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Licensee: PECO Energy  
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Facilities: Limerick Generating Station, Units 1 and 2

Location: Wayne, PA 19087-0195

Dates: July 7, 1998 through August 31, 1998

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EXECUTIVE SUMMARY  
Limerick Generating Station, Units 1 & 2  
NRC Inspection Report 50-352/98-07, 50-353/98-07

This integrated inspection included aspects of PECO Energy operations, engineering, maintenance, and plant support. The report covers a 8-week period of resident inspection and region-based inspection in the Emergency Preparedness area.

Operations

- Three times during the inspection period unit operators were faced with unexpected conditions requiring power reductions. The unit operators performed very well in recognizing and diagnosing the events, following plant procedures, and maintaining the units in a safe condition at all times during each of the events. (Section O4.1)

Engineering

- Reactor engineering support of a routine rod pattern adjustment activity was weak in that unexpected alarms were received which required plant operators to reduce plant power. Reactor engineering had not adequately assessed the response of the LPRMs to the rod pattern adjustment and therefore predicted a non-conservative plant power level for the conduct of the activity. This lapse in engineering performance for the routine activity resulted in an unexpected challenge to the unit operators. (Section E4.1)
- The identification of the missing fire damper by a fire protection technician, demonstrated a healthy questioning attitude with appropriate follow-up. The root cause for the missing dampers was thorough; however, weaknesses were noted with the comprehensiveness of previous actions for related issues which had the potential to identify this issue sooner. The failure to have an adequate fire barrier between independent fire zones is a violation of 10 CFR 50 Appendix "B" Criterion III, "Design Control" and is being treated as a Non-Cited Violation. (Section E8.6)

Plant Support

- The licensee's process for identifying, resolving and preventing problems in the emergency preparedness area consisted of three systems that were not well integrated for the purpose of trending of problems. As a result, several repeat emergency preparedness performance issues occurred but were not tracked as repeat issues. (Section P1.2)
- Facilities related to emergency preparedness were in a state of operational readiness and surveillance tests and equipment inventories were performed as required. However, the inspector noted instances where emergency equipment remained degraded for long periods of time necessitating reliance on compensatory measures. Information regarding repeated failures of offsite sirens was referred to FEMA on July 16, 1998 (Section P2)

Executive Summary (cont'd)

- Based upon the review of recent licensee changes, the E-Plan changes were adequately reviewed in accordance with 10 CFR 10.54(q). The letters of agreement with offsite agencies were in place and the licensee's offsite program with the states and counties continue to be a strength in their emergency preparedness program. (Section P3)
- The licensee conducted emergency response training and drills as required and training for the Emergency Response Organization was effectively implemented. (Section P5)
- The 1996 and 1997 audit reports of emergency preparedness met the specific requirements of 10 CFR 50.54(t). However, the audit reports did not contain sufficient detail describing the bases for their conclusions, program assessments were redundant from year to year, repeat items were not properly tracked, and checklist recommendations and areas for improvement were not discussed. (Section P7)
- The Post Accident Sampling System was determined to be operable and technicians demonstrated very good use of the system when acquiring actual samples. (Section P8.1)



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**ATTACHMENTS**

- Attachment 1 - Partial List of Persons Contacted
  - Inspection Procedures Used
  - Items Opened, Closed, and Discussed
  - List of Acronyms Used
- Attachment 2 - E-Plan and ERP Changes

## Report Details

### Summary of Plant Status

Unit 1 began this inspection period operating at 100% power. The unit remained at full power throughout the inspection period with exceptions for testing, rod pattern adjustments, and the following plant events:

- July 31      The unit operators reduced plant power to 22% in order to take the main turbine off-line after a leak in the turbine's electro-hydraulic control (EHC) system was discovered by an equipment operator. After repairs to the EHC system were effected, operators placed the turbine on line on August 1, and the plant reached 100% power on August 2.
- August 6      While performing routine rod pattern adjustments, with reactor power reduced to 99.5%, several alarms related to plant power annunciated. Operators reduced reactor power to 95% to clear the alarms and stabilize the plant while the cause of the alarms was determined. Unit 1 was returned to 100% power later that day.
- August 10     With both Schuylkill River makeup water pumps removed from service for planned maintenance, operators secured the "B" Perkiomen Creek makeup water pump and started the "A" pump. Two and a half hours later the "A" and "C" Perkiomen Creek pumps tripped. With all makeup water pumps out of service, the inventory of both station cooling towers began to decrease, and operators reduced power at both Unit 1 and Unit 2 to 90%. Operators returned the "B" and "C" Perkiomen pumps to service and then returned both units to 100% power.

Unit 2 began this inspection period operating at 100% power. The unit remained at full power throughout the inspection period with exceptions for testing, rod pattern adjustments, and the following plant events:

- July 10      Operators reduced power to 60% in order to conduct control rod scram time testing and to support the removal of main condenser water boxes from service for cleaning. The water box cleaning activities were performed over July 10-12, and operators returned the unit to 100% power on July 13.
- August 10     With both Schuylkill River makeup water pumps removed from service for planned maintenance, operators secured the "B" Perkiomen Creek makeup water pump and started the "A" pump. Two and a half hours later the "A" and "C" Perkiomen Creek pumps tripped. With all makeup water pumps out of service, the inventory of both station cooling towers began to decrease, and operators reduced power at both Unit 1 and Unit 2 to 90%. Operators returned the "B" and "C" Perkiomen pumps to service and then returned both units to 100% power.

