.

This procedural problem is another example of a number of procedural errors on the part of maintenance. Refer to section 8.0 of this report pertaining to the review of two previous violations written for failure to follow procedures. As a result of the reviews of PECo's corrective actions and other recent examples of procedurals errors, the inspector has concluded that corrective actions have not been effective. The failure to implement corrective actions is a violation of 10 CFR 50, Appendix B, XVI, "Corrective Actions" that states in part, "In the case of significant condition adverse to quality, the measures (for corrective action) shall assure that the cause of the condition is determined and corrective action shall be taken to preclude repetition." (50-352/92-27-01) (Section 6.1 discusses procedural compliance issues in further detail).

4.0 ENGINEERING AND TECHNICAL SUPPORT (37700)

On October 21, 1992, PECo completed a maintenance outage on the Unit 2 Reactor Core Isolation Cooling (RCIC) system. Following this outage, the inspector reviewed outstanding maintenance items that were not performed during the outage. The purpose of this review was to assess the effectiveness of the system maintenance outage in improving the reliability of the RCIC system. The inspector identified the following conditions:

1. Primary Containment Isolation Valve Sticking

Action Request (AR) A0162981 documented a problem where check valve 049-2F028 stuck in the closed position. This valve is a Primary Containment Isolation Valve (PCIV) in the RCIC barometric condenser vacuum pump discharge line. The valve was found to be sticking on September 3, 1991, when the barometric condenser failed to remove the steam from the RCIC turbine seals and valve leak off points. During subsequent testing, the valve opened and the system operated normally.

No corrective action was taken. Since the cause of the sticking had not been identified or corrected, the inspector questioned why PECo engineering assumed that the valve would not stick in the open or some intermediate position. Valve sticking would prevent the valve from performing its containment isolation function. The system engineer and his supervisor stated that the valve had stuck in the closed position and it had a spring to assist it in closing. They concluded that the valve was operable and would perform its containment isolation function. The inspector again questioned why a valve that exhibited a lack of free movement could be considered operable. As a result, PECo engineers performed troubleshooting of the valve using acoustic monitoring techniques.

On November 4 and 5, 1992, the RCIC vacuum pump was operated while the check valve was monitored acoustically to determine if the valve disc was opening and closing. The results of this troubleshooting determined that the check valve opened during the initial pump start on November 4, 1992 and then stuck open and remained open during the remainder of the testing. Efforts to reseat the valve were unsuccessful and the valve was declared inoperable on November 4, 1992. The inboard PCIV was closed to comply with the plant Technical Specifications. PECo's failure to promptly correct this deficiency is a violation (see paragraph 2 below).

The valve was disassembled on November 12, 1992 and found to have corrosion that interfered with the free movement of the valve disc. PECo plans to revise its check valve inspection program to include more frequent disassembly and inspection of this valve. When the inspector asked what actions were planned for the similar RCIC valve on Unit 1, he was informed that the Unit 1 valve had experienced similar problems and was inspected during the last refueling outage. Surveillance Test ST-6-051-231-2, a quarterly test for pump, valve and flow, has been performed since the inspection with no similar valve sticking deficiencies.

2. RCIC Vacuum Breaker Check Valve Deficiencies

Action Request A0162982 documented a problem with one of the four RCIC turbine exhaust vacuum breaker check valves with valve 49-2018. These valves function to permit air to break the vacuum that is created in the turbine exhaust line when the

steam in the line condenses after the turbine is shut down. The four valve arrangement ensures the vacuum break occurs even with the failure of any one of the valves.

The problem with valve 49-2018 was that it stuck open during the functional test that is performed quarterly. The initial failure occurred in November 1991. The valve again failed in December 1991 and March 1992. These failures did not impact the system operability since check valves 49-2F068 and 49-2017 provided adequate redundancy to prevent reverse flow through the vacuum breaker flow path. Reverse flow would be detrimental since it would result in an undesired flow of steam into the suppression pool air space during the RCIC system operation resulting in the heating of the air space above the suppression pool.

On June 30, 1992 and again on October 20, 1992, the 49-2018 valve passed the functional test. However, the inspector noted that during the October 20, 1992 test, the 49-2F068 and 49-2017 valve pair failed the test due to excessive reverse flow. The inspector questioned the operability of the vacuum breaker configuration since the 49-2F068 and 49-2017 valves had failed the most recent test. Even though the 49-2018 valve passed two recent tests, the valve had a history of test failures and no corrective actions had been taken to resolve the previous failures. The station engineering staff's position was that the most recent positive test results for the 49-2018 valve was an adequate basis to consider the system operable.

