

December 10, 1999

EA 99-298

Mr. G. Rainey, President  
PECO Nuclear  
Nuclear Group Headquarters  
Correspondence Control Desk  
P. O. Box 195  
Wayne, PA 19087-0195

SUBJECT: NRC INTEGRATED INSPECTION REPORT 50-352/99-08, 50-353/99-08

Dear Mr. Rainey:

On November 8, 1999, the NRC completed an inspection at your Limerick Generating Station, Units 1 and 2. Resident inspectors reviewed routine activities and regional inspectors reviewed the licensed operator requalification training program, the radiological control program, and the radioactive liquid and gaseous effluent control program. The enclosed report presents the results of this inspection.

In general, your staff continued to support safe operation of both units. Your staff performed well and responded promptly to a bomb threat. The licensed operator requalification, the radiation protection, and the radioactive liquid and gaseous effluent control programs were effectively implemented and maintained in accordance with regulatory requirements.

This inspection concluded our review of your staff's actions taken regarding your identification of a missed safety evaluation for a temporary change and, as a result, inappropriately defeating the reactor water cleanup leak detection system isolation function. Although your staff's actions were appropriate, your staff did not initially recognize the significance of the issue. In particular, we noted that your organization did not question the effect on safety when the reactor water cleanup isolation function was removed from service when it was required. Our review resulted in the violations that are discussed below.

Based on the results of this inspection, the NRC determined that three violations of NRC requirements occurred. These violations were treated as a Non-Cited Violation (NCV), consistent with Appendix C of the Enforcement Policy. The NCVs involved the failure to perform a safety analysis for a procedure revision that led to implementation of an activity involving an unreviewed safety question; the failure to restore the RWCU isolation logic within the allowed outage time when the RWCU isolation logic was required to be operable; and inadequate monitoring and recording of offsite noble gas releases, and are described in the subject inspection report. If you contest the violation or severity level of the(se) NCV(s), you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington, D.C. 20555-0001, with a copy to the Regional Administrator, Region I, and the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, D.C. 20555-0001, and the NRC Resident at the Limerick Generating Station.

Mr. G. Rainey

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In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, its enclosure(s), and your response will be placed in the NRC Public Document Room (PDR).

A reply to this letter is not required, but should you have any questions regarding this please contact me at 610-337-5322.

Sincerely,

**Original Signed By:**

Curtis J. Cowgill, Chief  
Project Branch 4  
Division of Reactor Projects

Docket Nos.: 50-352, 50-353  
License Nos: NPF-39, NPF-85

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NRC Inspection Report 50-352/99-08, 50-353/99-08

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Mr. G. Rainey

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EXECUTIVE SUMMARY  
Limerick Generating Station, Units 1 & 2  
NRC Inspection Report 50-352/99-08, 50-353/99-08

This integrated inspection included aspects of PECO Energy operations, engineering, maintenance, and plant support. The report covers a six-week period of resident inspection and region-based inspection in the Licensed Operator Requalification Training (LORT) program, the radiological control program and the radioactive liquid and a gaseous effluent control program.

Operations

- PECO's staff appropriately classified and responded to the Unusual Event due to a bomb threat within the site boundary. (Section O1.2)
- The Operations staff generally implemented operating procedures well. Nonetheless, some procedure implementation and adherence issues occurred and were being addressed by plant management. (Section O3.1)
- The LORT program met regulatory requirements and effectively trained and evaluated licensed operators. (Section O5.1)

Engineering

- The failure to have a record of a written safety evaluation for a procedure revision involving an unreviewed safety question, which ultimately led to the inappropriate bypass of RWCU isolation logic on three occasions, was a violation of 10 CFR 50.59 requirements. This failure was determined to be severity level IV violation based on low risk and is being treated as a Non-Cited Violation consistent with Section VII.B.1 of the enforcement policy. (Section E8.1)
- The failure to restore the RWCU isolation logic within the allowed outage time when the RWCU isolation logic was required to be operable, was a violation of Technical Specification 3.3.2. This was a severity level IV violation based on low risk and is being treated as a Non-Cited Violation consistent with Section VII.B.1 of the enforcement policy. (Section E8.1)

Although, PECO's identification, overall investigation, and final corrective actions for the inappropriate use of jumpers to bypass the RWCU leak detection system logic were appropriate, PECO did not initially recognize the significance of this issue. Subsequent PECO analysis and corrective actions were appropriate. )))))))))))

Plant Support

- PECO has effectively controlled external dose to the station staff. Some contributing factors include low plant dose rates and short refueling outages. Plant radiological postings and high radiation area controls have been implemented effectively. Lowering

## Executive Summary (cont'd)

of electronic dosimeter alarm thresholds has enhanced the ability to control individual exposures. (Section R1.2)