## I. Operations

### **O1 Conduct of Operations<sup>1</sup>**

#### **O1.1 General Comments (71707)**

Using Inspection Procedure 71707, the inspectors conducted frequent reviews of ongoing plant operations. In general, PECO Energy's conduct of operations was professional and focused on safety principles.

### **O4 Operator Knowledge and Performance**

#### **O4.1 Operator Response to Unit 1 Unexpected Forced Power Reductions**

##### **a. Inspection Scope (71707)**

Plant operators faced three unexpected forced power reductions during the inspection period: two reductions which solely affected Unit 1 and one which affected both Units 1 and 2. The inspectors observed and reviewed the operators' diagnosis, evaluation and response to the event initiators; use of procedures during the events; and restoration of the plant(s) to normal operating conditions.

##### **b. Observations and Findings**

At 1:20 am on July 31, a Unit 1 equipment operator identified that the electro-hydraulic control (EHC) system fluid reservoir level had dropped significantly from the previous day. The operating crew determined an unisolable leak had occurred on a main turbine control valve instrument line, and started a power reduction to 25% at 2:05 am in order to remove the main turbine from service and make repairs to the EHC system. The inspectors concluded that plant operators did an excellent job identifying the EHC leak and had exhibited conservative decision making and good procedure adherence in removing the turbine from service for repairs.

On August 6, while Unit 1 operators were performing a routine control rod pattern adjustment and withdrawing a control rod, unexpected average power range monitor (APRM) upscale and rod out block alarms annunciated. The inspectors monitored the Unit 1 operators' response to the step increase in one channel of indicated power and the subsequent alarms. When neither the operators nor reactor engineering could determine whether the alarms were caused by actual conditions in the core or by instrument error, shift supervision directed unit operators to reduce power to 95%. The cause of these alarms and reactor engineering response to them is discussed in paragraph E4.1 of this report. The inspectors determined that the operators responded well to the unexpected indications which arose during a

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<sup>1</sup> Topical headings such as O1, M8, etc., are used in accordance with the NRC standardized reactor inspection report outline. Individual reports are not expected to address all outline topics.



routine activity and maintained the plant in a safe condition while those indications were investigated.

On August 10, an unplanned load drop occurred on both units due to a loss of makeup flow to both cooling towers. Plant conditions that morning had the "A" and "B" Schuylkill River makeup pumps out of service for planned maintenance and the "B" and "C" Perkiomen Creek makeup pumps supplying the cooling tower reservoirs. At 11:30 am operators secured the "B" Perkiomen pump to perform additional planned maintenance and started the "A" pump. At 1:59 pm, the "A" Perkiomen pump tripped off and the "C" pump tripped shortly thereafter. Operators could not re-start either of the tripped Perkiomen pumps and, with cooling tower inventory decreasing, operators initiated a power reduction to 90% on both units in accordance with operating procedures. By 3:57 pm operators determined there was no apparent reason for the "C" Perkiomen pump trip and successfully restarted that pump. When two makeup pumps were in service operators returned both units to 100%. The inspectors reviewed the operators' response to the indications received in the control room on August 10 and concluded that the operators did a very good job recognizing and responding to the loss of the makeup pumps and subsequently placing both units in a safe condition. The licensee later determined that the "A" Perkiomen pump tripped due to a valid high stator temperature signal and the "C" pump tripped due to pump run-out and subsequent high vibrations which were the result of the design of the common discharge header for the Perkiomen makeup pumps.

c. Conclusion

Three times during the inspection period unit operators were faced with unexpected conditions requiring power reductions. The unit operators performed very well in recognizing and diagnosing the events, following plant procedures, and maintaining the units in a safe condition at all times during each of the events.

**08 Miscellaneous Operations Issues (90712)**

- 08.1 (Closed) LER 50-352/1-98-003: ESF Actuation Due to Incidental Contact with Reactor Vessel Instrument Rack. On February 13, 1998, an unexpected partial actuation of the primary containment and reactor vessel isolation control system occurred, which resulted in the isolation of four containment hydrogen and oxygen sampling system and two containment gaseous radiation monitoring system primary containment isolation valves (PCIVs). The licensee determined that the PCIV isolations were caused by the inadvertent contact by an equipment operator with a reactor vessel instrumentation rack, which caused a spurious signal to be generated by an affected transmitter. The licensee further determined that all systems functioned as designed and the event resulted in no adverse consequences.

PECO attributed the primary cause of the event to be personnel error and implemented corrective actions involving the counseling of the equipment operator and the briefing of all relevant site personnel to reinforce the need for caution while working around sensitive equipment. The inspector reviewed in office the

circumstances of this event and the licensee's analysis of and response to it. The inspector concluded this was an isolated event and the licensee's determination of cause and implementation of corrective actions were adequate. No NRC regulations were violated during the event, and this item is closed.

