U.S.NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-352/94-06 and 50-353/94-06

Docket Nos. 50-352 and 50-353

License Nos. NPF-39 and NPF-85

Licensee: PECO Energy
2301 Market Street
Philadelphia, Pennsylvania 19105

Facility Name: Limerick Generating Station (LGS), Units 1 and 2

Inspection At: Nuclear Group Headquarters, Wayne, PA and LGS

Inspection Conducted: February 14-17, 1994

Inspector: Jason C. Jang 3-7-94
Jason C. Jang, Sr. Radiation Specialist date
Effluents Radiation Protection Section (ERPS)
Facilities Radiological Safety and Safeguards
Branch (FRS&SB)

Approved by: Judith A. Joustra 3/7/94
Judith Joustra, Chief, ERPS, FRS&SB date
Division of Radiation Safety and Safeguards

Areas Inspected: Announced safety inspection of the projected dose calculation capability from radioactive liquid and gaseous effluent releases.

Results: Within the areas inspected, the licensee implemented a very good projected dose calculation. No safety concerns or violations of NRC requirements were identified.

DETAILS

1.0 Individuals Contacted

1.1 Licensee

* R. Boyce, Plant Manager
* M. Chrisinziano, Branch Manager, Nuclear Engineering Department
* F. Hickey, Effluent Physicist
* G. Murphy, Manager, Radiation Protection
R. Sholz, Manager, Technical Services Branch
* G. Stewart, Experience Assessment Engineer
D. Wahl, Health Physicst, Technical Services Branch

1.2 NRC

* N. Perry, Senior Resident Inspector

* Attended the exit meeting on February 17, 1994.

2.0 Purpose

The purpose of this inspection was to verify the licensee's capability to calculate projected offsite radiation doses from radioactive liquid and airborne (noble gases and particulates) effluent releases during normal operation.

3.0 Responsibility and Procedures

The Radiation Protection Department had the responsibility for calculating projected offsite doses, using its Offsite Dose Calculation Manual (ODCM) methodology, to control actual effluent releases. The ODCM contained many conservative parameters in order to ensure that effluent release limits would not be exceeded.

The inspector reviewed the following licensee's procedures, as part of the inspection of the implementation of the Technical Specification and the ODCM requirements.

- o ST-0-104-878-0, Monthly Liquid Release Dose Calculation
- o ST-0-104-879-0, Monthly Gaseous Release Dose Calculation

The inspector noted that these procedures were well written to allow performance of all necessary steps. The inspector had no further questions in this area.

4.0 Computer Codes for Projected Dose Calculations

4.1 NRC: PCDOSE Code

The PCDOSE code was developed by Idaho National Engineering Laboratory (EG&G Idaho, Inc.) for the U.S. Nuclear Regulatory Commission. The code was designed to calculate the maximum projected radiation dose to an individual and the average dose to the population due to radionuclides released in radioactive liquid and airborne effluent releases from a nuclear power plant. The code was designed for normal operation rather than for emergency situations. The code was developed from the methodology found in both NUREG-0133 and Regulatory Guide 1.109 (Revision 1). The PCDOSE code serves as a basis for comparison of similar programs conducted by individual utilities which operate nuclear power plants.

4.2 Licensee: Radiological Meteorological Monitoring System (RMMS)

The licensee used the RMMS computer code for calculating projected radiation dose during routine and emergency operations. The RMMS User's Manual described the routine operational purposes of the code as:

(1) Collect, evaluate, and report meteorological and radiological effluent release data from on-site monitors,
(2) Generate a data base and store data in a retrievable form, and
(3) Compute short-term or accumulated off-site radiation doses from various effluent discharge pathways caused by the release of gaseous and/or liquid radioactive materials.

5.0 Verification of the Projected Dose Calculation Program

During this inspection, the inspector conducted intercomparisons of dose calculation results (PCDOSE vs REMM) at the site. The inspector reviewed the ODCM for site specific parameters. The inspector noted that the RMMS computer code utilized the real-time meteorological parameters [such as dispersion (χ/Q) and deposition (D/Q)] to calculate the projected dose for radioactive noble gas and particulate releases, as well as iodines and tritium. The PCDOSE code does not use real-time meteorological information, therefore, the comparisons were made against the licensee's hand calculation results using the above procedure (ST-0-104-879-0).

The inspector evaluated the licensee's computer code by using site specific parameters and radioactive liquid release information. All comparisons were made using

simulated radioactive material releases because the licensee's actual releases were insignificant. The intercomparison results for the release pathways for liquids, noble gases, and particulates, are listed in Tables 1, 2, and 3.

The results of radioactive liquid release pathway intercomparisons were very good, as shown in Table 1. The licensee's results were about 16% higher than the NRC's. It appeared that conservative values were being used in the RMMS code.

The results of noble gas release pathway intercomparisons were excellent, as shown in Table 2.

The result of the particulate release inhalation pathway intercomparisons was also excellent, as illustrated in Table 3. The licensee's projected radiation dose for the goat milk pathway was about 2.7 times higher than the NRC's because the licensee applied conservatism in its calculation, which is acceptable to the NRC.

The NRC currently does not have specific criteria for comparisons. However, up to about a 50% difference in projected dose values is acceptable as long as the cause of difference can be identified.

Based on the above comparisons, the inspector determined that the licensee conducted a very good projected dose calculation program at the Limerick Generating Station site.

6.0 Exit Interview

The inspector met with the licensee representatives denoted in Section 1.1 of this inspection report at the conclusion of the inspection on February 17, 1994. The inspector summarized the purpose, scope, and findings of the inspection. The licensee acknowledged the inspection findings.

Table 1. Liquid Dose Projection Comparisons
Adult Dose (mrem)

	Bone	Liver	T. Body	Thyroid	Kidney	Lung	Gi-Lli
PECO	4.41E-5	6.03E-5	3.95E-5	3.06E-8	2.05E-5	6.84E-6	1.20E-6
NRC	3.81E-5	5.22E-5	3.42E-5	2.64E-8	1.77E-5	5.91E-6	1.04E-6
RATIO*	1.16	1.16	1.15	1.16	1.16	1.16	1.15

*Ratio = PECO/NRC

Table 2. Noble Gas Dose Projection Comparisons

	Beta Air (mrad)	Gamma Air (mrad)	Beta Skin (mrem)	Total Body (mrem)
PECO *	1.22E-7	7.93E-8	4.19E-4	5.31E-4
NRC	1.22E-7	7.90E-8	4.19E-4	5.29E-4

* ST-O-104-879-0, Monthly Gaseous Release Dose Calculation

Table 3. Particulates Dose Projection Comparisons
Thyroid (mrem)

	Inhalation Pathway (Child)	Goat-Milk Pathway (Infant)
PECO	1.57E-3	9.93E-4 *
NRC	1.57E-3	3.63E-4 **

* ST-O-104-879-0, Monthly Gaseous Release Dose Calculation with conservatism
** NRC Regulatory Guide 1.109 without conservatism