- Internal exposures for 1998 and 1999 have been minimal with all internal exposures well below reporting requirements. Emergency control room and fire brigade response Self-Contained Breathing Apparatus (SCBA) equipment was found in good working condition and control room operators were qualified in their use. (Section R1.4)
- PECO maintained adequate radioactive liquid and gaseous effluent control programs. The Offsite Dose Calculation Manual (ODCM) contained sufficient specification and instruction to acceptably implement and maintain the radioactive liquid and gaseous effluent control programs. (Section R1.5)
- PECO maintained and implemented an adequate Radiation Monitoring System (RMS) calibration program. It was noted that PECO had improved the calibration methodology for the radioactive liquid effluent radiation monitors. (Section R2.1)
- PECO maintained and implemented an effective routine surveillance test program for effluent air cleaning systems. (Section R2.2)
- The failure of the RM-21 computer system to capture and to store the noble gas monitored data from the south and north stack radiation monitoring systems was a violation of Section 6.10.3.(d) of the Plant Technical Specifications. Section 6.10.3.(d) of the Technical Specification states "records of gaseous and liquid radioactive material released to the environs will be retained for the duration of the unit operating license." PECO promptly initiated corrective actions and there was no significant public dose or environmental impact. This violation was being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the enforcement policy. This is PEP 10010341 in PECO's corrective action system. (Section R3.1)
- The quality assurance (QA) oversight of the Radiation Protection (RP) program was effective. RP self-assessments were comprehensive in scope and provided an overall view of RP program strengths and weaknesses. The corrective action program provided for effective identification and resolution of RP issues. (Section R7.1)
- PECO's QA Surveillance Audit program for effluent control was effectively implemented. PECO's Quality Control (QC) program for radioactive liquid and gaseous effluent control to validate analytical results was effective. (Section R7.2)
- There was no impact to the public health and safety or to the environment due to a transfer, on September 18, 1999, of 6,500 gallons of holding pond water to the Pottstown Waste Water Treatment Plant prior to being sampled by PECO. (Section R8)

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## Report Details

### Summary of Plant Status

Unit 1 began this inspection period operating at 100%. The unit operated at full power throughout the inspection period except for minor power reductions for testing and the following plant events.

- October 8 Operators reduced reactor power to 60% per general procedure (GP)-5, "Power Operations," to perform a deep/shallow control rod exchange and scram-time testing. Operators returned Unit 1 to 100% power on October 10.
- November 2 Operators reduced reactor power to 60% due to inadequate cooling tower make-up capability. Severe storm conditions caused debris to accumulate at the pump suction resulting in degraded pump performance. The unit was restored to full power output on November 4.

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

- October 1 Operators reduced reactor power to 60% per general procedure (GP)-5, "Power Operations," to perform planned maintenance. PECO performed scram time tests of 19 control rods, made a control rod pattern adjustment, repaired a casing drain leak on the 2B reactor feed pump, and cleaned the intermediate and low pressure condenser water boxes. Operators returned Unit 2 to 100% power on October 3.
- October 19 - 21 Operators removed the main turbine-generator from service to repair a stator water cooling leak that developed at the neutral phase bushing of the main generator. The operators reduced reactor power to 19% to remove the generator from service and maintained reactor power at about 20% throughout the outage.
- October 27 - 28 Operators removed the main turbine-generator from service to repair a hydrogen leak issuing from a man-way cover on the main generator. The operators reduced reactor power to 19% to remove the generator from service and maintained reactor power at about 20% throughout the outage.
- November 2 Operators reduced reactor power to 90% due to a lowering vacuum condition and inadequate cooling tower make-up capability. Severe storm conditions caused debris to accumulate at the pump sections resulting in degraded pump performance. The unit was restored to full power output on November 3.

## I. Operations

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

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

PECO Energy (PECO) conducted at power activities at Limerick Units 1 and 2 safely. Routine operations, surveillance, and other plant-related activities were performed as per station procedures, in a deliberate manner with clear communications, and with effective oversight by shift supervision. Control Room logs accurately reflected plant activities and shift turnovers were comprehensive. Operators implemented effective controls for work activities using conservative decision making.

#### O1.2 Unusual Event Declared at Limerick

##### a. Inspection Scope (93702)

The inspector responded to an Unusual Event declared at the Limerick Generating Station. The inspectors observed the activities performed by plant staff and assessed the status of the facility.

##### b. Observations and Findings

On October 28, 1999, at 3:35 a.m., shift management declared an Unusual Event after receiving a bomb threat that was relayed from the Montgomery County 911 dispatcher. The bomb threat had been received by the Montgomery County 911 dispatcher at approximately 2:43 a.m. Personnel from the Federal Bureau of Investigation and local law enforcement agencies responded to the site and assisted PECO in investigation and resolution activities. No bombs were found.

The NRC Operations Center was notified at 3:45 a.m., and the NRC began a number of response actions. By 5:25 a.m., NRC Region I activated its Incident Response Center and entered the monitoring phase of operation. NRC Regional security specialists and the resident inspector responded to the site and closely followed activities. PECO terminated the Unusual Event at 11:24 a.m.

The inspectors determined that PECO's notification of the event was timely. Management's actions to restrict access to the site and begin search activities with the local law enforcement organizations were appropriate. During the event Unit 1 remained operating at 100% power. Operators maintained Unit 2 between 21% and 28% power, having just synchronized the main generator to the grid prior to the event.

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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.

c. Conclusions

PECO's staff appropriately classified and responded to the Unusual Event due to a bomb threat within the site boundary.

**O2 Operational Status of Facilities and Equipment**

O2.1 Facility Tours (71707)

The inspectors routinely conducted independent plant tours and walkdowns of selected portions of safety-related systems during the inspection period. These activities consisted of the verification that system configuration, power supplies, process parameters, support system availability, and current system operational statuses were consistent with Technical Specification (TS) requirements and Updated Final Safety Analysis Report (UFSAR) descriptions. System operability and material conditions were noted to be acceptable in all cases. The inspectors did not identify any substantive concerns or deficiencies as a result of these walkdowns.