## II. Maintenance

### **M1 Conduct of Maintenance**

#### **M1.1 General Comments on Maintenance Activities (62707)**

The inspectors observed selected maintenance activities to determine whether approved procedures were in use, details were adequate, technical specifications were satisfied, maintenance was performed by knowledgeable personnel, and post-maintenance testing was appropriately completed.

The inspectors observed portions of the following work activities:

- Common - "B" Main Control Room Chiller Overhaul, August 3-7;
- Unit 2 - Control Rod 06-31 Scram Pilot Solenoid Valve Replacement, August 6;
- Unit 1 - Clean and Examine "B" RECW Heat Exchanger, August 11-14;
- Common - "C" Schuylkill Makeup Water Pump Functional Test, August 20;
- Unit 1 - D TIP Detector Troubleshooting and Manual Handwheel Withdraw, August 31;
- Unit 2 - D22 18 month Overhaul, August 31;

Observed maintenance activities were conducted well using approved procedures, and were completed with satisfactory results. Communications between the various work and support groups were good, and supervisor oversight was good.

#### **M1.2 General Comments on Surveillance Activities (61726)**

The inspectors observed selected surveillance tests to determine whether approved procedures were in use, details were adequate, test instrumentation was properly calibrated and used, technical specifications were satisfied, testing was performed by knowledgeable personnel, and test results satisfied acceptance criteria or were properly dispositioned.

The inspectors observed portions of the following surveillance activities:

- Unit 2 - ST-6-048-230-2, "Standby Liquid Control Pump Flow Test," - July 21;
- Unit 2 - ST-6-052-232-2, "B Loop Core Spray Pump and Valve Flow Test," - August 6;
- Common - ST-6-011-452-0, "B Emergency Service Water Lineup Verification," - August 14

- Unit 1 - ST-6-060-720-1, "Suppression Pool Drywell Vacuum Breaker Test," - August 20;

Observed surveillance tests were conducted well using approved procedures, and were completed with satisfactory results. Communications between the various work and support groups were good, and supervisor oversight was good.

#### **M8 Miscellaneous Maintenance Issues (92902)**

- M8.1 (Closed) LER 50-352/1-98-001: ESF Actuation, HPCI Initiation, During Troubleshooting Equipment Restoration. This LER documented an event on January 24, 1998, where a high pressure coolant injection (HPCI) actuation was caused by an I&C technician who interrupted a HPCI system ground circuit while removing test equipment, per a troubleshooting control form (TCF), from the 1B residual heat removal system. PECO attributed the cause of the event to less than adequate understanding of the potential for a loss of ground during the removal of the test equipment. The personnel involved with the TCF had failed to realize the impact the TCF had on the daisy chained ground circuit which involved the HPCI system. PECO documented corrective actions which included a review of the event and the vulnerability of daisy chained ground circuits with all work group personnel expected to perform similar troubleshooting activities, and the inclusion of troubleshooting daisy chained circuits in the applicable continuing training program.

The inspector determined that the corrective actions for this event were inadequate, in that during the month of July, Fix-It-Now (FIN) maintenance technicians caused a momentary loss of main condenser vacuum during troubleshooting. The transient occurred when the technicians inadvertently interrupted a daisy chained ground circuit affecting the condenser steam jet air ejectors. Upon investigation, the inspector found that the Limerick FIN team had not been included in the corrective action training related to the January HPCI event. The inspector verified by direct on-site inspection that the FIN team personnel were trained and FIN work control procedures were modified following the July event. The inspector concluded that no NRC regulations were violated in either event and that, following the July event, licensee corrective actions were adequate. This item is closed.

- M8.2 (Closed) LER 50-352/1-98-010: Failure to Perform Two Surveillance Tests Related to the Reactor Coolant Recirculation System (RCRS). This LER documented an event where the calibration tests for the RCRS flow summers were not performed within the 7-day frequency by required Technical Specifications. The tests had been performed on May 17, 1998, as required in conjunction with the Unit 1 startup, but one day ahead of the normally scheduled test performance. The tests were not repeated until May 25 and 26, exceeding the frequency required by Technical Specifications. The results of the May 25-26 tests were satisfactory, and no adjustments to the flow units was required. PECO attributed the cause of the late surveillance test performance to lack of adequate attention to the daily work schedule and to less than adequate communication between unit surveillance test coordinator (STC) and I&C technicians scheduled to do the tests. PECO's corrective actions included a review of other potentially similar surveillance tests and the



communication of the event to be relevant I&C supervisors and STCs. The failure to perform these surveillances within the required interval is a violation of Technical Specifications. This licensee-identified, non-repetitive and corrected violation is being treated as a Non-Cited Violation consistent with Section VII.B.1 of the NRC Enforcement Policy." (NCV 50-352, 353/98-07-01)

- M8.3 (Closed) LER 50-352/1-98-012: HPCI System Inoperable Due to Clogged Exhaust Drain Pot Flow Orifice. On May 30, during the performance of a routine test, flow from the Unit 1 HPCI turbine exhaust drain pot could not be confirmed. PECO recognized this condition indicated an undeterminate amount of condensed water may have been present in the HPCI turbine and therefore declared the HPCI system inoperable. Corrective maintenance identified the cause of the exhaust drain line blockage as a piece of an internal hold-down bolt locking tab in the drain line flow orifice. The licensee determined that the piece had resulted from either past work practices or from equipment failure, and corrective actions included: an internal inspection of each unit's HPCI turbine; performance of an orifice flow check following each HPCI system's operation; and evaluations of a permanent HPCI system modifications to prevent the similar failure of the locking tabs.