During discussions with the system engineer, the subject of a temperature switch in the vacuum breaker line whose design function is to provide an alarm in the main control room resulting from steam leakage past the vacuum breakers was identified. The inspector reviewed the alarm response procedure for a high temperature and found that it provided directions to the operators to isolate the vacuum breaker line by closing a motor operated isolation valve and then to reopen the valve when the turbine is secured. These actions would ensure the system operability even with reverse flow past the check valves. One additional question was identified when the inspector reviewed the setpoint for the temperature switch. While the temperature switch setpoint is 225°F, it was not clear from a review of the RCIC surveillance test data what the actual temperature of the steam in the exhaust line is during operation. It appears that the steam temperature is very close to the 225°F setpoint, thereby, raising the question whether the switch would actually alarm in the event the check valves leaked. The inspector requested PECo to supply the engineering setpoint calculation that would provide the basis for 225°F. The inspector was informed that there was no specific calculation available and the setpoint was based on the engineering judgment of the design engineer. As a result of this review, the system engineer is planning to take additional test data, using more accurate instrumentation, to determine actual steam exhaust temperature. The question of the adequacy of the temperature switch setpoint is unresolved pending the completion of this additional testing and data evaluation. (50-353/92-27-01).

During a disassembly on January 18, 1992 it was discovered that one of the four valves, 49-2018, had a problem where a manufacturing defect was the cause of the sticking of the valve disc. This sticking problem had been identified by the valve manufacturer, Velan Valve Corporation. Velan reported this condition as required by 10 CFR 21, Reporting of Defects and Noncompliance. During the first week of November, 1992 the vacuum breaker check valves were subsequently disassembled and the internals were replaced.

The inspector concluded that the failure of the RCIC check valves (PCIV 49-2F028 and the vacuum breaker check valves) are conditions adverse to quality. As such, PECo's failure to promptly correct these problems constitute a violation of 10 CFR Appendix B, Criteria XVI, "Corrective Action." (50-353/92-27-02).

5.0 RADIOLOGICAL PROTECTION (71707)

During the report period, the inspector examined work in progress in both units including health physics procedures and controls, ALARA implementation, dosimetry and badging, protective clothing use, adherence to radiation work permit (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 provided the required information and people working in RWP areas were observed as meeting the applicable requirements. The activities observed by the inspectors were acceptable.

6.0 SAFETY ASSESSMENT/QUALITY VERIFICATION

The recent event of a mechanic overpressurizing an accumulator of an electro-hydraulic valve installed in Standby Gas Treatment System (SGTS), because he did not fully understand the graph of pressure vs. temperature, then proceeding to charge the accumulator to a higher than required pressure, is another example of workmen at Limerick failing to follow procedures. Since April of 1991, six violations (Severity Level 4) have been issued involving procedural noncompliance within the maintenance department. This current misuse of procedures brings the number of related violations to seven. PECo's letters to the NRC have documented their corrective actions specifying that the majority of these violations were due to the workman's unfamiliarity with the procedure. PECo encourages the workmen to stop and check if they do not understand procedures, and get help. However, this practice alone has not prevented a recurrence of these procedural violations.

By reviewing the violations issued since April, 1991, the inspector concluded that corrective actions taken by PECo regarding procedural non-compliance have not been effective. A violation was issued in August 1991 that addressed the issue of ineffective corrective actions regarding procedural compliance. A management meeting was held with PECo to discuss Nuclear Maintenance Division (NMD) activities at Limerick and Peach Bottom facilities. That meeting also discussed the procedural compliance problems. Since the management meeting, corrective actions taken by PECo have been extensive. These corrective actions have included stopping work, all hands meetings, additional training and counseling of individuals. PECo has also changed procedures for clarification purposes. However the problem still exists. The recent problem described in Section 4.1 showed that the workman did not understand the procedure but proceeded without direction, causing the overpressurization of the accumulator. PECo maintains an engineering staff onsite and a technical engineering staff within the department to answer questions about procedures and methodology of performing maintenance.

The inspector reviewed outstanding items regarding procedural noncompliance within PECo's systems for recording related events. The period of review was January 1, 1992 to the present. The following licensee tracking systems were reviewed:

- Confirmatory Action Requests (CAR's) documents written by QA/QC to address identified discrepancies within the PECo operation of Limerick.

- Human Performance Evaluation System (HPES) Event driven root cause analysis performed on plant occurrences.

- Plant Monitoring - evaluations of work in progress performed by QA personnel.

There were a total of 31 items identified related to procedural compliance. Some of the deficiencies were of minor consequence and some had impact on plant conditions that required rework or additional repairs. Of the 31 items identified, the following resulted from a casual analysis: (The 31 items were discussed with PECo licensing department.)

Twelve were the result of less than adequate procedures used by workers with lack of experience or training.

Eight were the result of not having QC hold points performed.

Five were the result of the failure to follow A-26 "Plant Maintenance Procedure." This was mainly the responsibility of the work foreman.

Ten were the result of failure to follow procedures.

As a result of NRC identified violations discussed above, and the similar findings identified by PECo, the NRC has concerns that the corrective actions taken by PECo have not been fully effective. These concerns will be discussed at an upcoming management meeting between the licensee and NRC.