**O3 Operations Procedures and Documentation**

O3.1 Operator Use of Procedures

a. Inspection Scope (71707)

The inspector observed the operations staff's use of operating procedures during power ascension and other routine activities at both units. The inspector assessed operator adherence to the procedure and use of peer-check while performing the procedure.

b. Observations and Findings

On October 28, 1999, during Unit 2 power ascension activities, the inspector observed good procedure use and peer-checking by the operations staff. The operators appropriately adhered to procedures while placing the reactor feed pump (RFP) and feedwater heater in-service, and resetting the recirculation pump motor-generator scoop tube and run-back circuit.

On November 3, 1999, the inspector identified that operators inappropriately responded to a main steam line (MSL) high radiation alarm in the control room. The annunciator alarmed intermittently (every five to ten minutes) over an extended period of time. After about five and one-half hours the operators reduced reactor power to 95% to maintain the annunciator extinguished. PECO subsequently determined that the high radiation condition was caused by unanticipated changes in reactor coolant chemistry as a result of a reactor water cleanup outage.

The operators did not initially take the action of the off normal (ON) procedure because only one MSL radiation monitor was alarming, which they initially suspected to be an alarm set point problem, and they did not recognize the upward trend on the other channels. This condition was also an entry condition into their emergency operating

TRIP procedures. The inspector also noted that the operators did not know the specific set points for the MSL radiation monitors. Since the operators did not routinely log or trend the MSL parameters or have an alternative means to readily verify the normal value and alarm set point, the operators were not able to promptly determine if the alarm was indicative of a degraded plant condition or a result of an instrumentation problem. Poor communications between Operations and Chemistry further delayed appropriate procedure implementation.

In discussion with the inspectors, plant management stated the delay in taking the actions in the ON did not meet their expectations. As part of the requalification training cycle beginning in December, PECO had planned to emphasize procedure use. In addition PECO placed an operator aide near the MSL radiation monitors indicating the normal background and alarm set point values. An evaluation was added to PEP I0010455 to address the operator performance issues.

On November 3, 1999, the inspector observed the recovery of the Unit 1 "A" reactor feed pump following a trip. The inspector identified that the operator, with shift supervision approval, skipped several steps in the applicable procedure (S6.1.A) when they found that the procedure did not match plant conditions and did not process a temporary change to the procedure as required. Specifically, several drain valves were not repositioned as directed by the procedure. The Operations staff initiated PEP I0010457 to address the procedural adherence and adequacy issues. The inspector determined that the failure to correctly implement or temporarily change to the reactor feedwater pump startup procedure is a minor violation of technical specification 6.8.1 and is not subject to formal enforcement.

c. Conclusions

The Operations staff generally implemented operating procedures well. Nonetheless, on two, occasions the inspectors noted that operators did not appropriately implement station procedures.

## **O5 Operator Training and Qualification**

### **O5.1 Licensed Operator Requalification Training Program Evaluation**

a. Inspection Scope (71001)

The inspectors evaluated the Limerick Licensed Operator Requalification Training (LORT) program using Inspection Procedure (IP) 71001, during the week of October 18, 1999. The following areas were evaluated: LORT program content; written and operating test content; operating test administration; training feedback program effectiveness; remedial training; and conformance with license conditions.

b. Observations and Findings

(1) LORT Program Content

The inspectors reviewed the subjects covered in the two-year LORT cycle, and verified that the facility trained on a variety of plant and industry events. The licensee was effectively incorporating appropriate topics in their LORT program. Operator interviews indicated that the operators were getting the training required for them to do their jobs.

The inspectors reviewed LORT materials to determine if significant human errors identified in the Probability and Risk Assessment (PRA) were addressed. Training on eight of the ten significant human errors identified in the PRA was specifically incorporated into the LORT program. The facility did not consider it necessary to train on "failure to open the Residual Heat Removal Service Water (RHRSW) maintenance valve" because this valve would only be closed by a special test procedure subject to "just-in-time" training. The human error associated with disabling Automatic Depressurization System (ADS) during maintenance was being pursued by the training staff. The inspectors concluded that PRA insights were incorporated overall into the LORT program.

These reviews and discussions indicated that the LORT program was effective.

(2) Written and Operating Test Content and Administration

The inspectors reviewed a sample of biennial written exams for 1997 and annual operating tests for 1998 and 1999. The annual operating tests for the week of October 18, 1999 were reviewed in detail using the checklists in the examiner standards. The inspectors determined that the licensee followed the guidance in the NRC examination standards (NUREG 1021). The exams discriminated between operators with adequate knowledge and abilities from those who did not.

Performance standards were clearly defined, objective and relevant. The inspectors found that the operators understood the performance standards. The inspectors noted that the simulator performance evaluation form provided excellent guidance for evaluating operators.

Four simulator scenarios and a number of Job Performance Measures (JPM) were observed being administered to an operating crew. Crew behavior in the simulator was noted to be the same as in the control room. Crew performance on the simulator was adequate and all operators passed the simulator exam. The inspectors assessed the effectiveness of the facility in conducting and evaluating test performance. The facility provided thorough objective assessments.