The inspector reviewed the event and PECO's response to it. The inspector determined by direct on-site inspection that the licensee's corrective actions for this event were good. The inspector further determined no NRC regulations had been violated, and this item is closed.

### III. Engineering

#### E4 Engineering Staff Knowledge and Performance

##### E4.1 Reactor Engineering Support of Unit 1 Control Rod Pattern Adjustment

###### a. Inspection Scope (71707, 37551)

On August 6, during a routine rod pattern adjustment, unexpected APRM upscale and rod out block alarms were received in the control room when operators withdrew a control rod. The inspectors reviewed the reactor engineering planning and oversight of the rod pattern adjustment activities.

###### b. Observations and Findings

The purpose of the rod pattern adjustment was to withdraw the last two groups of control rods (groups 27 and 28) following the Unit 1 startup, in order to improve the power shape in the core and reduce burn-up at the control rod blade tips. The withdrawal of the first rod group was routine, but when operators withdrew the second rod group, an APRM upscale alarm on the 1A APRM and a rod withdraw block alarm were received in the control room. The 1A APRM indicated 104.5% power, and the 1E APRM indicated 102.5% power. The receipt of these alarms had not been predicted by reactor engineering; in fact, reactor engineering had advised operations that reducing plant power to 99.5% would be adequate for

conducting the rod pattern adjustment. Additionally, once the alarms were received, reactor engineering evaluation of the information could not determine whether the alarms were valid indications of reactor power or a result of instrument error. Operators halted the rod adjustment activity and reduced plant power to 95%.

The inspectors observed the withdrawal of the second group of control rods involved in the adjustment and the investigation of the alarms by a team of operators, reactor engineering and I&C. That team's review identified that the LPRM strings next to the rods being pulled fed into the 1A and 1E APRMs, and that the power indications had been affected by the rod withdrawal. The team further determined that this was normal behavior for the APRMs and that overall reactor power level had remained within allowed limits, although the effect of the local power excursion was not planned for nor predicted by reactor engineering. While power level was at 95%, the gain adjustment factor for the affected APRMs was adjusted, and the rod pattern adjustment was completed without further incidents.

c. Conclusion

Reactor engineering support of a routine rod pattern adjustment activity was weak in that unexpected alarms were received which required plant operators to reduce plant power. Reactor engineering had not adequately assessed the response of the LPRMs to the rod pattern adjustment and therefore predicted a non-conservative plant power level for the conduct of the activity. This lapse in engineering performance for the routine activity resulted in an unexpected challenge to the unit operators.

**E8 Miscellaneous Engineering Issues (92903)**

**E8.1** (Closed) LER 50-352/1-98-011: Inoperable Residual Heat Removal (RHR) System.

The 1B RHR system was determined to have been inoperable as a result of intermittent minimum flow valve actuation due to a degraded control logic component. This event was discussed in Inspection Report 50-352, 353/98-02. No new issues were revealed by the LER.

**E8.2** (Closed) LER 50-353/2-98-002: Inadvertent Initiation of the Standby Liquid Control (SLC) System.

An inadvertent initiation of the SLC system and injection of sodium pentaborate into the reactor vessel occurred as a result of an electromagnetic interference induced signal into the SLC system's automatic actuation circuits. This event was discussed in Inspection Reports 50-352, 353/98-04 and 50-352, 353/98-05. No new issues were revealed by the LER.

E8.3 (Closed) LERs 50-352, 353/1-97-013 and 1-97-013 r. 1: Inadequate Testing of Primary Containment Isolation Valves. This condition was discussed in Inspection Report 50-352, 353/97-10 and 50-352, 353/98-04. No new issues were revealed by the LER or revision to the LER.

E8.4 (Closed) LER 50-352/1-97-011 r. 1: Inoperable HPCI Turbine Exhaust Valve as a Result of Internal Mechanical Damage. This condition was discussed in Inspection Report 50-352, 353/98-02. No new issues were revealed by the LER revision.

E8.5 (Closed) IFI 50-352;353/98-02-02:Shutdown Cooling (SDC) Suction Valve Failure to Re-Open. Following a loss of shutdown cooling event operators were unable to reopen the SDC suction valve (HV-51-1F008) electrically. A definitive root cause for the inability to re-open the valve was not identified. The event was characterized as an inspection follow-up item pending inspections of the motor operator. During the recent Unit 1 refueling outage 1RFO7 the inspections, preventative maintenance and diagnostic testing were completed on HV-51-1F008 with no anomalies noted and all parameters within specifications. This issue is closed.

E8.6 (Closed) LER 50-352, 353/1-98-004: Missing Fire Dampers

a. Inspection Scope (92903)

During a pre-outage walkdown of fire dampers for an upcoming surveillance test, a structural fire barrier penetration was identified without the required fire damper installed. Further, inspections revealed 3 additional fire dampers missing in similar applications. The inspector evaluated the licensee's root cause and corrective actions for the missing fire dampers.

b. Observations and Findings

A fire protection technician performing a pre-outage planning survey to determine the scaffolding needed for planned fire damper inspections, noted a ventilation register for which no fire damper testing had previously been performed. The technician, using the ventilation prints, verified that no fire damper was installed and alerted his management who found that a fire damper was required since this penetration was through a wall separating two different fire zones. Additional investigation identified three other similar locations which had missing fire dampers.