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 follow-up to PECo's actions regarding the disposition of corrective initiatives. In his review, the inspector validates the above and determines whether events are described accurately and whether corrective and compensatory actions have been properly addressed. The following LER met all the requirements discussed above.

LER 1-92-017, Event Date: October 12, 1992, Report Date: November 6, 1992
Engineered Safety Feature Actuation During Surveillance Testing (Refer to Section 1.2 of this report for a discussion of this event.)

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 September 1992, dated October 9, 1992
Monthly Operating Report for October 1992, dated November 13, 1992

The resident inspector had no questions or concerns regarding the above reports.

8.0 FOLLOWUP OF PREVIOUS INSPECTION FINDINGS (92702)

(Closed) Unresolved Item (50-352/92-25-01). Emergency Service Water to the Emergency Diesel Generator

During a walkdown inspection of the Emergency Service Water (ESW) System the inspector found that the differential pressure across the IC Emergency Diesel Generator (EDG) was greater than the maximum specified in the ESW system operating procedure, S.11.1.A This discrepancy was discussed with the ESW system engineer who subsequently determined that the differential pressures stated in S.11.1.A were too conservative and were not necessary to ensure proper system operation. Monthly ESW flow tests are performed to ensure the EDG's are receiving the proper ESW cooling water flow. On October 8, 1992 Procedure S.11.1.a was revised to delete the prerequisite pertaining to the EDG differential pressure. This item is closed.

(Update) Violation (50-352/92-03-01). Failure to Follow Maintenance Procedures.

During maintenance on the Unit 1 "B" residual heat removal heat exchanger inlet isolation valve, there was a failure to follow an approved maintenance procedure. PECo acknowledged the violation and stated the causes as being (1) procedural noncompliance due to lack of attention to detail on the part of the individuals who performed and verified the performance of the procedure, and (2) the procedure being less than adequate with regards to technical direction and human factors aspects.

PECo has taken a total of eight corrective actions to address the violation and to prevent recurrence of the violation.

Six corrective actions were taken to address noncompliance due a lack of attention to detail. Three of the six corrective actions taken to address lack of attention to detail consisted of the following all-hands meetings:

- A Maintenance/I&C section all-hands meeting that emphasized the necessity for attention to detail when using procedures.

- An all-hands meeting was held with quality verification section personnel. Topics included discussion on procedural compliance and the action to take if a procedure cannot be complied with. In addition, discussion was held on the actions that were related to this violation.

- An all-hands meeting was held with quality verification inspectors that emphasized strict procedural compliance, attention to detail, and independence of the quality verification section, along with the method of reconciling discrepancies between procedure text and the maintenance data record form

Other corrective actions taken to address lack of attention to detail consisted of the following.

- The development and implementation of a procedure use and compliance training module. This module included aspects that dealt with how to get procedures changed, and expectations related to the conduct of maintenance and procedure use.

- The development and implementation of a performance improvement plan for the quality verification inspector involved in this event. This plan encompassed remedial training, a written examination, and performance demonstrations in the field.

- A review conducted by quality verification management to identify areas that may need strengthening. A result of the review showed that strengthening of the quality verification planning process was needed.

Two corrective actions were taken to address procedural noncompliance due to less than adequate procedures.

- The Preventive Maintenance Procedure for Electrical Checkout and Adjustment of Limitorque Operators, PMQ-500-087, was revised to specify when diagnostic testing is required, human factors improvements, and better defined acceptance criteria.

- Revisions to the Post-Maintenance Testing Maintenance Guideline, MG-20, were made to be more specific with respect to limit switch adjustments.

Section 3.1 discusses a recent event where a maintenance error occurred when the technician had difficulty interpreting the procedure. This item remains open pending further NRC inspection to assess the adequacy of the corrective actions discussed above.

(Update) Violation (50-352/92-11-01). Failure to Follow Procedure.

This violation was written when 13,000 gallons of water was drained inadvertently from the reactor cavity when test personnel failed to follow step 7.1.b of procedure ST-4-LLR-092-1 "Local Leak Rate test for Feedwater." There was an additional column for locked position for the valves in the procedure. These positions were for plant operating conditions and had no relationship to the performance of the surveillances. The technician became confused by this column and positioned valve 44-1029 to open (the locked valve position for operation) instead of closed, the as-found condition for the unit in shutdown. The inspector reviewed PECo's letter of July 2, 1992 and noted that PECo acknowledged the violation and made changes to the procedure. PECo has changed the procedure and has provided additional training to personnel who perform LLRT during plant shutdown conditions.

Section 3.1 discusses a recent event where a maintenance error occurred when the technician had difficulty interpreting the procedure. This item remains open pending further NRC inspection to assess the adequacy of the corrective actions discussed above.

9.0 MANAGEMENT MEETINGS

The NRC Resident Inspectors discussed the issues in this report with PECo representatives throughout the inspection period, and summarized the findings at an exit meeting with the Plant Manager, Mr. J. Doering, on November 16, 1992. No written inspection material was provided to licensee representatives during the inspection period.