(3) Remediation

The inspectors reviewed the remedial training records for three biennial written exam failures in 1997, simulator failures in 1998 and 1999, and a JPM exam failure in 1999. Evaluation and remediation of the identified deficiencies were in accordance with facility procedures and appropriate. Retake written exams were reviewed and no overlap with the failed exam was noted. No weaknesses were identified in the remediation process.

(4) Training Feedback

The training feedback process was found to be effective in capturing operator concerns and providing timely resolution. This finding was based upon operator and instructor interviews as well as review of training records associated with feedback.

(5) Compliance with License Conditions

A review of records and discussions with licensee personnel found that the licensee was meeting the requirements of:

10 CFR 55.53 for maintaining active operator licenses,  
10 CFR 55.49 for operator participation in the LORT program, and  
10 CFR 55.21 for biennial medical exams

No problems were found.

c. Conclusions

The LORT program met regulatory requirements and effectively trained and evaluated licensed operators.

**O8 Miscellaneous Operations Issues (90712)**

O8.1 (Closed) LER 1-99-011:

PECO's notification to the NRC for the declaration of an Unusual Event due to the detection of toxic gas within the site boundary. This event was discussed in Inspection Report 50-352, 353/99-07. No violations or new issues were revealed by the Licensee Event Report (LER).

## 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, 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 activity:

- Unit 2, Stator Cooling Water System Leak Repair (2M24) - October 18 - 20;
- Unit 2, SP-203, Main Generator Stator Cooling Chemical Cleaning - October 22;
- Unit 2, Main Generator Hydrogen Leak Repair (2F25) - October 27-28;
- Unit 1, M-C-700-261, Votes Testing HV-055-126, Suppression Pool Instrument Primary Containment Isolation Valve - November 1;

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. 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, test instrumentation was properly calibrated and used, technical specifications were satisfied, testing was performed by knowledgeable personnel, and test results either satisfied the acceptance criteria or were properly dispositioned.

The inspectors observed portions of the following surveillance activity:

- RT-6-020-875-0, Fuel Oil Inventory and Usage - September 30;
- ST-6-052-232-2, 2B Core Spray Loop Pump, Valve and Flow - November 1;

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. Supervisor oversight was good.

### III. Engineering

#### E8 Miscellaneous Engineering Issues (92902)

##### E8.1 (Closed) Apparent Violations EEI 353/99-07-02 &03: Bypass of the Reactor Water Cleanup (RWCU) Leak Detection System Isolation Logic

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

In inspection report 50-352,353/99-07 two apparent violations were identified. In the first apparent violation PECO did not perform an adequate review of a change that implemented bypassing of the RWCU leakage detection system isolation logic. In the second apparent violation the RWCU leakage detection system isolation logic was bypassed longer than the technical specification allowed outage time. The inspection report indicated that these violations would be processed after further NRC inspection and review of PECO's root cause and corrective actions.

###### b. Observations and Findings

PECO did not perform the requisite 10 CFR 50.59 review to determine if temporarily bypassing the RWCU leak detection system while placing the RWCU in-service involved an unreviewed safety question (USQ). Specifically, with the RWCU leak detection system isolation logic bypassed, the automatic detection and isolation would not occur for a postulated high energy line break in the RWCU system. With reliance only on manual detection and isolation, the potential existed that offsite radiological release dose consequences for a pipe break in the RWCU system could exceed that allowed for a main steam line break outside containment as described in UFSAR, chapter 15.6.4. Consequently, temporarily defeating the LDS function involved a USQ.

The inspector determined that ultimately PECO's root cause and corrective actions were thorough, although PECO's initial corrective actions were narrowly focused. PECO's identification that they did not adequately review the change was a good finding. NRC inspectors reviewed the initial PEP and questioned the comprehensiveness of the initial review. The NRC questions included the apparent organizational acceptance of removal of this safety equipment from service because it was only to be removed from service within the technical specification allowed outage time. PECO acknowledged the NRC concerns and began a more comprehensive review and then took actions which were generally thorough. After PECO completed their evaluation of the event, the inspector identified some items that PECO did not. The inspector identified problems with use of the troubleshooting repair and test (TRT) process when PECO documented the jumper installation and removal, inadequate LCO entries, and the use of an informal mechanism to stop the practice of defeating the RWCU leak detection system isolation logic. Overall, the inspector determined that PECO's corrective actions for the inadequate 10 CFR 50.59 review were appropriate.

The NRC's independent risk assessment determined that the increase in core damage risk associated with bypassing the RWCU leak detection system was negligible.