An engineering analysis found that only one of the four subject ventilation penetrations, which communicate directly between two fire zones, impacted the ability to perform a safe shutdown during a design basis fire. Specifically, a fire in one of these areas could propagate to the other fire zone through the unprotected penetration and impact the redundant equipment necessary for a safe shutdown.

The licensee determined that the missing dampers were a result of an original design error attributed to less than adequate detail on the fire barrier drawings and inattention to detail when the designer specified the necessary fire dampers.



Specifically, details for partial height walls, slabs and compartments had been omitted thus requiring interpretation by the user during activities such as design reviews. This omission of detail apparently cascaded into the failure to specify the need for fire dampers in the four locations discussed in the LER which involved penetration through slabs which formed ceilings and walls separating fire zones. The licensee also determined that the missing dampers went undiscovered until recently, in part, as a result of inadequate corrective actions for previous issues. For example, a 1994 PEP (I0003117) found that the security barrier quadrant of the hazard barrier prints lacked sufficient detail to properly designate partial elevation details as security barriers. These prints are divided into four quadrants (secondary containment, fire, flooding and security) with each quadrant containing redundant building plans with the associated hazard boundary specified. The corrective action for this previous PEP issue only assessed the security quadrant. In addition, LER 352/85-28 which identified conduit fire seals missing as a result inadequate design drawing detail, specified corrective actions which could have identified the missing dampers.

Following an engineering evaluation and ventilation testing the corrective action for the missing fire dampers was to install 2 fire dampers and to block the other two penetrations with material that would provide the appropriate fire rating. In addition, the licensee plans to revise the specific drawings in question to provide the necessary detail and to show the revised configuration. Print reviews and walkdowns were performed and confirmed no other penetrations are missing dampers. The licensee also implemented corrective actions for the failure to previously identify the missing dampers which involved training for the engineering staff, to address a number of the identified causal factors. The failure to have an adequate fire barrier between independent fire zones is a violation of 10 CFR 50 Appendix "B" Criterion III, "Design Control." This licensee-identified, non-repetitive and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy. (NCV 50-352, 353/98-07-02)

c. Conclusion

The identification of the missing fire damper by a fire protection technician, demonstrated a healthy questioning attitude with appropriate follow-up. The root cause for the missing dampers was thorough; however, weaknesses were noted with the comprehensiveness of previous actions for related issues which had the potential to identify this issue sooner. The failure to have an adequate fire barrier between independent fire zones is a violation of 10 CFR 50 Appendix "B" Criterion III, "Design Control" and is being treated as a Non-Cited Violation.

#### IV. Plant Support

##### P1 Conduct of Emergency Preparedness Activities

###### Effectiveness of Licensee Controls in Identifying, Resolving and Preventing Problems

###### a. Inspection Scope (82701)

The inspectors reviewed the licensee's corrective action systems, trending reports, and self assessments to evaluate the effectiveness of the licensee's controls in identifying, resolving and preventing problems. The evaluation included a review of action items generated as a result of the 1997 and 1998 emergency drills and the October 1997 (IR 50-352;353/97-08) and April 1998 (IR 50-352;353/98-06) actual emergency events. Also performed was an assessment of the corrective actions generated as a result of the NRC inspection findings (IR 50-352,353/97-05) for the 1997 biennial full participation graded exercise.

###### b. Observations and Findings

##### P1.1 Corrective Actions

The inspectors reviewed three corrective action item programs utilized by the EP staff: the Performance Enhancement Process (PEP), the Action Request (AR) process, and the EP internal Action Item Tracking (AIT) system. The inspectors noted that the Limerick EP group utilized the AIT system for all drill observations and findings; the Nuclear Quality Assurance (NQA) Group generated PEPs as a result of audit findings; and the corporate EP group initiated ARs that included some action items for the Limerick EP group onsite.

The Limerick EP group did not compile all the corrective action items related to EP for tracking and trending purposes. As a result, the Limerick EP group did not identify repeat items from successive years nor integrate and assess the EP related findings of the different corrective action programs. The trending performed by the Limerick EP group consisted of an annual trending report generated from the Limerick EP AIT system over a 12 month period. The following are some examples of items repeated but not tracked as repeat items: (1) Operations Support Center (OSC) Noise distraction; (2) Training deficiencies; (3) chemistry procedures used for emergency response were not updated (ERP-400 and CH-910). Individually, the repeat items identified did not prevent the implementation of the Emergency Plan (E-Plan). The licensee agreed to review its trending process in light of the deficiencies identified.

##### P1.2 Self Assessments (SAs)

The SAs were a compilation of accomplishments, on-going activities, and action items but did not fully meet the expectations of the licensee's procedure AG-CG-019, "Self-Assessment Guideline." The team observed that the SA reports for 1996 and 1997 did not evaluate the performance of the EP staff and did not

document how the Limerick EP group could improve the effectiveness of its internal program and process. Examples of this could be the effectiveness of the correction action and trending processes and the performance of the emergency response organization (ERO).

c. Conclusions

The licensee's process for identifying, resolving and preventing problems in the emergency preparedness area consisted of three systems that were not well integrated for the purpose of trending of problems. As a result, several repeat emergency preparedness performance issues occurred but were not tracked as repeat issues.

**P2 Status of EP Facilities, Equipment, and Supplies**

a. Inspection Scope (82701)

The inspectors performed an inventory of an audit of emergency equipment in the OSC, the TSC, and the Emergency Operations Facility (EOF) to assess emergency facility readiness. Also, a review of required 1996 and 1997 equipment surveillance tests records, facility inventories and communication tests were conducted for completeness and accuracy.

b. Observations and Findings

The equipment inventoried at each of the facilities was present as required by the equipment checklists. All radiological survey instruments at the facilities were calibrated as required. The inspectors reviewed equipment surveillance test records and inventory checklists and determined that they were completed as required.

The inspector noted three areas where emergency equipment or parts have been inoperable for long periods of time. Examples are: (1) the licensee has not been able to retrieve real-time radiological and meteorological data on their dose assessment models (Limerick only) located in the EOF and TSC since February 1997; (2) there were four equipment maintenance tags on the Post Accident Sampling System (PASS) panels of which three were over a year old; and (3) consistent siren failures as discussed below. Although there were alternative methods in place for working around these equipment problems, the inspectors questioned the priority given to the emergency equipment repairs.

The inspectors reviewed the monthly offsite siren operability test records and found that an acceptable percent of all sirens tested within the Limerick emergency planning zone, were found to be operable. However, when trending the locations of the failed sirens in the past year, the inspectors found that of the 51 that failed, 27 of them failed for at least two or more consecutive months. In fact, two sirens were inoperable for five months consecutively. The licensee was aware of the repetitive nature of these failures and stated that they were due to meteorological conditions or the maintenance vendor not being able to locate the problem. Also,



the inspector determined that if the sirens were to fail during a real emergency, the licensee had other contingencies in place for advising the public living within those areas. For further review, the inspectors referred this issue to the Federal Emergency Management Agency, (FEMA) who is responsible for assessing the adequacy of "offsite" emergency preparedness.

c. Conclusions

Facilities related to emergency preparedness were in a state of operational readiness and surveillance tests and equipment inventories were performed as required. However, the inspector noted instances where emergency equipment remained degraded for long periods of time necessitating reliance on compensatory measures. The information regarding repeated failures of offsite sirens was referred to FEMA on July 16, 1998.

**P3 EP Procedures and Documentation**

a. Inspection Scope (82701)

The inspectors assessed the process used to review and change the common (Peach Bottom/Limerick) PECO Nuclear E-Plan and Limerick's emergency response procedures (ERPs). The assessment included recent ERP/E-Plan changes to assess the impact on the effectiveness of the EP program and to verify that appropriate letters of agreement were in place with offsite emergency agencies.

b. Observations and Findings

The inspectors assessed the 10 CFR 50.54(q) review (effectiveness review) process for E-Plan changes and the annual E-Plan review process performed by the licensee. Based upon the licensee's determination that the changes do not decrease the overall effectiveness of the E-Plan, no NRC approval is required, in accordance with 10 CFR 50.54(q). The inspectors had conducted an in-office review of recent ERP/E-Plan changes and found them to be in accordance with 10 CFR 50.54(q) requirements. A list of the changes reviewed by the NRC is included as Attachment 2 to this report.

The inspectors verified that agreement letters with offsite agencies and support organizations were valid and updated as required per the E-Plan. The licensee continues to meet quarterly with offsite agencies and the recent changes to the licensee's Emergency Action Level (EAL) scheme were coordinated with state and local officials prior to their submittal to the NRC for approval. If revisions are required to the proposed EAL scheme, the licensee stated they would continue to meet with the offsite agencies for concurrence. Also, the licensee is in the process of facilitating discussions with offsite agencies regarding their responsibility and general oversight of maintaining their local E-Plans.

c. Conclusions

Based upon the review of recent licensee changes, the E-Plan changes were adequately reviewed in accordance with 10 CFR 10.54(q). The letters of agreement with offsite agencies were in place and the licensee's offsite program with the states and counties continue to be a strength in their emergency preparedness program.

**P5 Staff Training and Qualification in EP**

a. Inspection Scope (82701)

The inspectors reviewed EP training records, training procedures, and the E-Plan's training requirements to evaluate the licensee's ERO training program.

b. Observations and Findings

The inspectors determined through a review of training lesson plans, training record reviews, and discussions with ERO members, that the required EP training was being conducted in accordance with the licensee's E-Plan and applicable procedures. The inspectors selected the training records of the ERO staff responding to the October 1997 and April 1998 emergency events and found their qualifications were current. Also, a training session regarding the operation of the OSC was observed and found to be thorough and met the lesson plan objectives.

The inspectors verified that the required for medical, radiation monitoring, and fire drills were being conducted as required.

c. Conclusion

The licensee conducted emergency response training and drills as required. The inspectors concluded that training for the ERO was effectively implemented.