The NRC concluded that two violations occurred:

10 CFR 50.59 (b)(1) requires, in part, records for changes to the facility as described in safety analysis report must include a written safety evaluation which provides the basis for the determination that the change to the facility does not involve an unreviewed safety question. Contrary to the above, PECO changed the facility as described in UFSAR Section 7.6.1.3.3.4 on July 23, 1998, September 17, 1998 and September 28, 2998, to temporarily install electrical jumpers to bypass the reactor water cleanup system leak detection system isolation functions during reactor water cleanup system startup and did not have a written safety evaluation to determine if this temporary change involved an unreviewed safety question. This violation of 10 CFR 50.59 is a severity level IV violation based on the low risk. This violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the enforcement policy. **(NCV 50-353/99-08-01)**

Technical Specification 3.3.2 requires, in part in Operational Condition 1, the closing of reactor water cleanup system isolation valves within 1 hour if the number of operable reactor water cleanup isolation instrumentation channels is less than required. Contrary to the above on July 23, 1998, when no required reactor water cleanup isolation instrument channels for system flow and area temperature were operable, PECO did not close the reactor water cleanup isolation valves within one hour. This failure to comply with TS 3.3.2. is a severity level IV violation based on low risk. This violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the enforcement policy. **(NCV 50-353/99-08-02)**

c. Conclusions

The failure to have a record of a written safety evaluation for a procedure revision involving an unreviewed safety question, which ultimately led to the inappropriate bypass of RWCU isolation logic on three occasions, was a violation of 10 CFR 50.59 requirements. This failure was determined to be severity level IV violation based on low risk and is being treated as a Non-Cited Violation consistent with Section VII.B.1 of the enforcement policy.

The failure to restore the RWCU isolation logic within the allowed outage time when the RWCU isolation logic was required to be operable, was a violation of Technical Specification 3.3.2. This was a severity level IV violation based on low risk and is being treated as a Non-Cited Violation consistent with Section VII.B.1 of the enforcement policy.

Although, PECO's identification, overall investigation, and final corrective actions for the inappropriate use of jumpers to bypass the RWCU leak detection system logic were appropriate, PECO did not initially recognize the significance of this issue which delayed comprehensive review of the problem. Subsequent PECO analysis and corrective actions were appropriate.

## IV. Plant Support

### R1 Radiological Protection and Chemistry (RP&C) Controls

#### R1.1 Radiation Instrumentation

##### a. Inspection Scope (83750)

Currently in use radiation measuring instruments were randomly sampled and checked for proper performance through exposure to sources or review of recent independent performance test results.

##### b. Observations and Findings

Quarterly blind spike test results of vendor processing of personnel Thermoluminescent Dosimeter (TLD) indicated acceptable results through the third quarter of 1999. Selected electronic dosimeters appropriately alarmed when exposed to a calibrated source strength. Several contamination monitoring instruments that were in current use for the release of personnel and equipment from the plant were tested with a low level source and each instrument alarmed as required. Selected radiation survey instruments were tested in a source calibrator and each provided correct readings. All of the radiation and contamination monitoring instruments selected were affixed with current calibration stickers and daily response check stickers indicating that annual calibrations and daily response checks had been performed. The Canberra Accuscan investigative whole body counter performance was also reviewed. A two-radio nuclide source was counted and analyzed, correctly identifying and quantifying the activity. Quality control counts had been routinely performed, demonstrating counter availability.

##### c. Conclusions

Radiation protection instrumentations demonstrated accurate measurement results and were properly maintained.

#### R1.2 External Exposure

##### a. Inspection Scope (83750)

The 1998 ALARA Exposure Report, the Unit 2 Fifth Refueling Outage Report, and 1999 Station ALARA Council Meeting Minutes were reviewed. Interviews with radiological engineering staff were performed. Tours of the plant were also conducted to review postings and high radiation area controls.

b. Observations and Findings

The two-year rolling average collective exposure at Limerick through 1998 was 145.9 person-rem. During 1999, the Spring Unit 2 outage resulted in 143 person-rem as compared to a goal of 200 person-rem. The 1999 exposure goal of 340 person-rem has been reduced to 280 person-rem due to better than expected outage performance. One of the reasons for lower exposures for the outage was lower than expected drywell dose rates. Unit 2 source term measurements (average recirculation piping contact dose rates) were 107.5 mrem/hr which is low. This has been attributed to the effects of depleted zinc injection in replacing cobalt in the reactor water and good water chemistry controls. Also, refueling outages have been short, averaging 35 days in duration over the last four years.

All high radiation areas were found to be properly barricaded or locked and plant postings and contamination controls were effectively implemented. Radiological engineering has reviewed Radiation Work Permit (RWP) individual exposure entry data and survey data from 1998 and lowered the RWP-specific electronic dosimetry alarm set points from an average of 116 mrem to 72 mrem. The lowering of electronic dosimeter alarm thresholds enhances the ability to control individual exposures to lower levels.

c. Conclusions

PECO has effectively controlled external dose to the station staff. Some contributing factors include low plant dose rates and short refueling outages. Plant radiological postings and high radiation area controls have been implemented effectively. Lowering of electronic dosimeter alarm thresholds has enhanced the ability to control individual exposures.

R1.3 ALARA (As Low As is Reasonably Achievable)

a. Inspection Scope (83750)

The ALARA planning and status of two ongoing projects were reviewed: performance testing of new turbines utilizing Na-24 injection, and RWCU pump replacement. This consisted of a review of radiological engineering planning documents and interviews with radiological engineering staff.

b. Observations and Findings

The Na-24 injection tests involved high radiation level source material that was manually poured, mixed and injected into various turbine systems. ALARA planning included transport of the source cask, source transfer and mixing, injection and sampling. Each phase of the project was planned with sufficient detail incorporating various exposure reduction aspects. The project estimated exposure was 1.6 person-rem. The Unit 1 Na-24 tests were completed at the time of this inspection at an actual exposure of 0.427 person-rem with no contamination incidents reported.

The RWCU pump replacement project preliminary exposure estimate was 13.225 person-rem. Job planning was coordinated with ALARA well in advance of the work, resulting in the development of a shielding application and pump removal logistics. The original ALARA planning did not consider replacement of 14 feet of pipe in the RWCU Isolation Valve Room at an additional exposure of 5 person-rem. The exposure estimate oversight is not expected to result in unnecessary exposure although the final job exposure is expected to be higher than originally estimated. With one RWCU pump and associated piping removed, actual exposures have totaled 10.6 person-rem versus 11.6 person-rem estimated.

c. Conclusions

Sodium-24 turbine testing and replacement of RWCU pump work have been effectively planned and implemented with exposures minimized and properly controlled.

R1.4 Internal Exposure

a. Inspection Scope (83750)

Review of internal exposure tracking records was conducted. Tours of emergency and fire brigade SCBA storage locations, and respirator storage and respirator issue locations were conducted. Also, on-shift licensed operator SCBA qualification records were examined.

b. Observations and Findings

Internal exposure records for 1998 and 1999 indicated that individuals with internal exposures were tracked. PECO used low threshold levels and records were well below regulatory recording levels.

The control room and the north and south fire brigade SCBA storage locations were stocked as described in the UFSAR. Selected breathing air bottles and respiratory protection equipment were inspected and found in excellent working condition. A list of on-shift licensed operators was compared against their SCBA qualification records and no deficiencies were identified. The respirator issue and storage locations contained only MSHA and NIOSH approved equipment and were maintained in good condition.

c. Conclusions

Internal exposure performance for 1998 and 1999 has been very good with all internal exposures well below reporting requirements. Emergency control room and fire brigade response SCBA equipment was found in good working condition and control room operators were qualified in their use.

**R1.5 Implementation of the Radioactive Liquid and Gaseous Effluent Control Programs****a. Inspection Scope (84750-01)**

The inspector reviewed radioactive liquid and gaseous effluent release permits; selected effluent control procedures; the Offsite Dose Calculation Manual (ODCM); and overall effluent program implementation.

The inspector also toured the control room; selected radioactive gas processing facilities and equipment; and the reactor and turbine buildings to review the plant air balance.

**b. Observations and Findings**

All TS/ODCM required effluent radiation monitors were operable during this inspection. Air cleaning systems were operable at the time of the plant tour. The turbine and reactor buildings were maintained at a negative pressure.

Reviewed procedures were detailed and easy to follow, and ODCM requirements were incorporated into the appropriate procedures. Reviewed radioactive liquid and gaseous effluent release permits were complete.

The ODCM provided descriptions of the sampling and analysis programs, which were established for quantifying radioactive liquid and gaseous effluent activities, and for calculating projected doses to the public. All necessary parameters, such as effluent radiation monitor set point calculation methodologies, and site-specific dilution factors, were listed.

**c. Conclusions**

PECO maintained adequate radioactive liquid and gaseous effluent control programs. The ODCM contained sufficient specifications and instructions to acceptably implement and maintain the radioactive liquid and gaseous effluent control programs.

**R2 Status of RP&C Facilities and Equipment****R2.1 Calibration of Effluent/Process/Area/Accident Radiation Monitoring Systems (RMS), Flow Rate Measurement Devices, and Explosive Gas Monitor****a. Inspection Scope (84750-01)**

The most recent calibration results were reviewed for selected effluent and process RMS for both units.

**b. Observations and Findings**

All calibration results (RMS, flow rate measurement devices, and hydrogen monitors) were within PECO's acceptance criteria. PECO wrote new procedures to perform

calibrations for the above liquid effluent RMS. The procedures were well written and calibration results were acceptable.

c. Conclusion

PECO maintained and implemented an adequate RMS calibration program. The inspector noted that PECO had improved the calibration methodology for the radioactive liquid effluent radiation monitors.

R2.2 Air Cleaning Systems

a. Inspection Scope (84750-01)

The inspection consisted of a review of PECO's most recent surveillance testing results (visual inspection, in-place HEPA and charcoal leak tests, air capacity tests, pressure drop tests, and laboratory tests for the iodine collection efficiencies) for:

- (1) the standby gas treatment system;
- (2) the control room air cleaning system; and
- (3) the reactor enclosure air cleaning system.

b. Observations and Findings

All surveillance results were within the TS acceptance criteria. PECO had tested their charcoal using ASTM D3803-1979 and ASTM D3803-1989 methodologies in 1999 to comply the NRC Generic Letter 99-02. Testing results using both methods were within the TS acceptance criteria.

The inspector noted that the responsible PECO staff had very good knowledge in the areas of: (1) the NRC Generic Letter 99-02; (2) maintaining negative pressures; and (3) integrity of air cleaning system components.

c. Conclusions

PECO maintained and implemented an effective routine surveillance test program for effluent air cleaning systems.