**P7 Quality Assurance in EP Activities**

a. Inspection Scope (82701)

The inspectors reviewed Audit Reports No. A1108274 and A0967117, of the PECO Nuclear EP Program, conducted in 1996 and 1997, respectively. The inspectors also reviewed audit plans, checklists and interviewed personnel from the NQA Department regarding the process for conducting a program audit.

b. Observations and Findings

NQA's annual review assessed both the Peach Bottom and Limerick onsite EP programs and the offsite corporate program. The inspectors determined through document reviews and interviews that the audit reports and checklists combined had met the requirements specified in 10 CFR 50.54(t). However, due to the lack

of detail in the audit reports, the inspectors needed to conduct interviews in order to determine the bases for the reports' conclusions.

The inspectors noted that the 1996 and 1997 audit reports were the same with minor modifications and contained several identical paragraphs to describe the NQA's conclusions.

The checklists had repeat findings that weren't mentioned in the final report or entered in the corrective action system. For example, both the 1996 and 1997 checklists discussed that the licensee's EAL scheme tended to be subjective with the potential for different interpretations of the EALs. Neither finding was captured in the final report nor assigned a corrective action number for follow up. During the Peach Bottom 1996 biennial exercise, (NRC IR 50-277;278/96-12) and the Limerick, 1997 emergency exercise (NRC IR 50-352;353/97-05), the NRC identified that the licensee took excessive time in notifying their ERO under emergency conditions. The NQA checklists also reflected these findings in both the 1996 and 1997 audit reports. Further, this issue became an NRC concern during the October 1997 diesel generator failure event (NRC IR 50-352;353/97-08). The checklists referred to this repeated finding; however, the reports did not mention the issue and no follow up was assigned.

The checklists were compliance-oriented and contained several suggestions for improvement that were made by a member of the audit team with EP experience. However, those recommended improvements were not captured or in the formal report.

The inspectors verified that offsite officials were sent copies of the audit report section pertaining to the licensee's interface with offsite agencies and that the reports were distributed to the appropriate licensee management.

c. Conclusions

The 1996 and 1997 audit reports of emergency preparedness met the specific requirements of 10 CFR 50.54(t). However, the audit reports did not contain sufficient detail describing the bases for their conclusions, program assessments were redundant from year to year, repeat items were not properly tracked, and checklist recommendations and areas for improvement were not discussed.

**P8 Miscellaneous EP Issues**

**P8.1 Post Accident Sampling System (PASS)**

a. Scope

The inspectors reviewed the licensee's PASS procedures and drill records to determine if the licensee met its E-plan commitment. Also, the chemistry staff collected a containment air sample and reactor coolant sample for ensuring the operability of the PASS system.



b. Observations and Findings

The inspectors reviewed the PASS chemistry procedure and found it to be comprehensive and detailed. The Chemistry department maintains operation of the PASS and the required quarterly surveillance tests were performed. The licensee is required by its E-Plan to request, acquire, analyze and provide PASS sample results within a three hour time limit. The inspectors verified through records that a sample was actually collected during the last annual emergency exercise and met the time limit requirements. During this inspection, two chemistry technicians collected reactor coolant and containment atmosphere samples and demonstrated operability of the system. The technicians were efficient, followed procedures and successfully collected the samples meeting the three hour time requirements.

c. Conclusion

The PASS was determined to be operable and technicians demonstrated very good use of the system when acquiring actual samples.

**F8 Miscellaneous Plant Support Issues (90712)**

- F8.1 (Closed) VIO 50-352, 353/97-50-01012 and 97-115-01022 Deliberate Falsification of Required Plant Records. These two violations involved the falsification of one required chemistry sample and several fire protection surveillances. The inspector verified that the corrective actions described in the licensee's response letter, dated September 4, 1997, were reasonable and complete. Although the licensee's investigation found that the instances cited were isolated examples and not reflective of a more wide spread cultural problem, the corrective actions included a number of activities to re-emphasize the PECO standards for truthfulness and integrity with employees. No similar problems were identified.

**V. Management Meetings**

**X1 Exit Meeting Summary**

The inspector presented the inspection results to members of plant management at the conclusion of the inspection on September 8, 1998. The plant manager acknowledged the inspectors' findings. The inspectors asked whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

## ATTACHMENT 1

### PARTIAL LIST OF PERSONS CONTACTED

#### Licensee

M. Karney, Limerick's Nuclear Security and Emergency Preparedness Manager  
R. Kinard, Corporate Emergency Preparedness Manager  
A. S. Macainsh, Manager Support Services  
J. B. Cotton, Vice President

### INSPECTION PROCEDURES USED

IP 37551: Onsite Engineering  
IP 61726: Surveillance Observation  
IP 62707: Maintenance Observation  
IP 71707: Plant Operations  
IP 71750: Plant Support Activities  
IP 82701: Operational Status of the Emergency Preparedness Program  
IP 90712: In-office Review of Written Reports  
IP 92902: Followup - Maintenance  
IP 92903: Followup - Engineering

### ITEMS OPENED, CLOSED, AND DISCUSSED

#### Opened/Closed

NCV 50-352, 353/98-07-01 Failure to Perform Two Surveillance Tests Related to the Reactor Coolant Recirculation System. (Section M8.2)  
NCV 50-352, 353/98-07-02 Missing Fire Dampers. (Section E8.6)