**R3 RP&C Procedures and Documentation**

R3.1 Review of Annual Radioactive Effluent Reports

a. Inspection Scope (84750-01)

The inspector reviewed the 1997 and 1998 Annual Radioactive Effluent Reports to ensure PECO met TS/ODCM requirements.

b. Observations and Findings

The inspector identified that PECO did not report in the 1997 and 1998 Annual Radioactive Effluent Reports, all noble gasses released during the period. PECO quantified the noble gas releases through one north and two south stacks by a grab sample once in a month and analyzed it as required by the TS/ODCM. Analytical results of these grab samples for two years (1997 and 1998) indicated the absence of noble gases. PECO did not include release from special plant activities such as the sluicing of spent resins because the RM-21 computer did not capture and store the monitoring results from the north and south stacks RMS from 1997 until September 1999. Although this amount of release did not significantly impact either the public health or the environment, it must be quantified and added to the annual release, as required by TS/ODCM. For example, after the RM-21 computer was upgraded and made operational, during the sluicing spent resin operation on September 21, 1999, the RM-21 indicated that the south stack noble gas release changed from  $1\text{E-}7$   $\mu\text{Ci/cc}$  to  $1\text{E-}5$   $\mu\text{Ci/cc}$  for about two minutes.

Section 6.10.3.(d) of the Technical Specification stated those "records of gaseous and liquid radioactive material released to the environs shall be retained for the duration of the unit operating license." The inspector determined that the failure of the RM-21 computer system to capture and store the monitored data from the south and north stacks RMS was a violation of Section 6.10.3.(d) of the Technical Specification requirement. This violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the enforcement policy. **(NCV 50-352,353/99-08-03)**

PECO promptly initiated corrective actions (PEP I0010341) to address this violation. Corrective actions included: (1) quantifying the total amount of noble gas releases during the sluicing spent resin operations for 1997 and 1998 using an operations log; (2) quantifying its projected dose calculation for 1997 and 1998; (3) updating the 1997 and 1998 Annual Radioactive Effluent Reports; and (4) training of new responsible personnel.

c. Conclusions

The failure of the RM-21 computer system to capture and to store the noble gas monitored data from the south and north stack radiation monitoring systems was a violation of Section 6.10.3.(d) of the Plant Technical Specifications. PECO promptly initiated corrective actions and there was no significant public dose or environmental impact. This violation was being treated as a Non-Cited Violation, consistent with Section VII.B.1 of the enforcement policy. This is PEP 10010341 in PECO's corrective action system.

### R3.2 Comparison of Projected Dose Calculation Methodology

#### a. Inspection Scope (84750-01)

PECO's projected dose calculation program, including the applicable computer code, was examined to validate Limerick's capability for calculating projected doses to the public, required by the TS/ODCM. The NRC PCDOSE code was used for an independent comparison.

Projected dose comparisons for the following pathways were made:

- b. Radioactive Liquid Release Pathway;
- c. Noble Gas Release Pathway; and
- d. Radioactive Iodine Release Pathway.

#### b. Observations and Findings

The ODCM and dose projection procedures contained safety factors and site-specific data. The NRC PCDOSE code does not use safety factors. After correcting for safety factors and site specific data, the resultant projected doses for all pathways were in good agreement.

#### c. Conclusions

PECO established and maintained an acceptable means to calculate projected doses to the public as required by the TS/ODCM.

## R7 **Quality Assurance (QA) in RP&C Activities**

### R7.1 Quality Division RP Program Audit Reports

#### a. Inspection Scope (83750)

The Quality Division RP program audit reports conducted in 1998 and 1999 and the 1999 Quality Division RP surveillance reports were reviewed. Also, the 1999 RP program self-assessment-integrated report was reviewed. In addition, approximately twelve Performance Enhancement Program (PEP) radiological issues from 1999 were reviewed with respect to corrective action program performance.

#### b. Observations and Findings

The Quality Division audited the RP program over a two-year period. Both annual audits were sufficiently broad and detailed and provided effective independent oversight of the RP program. In addition, the Quality Division provided a series of RP surveillances that resulted in effective feedback on the conduct of RP activities. RP program self-assessments provided program feedback utilizing a detailed matrix of self-assessment subject areas, which were color-coded in a similar basis as the new reactor oversight



program. The RP program self-assessments were particularly valuable in gaining an overall RP program perspective.

The PEPs reviewed indicated some RP program performance issues, however, the corrective action program properly identified the issues and causes and the corrective action assignments generally involved multiple paths and addressed all identified causes.

c. Conclusions

The quality assurance oversight program was effective in independently monitoring the quality of the RP program. RP self-assessments were comprehensive in scope and provided an overall view of RP program strengths. The corrective action program provided for effective identification and resolution of RP issues.

R7.2 Quality Assurance and Quality Control

a. Inspection Scope (84750-01)

The inspector reviewed the 1998 QA audit and the implementation of the radioactivity measurement laboratory QC program.

b. Observations and Findings

The 1998 QA surveillance audits identified minor weaknesses in the area of radioactive liquid and gaseous effluent control programs. None of the findings had regulatory significance. The scope and depth of the QA surveillance audits were appropriate.

PECO's QC program for effluent control was appropriately implemented. PECO's QC program for the radioactive liquid and gaseous effluent control to validate analytical results was effective. No discrepancies were evident from QC data for inter-laboratory comparisons. The QC program consisted of measurements of blind duplicate, spike, and split samples through a vendor-supplied service. When discrepancies were found, effective resolutions were determined and implemented.

c. Conclusions

PECO QA surveillance audit program for effluent control was effectively implemented. PECO's QC program for radioactive liquid and gaseous effluent control to validate analytical results was effective.