#### Closed

VIO 50-352, 353/97-50-01012 & VIO 50-352, 353/97-115-01022 Two instances involving deliberate falsification of required plant records, one involving a chemistry sample and the other associated with fire protection surveillances. (Section F8.1)  
IFI 50-352;353/98-02-02 Shutdown Cooling (SDC) Suction Valve Failure to Re-Open. (Section E8.5)  
LER 50-352/1-98-003 ESF Actuation Due to Incidental Contact with Reactor Vessel Instrument Rack. (Section O8.1)  
LER 50-352/1-98-001 ESF Actuation, HPCI Initiation, During Troubleshooting Equipment Restoration. (Section M8.1)

LER 50-352/1-98-010	Failure to Perform Two Surveillance Tests Related to the Reactor Coolant Recirculation System. (Section M8.2)
LER 50-352/1-98-012	HPCI System Inoperable Due to Clogged Exhaust Drain Pot Flow Orifice. (Section M8.3)
LER 50-352/1-98-011	Inoperable residual heat removal system as a result of faulty intermittent minimum flow valve actuation. (Section E8.1)
LER 50-353/2-98-002	Inadvertent initiation of the SLC system and injection of sodium pentaborate into the reactor vessel as a result of an electromagnetic interference induced signal into the SLC system's automatic actuation circuits. (Section E8.2)
LERs 50-352, 353/1-97-013 & 1-97-013 rev. 1	Inadequate testing of primary containment isolation valves. (Section E8.3)
LER 50-352/1-97-011 rev. 1	Inoperable high pressure coolant injection turbine exhaust valve as a result of internal mechanical damage. (Section E8.4)
LER 50-352, 353/1-98-004	Missing Fire Dampers. (Section E8.6)

Discussed

None



## LIST OF ACRONYMS USED

AGAF	APRM Gain Adjustment Factor
AIT	Action Item Tracking
APRM	Average Power Range Monitor
AR	Action Request
CFR	Code of Federal Regulations
EAL	Emergency Action Level
EHC	Electro-Hydraulic Control
EOF	Emergency Operations Facility
EP	Emergency Preparedness
E-Plan	Emergency Plan
ERO	Emergency Response Organization
ESF	Engineered Safety Feature
FEMA	Federal Emergency Management Agency
HPCI	High Pressure Coolant Injection
IFI	Inspection Follow-up Item
IR	Inspection Report
LER	Licensee Event Report
LPRM	Low Power Range Monitor
NCV	Non-Cited Violation
NQA	Nuclear Quality Assurance
NRC	Nuclear Regulatory Commission
OSC	Operations Support Center
PASS	Post Accident Sampling System
PECO	PECO Energy
PEP	Performance Enhancement Process
RCRS	Reactor Coolant Recirculation System
RECW	Reactor Enclosure Cooling Water
SA	Self Assessments
SDC	Shutdown Cooling
SLC	Standby Liquid Control
STC	Surveillance Test Coordinator
TCF	Troubleshooting Control Form
TSC	Technical Support Center
VIO	Violation

**ATTACHMENT 2  
E-PLAN AND ERP CHANGES**

Document No.	Title of Document	Revision No.
ERP-C-1900 (PB/LIM)	Recovery Phase Implementation	2
ERP-101 (PB)	Classification of Emergencies	20
ERP-200 (PB)	Emergency Director	14
ERP-C-1300-9 (PB/LIM)	EOF Dose Assessment Team Leader	1
ERP-110, App. 1 (PB)	Emergency Notifications	10
ERP-130 (PB)	Site Evacuation	13
ERP-230 (PB)	OSC Activation	15
ERP-800 (PB)	OSC Director	5
ERP-810 (PB)	Maintenance Team	9
ERP-C-1200 (PB/LIM)	Emergency Response Manager	7
ERP-C-1250 (PB/LIM)	Emergency Preparedness Coordinator/EOF	2
ERP-C-1500 (PB/LIM)	Logistics Support Team	5
ERP-C-1900 (PB/LIM)	Recovery Phase Implementation	3
ERP-C-1900-2,3,4	Recovery Acceptance Checklist	2
ERO-301 (PB)	Dose Assessment Coordinator	2
ERP-410 (PB)	Chemistry Sampling & Analysis Group	9
ERP-110, App 1 (PB)	Emergency Notifications	49
ERP-110 (LIM)	Emergency Notifications	24
ERP-140 (LIM)	Staffing Augmentation	9
ERP-200 (LIM)	Emergency Director Response	10
Full set of ERPs (PB)	Emergency Response Procedures	
ERP-101 (LIM)	Classification of Emergencies	9
ERP-200 (LIM)	Emergency Director Response	11
ERP-206 (PB)	Support Services Group	6
ERP-600 (LIM)	Health Physics Team	12
ERP-140 (PB)	ERO Callout	16

Document No.	Title of Document	Revision No.
ERP-140, App. 2 (PB)	Aspen Emergency Message	21
ERP-140, App. 2 (PB)	Aspen Emergency Message	22
ERP-C-1000 (PB/LIM)	EOF Activation/Deactivation	4
ERP-C-1000-2	EOF Deactivation Checklist	2