**R8 Miscellaneous RP&C Issues****R8.1 Review of Holding Pond Water Release to the Local Waste Water Treatment Plant****a. Inspection Scope (84750-02)**

On September 18, 1999, due to mis-communications, a PECO contractor pumped out about 6,500 gallons of the holding pond water and transferred it to the Pottstown Waste Water Treatment Plant prior to PECO having sampled the water. The holding pond is designed to catch runoff from the plant, to avoid any unmonitored release.

The inspector reviewed PECO's actions regarding a potential unmonitored release. PECO tracked this event in Performance Enhancement Program (PEP) I0010270.

**b. Observations and Findings**

After the water was released to the water treatment plant, PECO was able to collect about 500 ml of the holding pond water from the contractor's truck. PECO counted the sample using 1,000 ml counting geometry. The analytical results (Lower Limits of Detection (LLDs)) were corrected to 500 ml geometry and compared to the environmental LLDs listed in Table I3.4-3 of the ODCM. Measurement results of the holding pond water indicated that all gamma emitters (Co-58, Fe-59, Co-60, Zn-65, Nb-95, Zr-95. And Cs-134) were lower than the environmental LLDs with the exception of Cs-137. The measurement result for Cs-137 was slightly higher than the LLD listed in the ODCM but within statistical fluctuations. The inspector determined that there was no impact to the public health and safety and to the environment.

PECO has enacted several immediate corrective actions, including posting and barricading the holding pond. PECO's also installed a fence around the holding pond to prevent unauthorized access.

**c. Conclusions**

There was no impact to the public health and safety or to the environment due to a transfer, on September 18, 1999, of 6,500 gallons of holding pond water to the Pottstown Waste Water Treatment Plant prior to being sampled by PECO.

**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 December 3, 1999. 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.

The inspector presented the inspection results to members of licensee management at the conclusion of the radiological control program inspection on October 7, 1999. PECO management acknowledged the findings presented.

The inspector presented the inspection results to members of licensee management at the conclusion of the radioactive liquid and gaseous effluent control program inspection on October 8, 1999. PECO management acknowledged the findings presented.

The inspector presented the inspection results to members of licensee management at the conclusion of the Licensed Operator Requalification Training program inspection on October 22, 1999. PECO management acknowledged the findings presented.

### **X3 Other NRC Activities**

On September 28, 1999, Commissioner Jeffrey S. Merrifield visited the Limerick Generation Station. During his visit, the Commissioner met with senior plant management, toured the plant, and observed portions of the Operational Safeguards Readiness Evaluation being conducted by the NRC staff that week. The Commissioner also met with Corban McNeal, Chief Executive Officer, PECO Energy.

## INSPECTION PROCEDURES USED

IP 37550:	Engineering Inspection
IP 37551:	Onsite Engineering
IP 61726:	Surveillance Observation
IP 62707:	Maintenance Observation
IP 71707:	Plant Operations
IP 71750:	Plant Support Activities
IP 73753	In service Inspection
IP 81700:	Physical Security Program for Power Reactors
IP 83750	Occupational Radiation Exposure
IP 84750-01	Radioactive Waste Treatment, and Effluent and Environmental Monitoring
IP 90712:	In-office Review of Written Reports
IP 90713:	Review of Periodic and Special Reports
IP 92904:	Follow-up - Plant Support
IP 93702:	Prompt Onsite Response to Events at Operating Power Reactors

## ITEMS OPENED, CLOSED, AND DISCUSSED

Opened/Closed

NCV 50-352,353/99-08-01	Failure to perform a safety analysis for a procedure revision that led to implementation of an activity involving an unreviewed safety question
NCV 50-352,353/99-08-02	Failure to restore the RWCU isolation logic within the allowed outage time when the RWCU isolation logic was required to be operable
NCV 50-352,353/99-08-03	Failure to capture and store the monitored data from the south and north stacks RMS

Closed

LER 50-352, 353/1-99-011:	Declaration of an Unusual Event due to the detection of toxic gas within the site boundary. (Section O8.1)
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## LIST OF ACRONYMS USED

ADS	Automatic Depressurization System
ALARA	As Low As is Reasonably Achievable
BWR	Boiling Water Reactor
CEDE	Committed Effective Dose Equivalent
CFR	Code of Federal Regulations
HEPA	High Efficiency Particulate
HpGe	High Purity Germanium
IP	Inspection Procedure
JPM	Job Performance Measures
LCO	Limiting Condition for Operation
LER	Licensee Event Report
LLD	Lower Limits of Detection
LORT	Licensed Operator Requalification Training
MGP	MGP Instruments, Inc.
MSHA	Mine Safety and Health Administration
NCV	Non-Cited Violation
NE	Nuclear Enterprises, Inc.
NIOSH	National Institute for Occupational Safety and Health
NRC	Nuclear Regulatory Commission
ODCM	Offsite Dose Calculation Manual
PECO	PECO Energy
PEP	Performance Enhancement Program
PRA	Probability and Risk Assessment
QA	Quality Assurance
QC	Quality Control
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RMS	Radiation Monitoring System
RP&C	Radiological Protection and Chemistry
RP	Radiation Protection
RPV	Reactor Pressure Vessel
RWCU	Reactor Water Clean-up
RWP	Radiation Work Permit
SCBA	Self-Contained Breathing Apparatus
TLD	Thermoluminescent Dosimeter
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report