U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-352/92-08 and 50-353/92-07

Docket No. 50-352 and 50-353

License No. NPF-39 and NPF-85

Licensee: Philadelphia Electric Company
Correspondence Control Desk
P. O. Box 195
Wayne, PA 19087-0195

Facility Name: Limerick Generating Station, Units 1 and 2

Inspection At: Limerick, Pennsylvania

Inspection Conducted: February 10-14, 1992

Inspector: S. Sherbini 2/21/92
S. Sherbini, Senior Radiation Specialist (date)
Facilities Radiation Protection Section

Approved by: W. Pasciak 2-26-92
W. Pasciak, Chief, Facilities Radiation Protection Section (date)

Areas Inspected: A routine inspection of the radiological controls program on site. Areas reviewed included staffing and qualifications, training, dosimetry, access control, and calibration and testing of survey instrumentation. Tours of the facility were also conducted.

Results: The plant was well posted, general housekeeping was good, and all program areas inspected were found to be well managed. However, some deviations from procedural requirements were observed, and some deficiencies in the procedures were found. Within the scope of this inspection, no violations were identified.

DETAILS

1.0 Personnel Contacted

1.1 Licensee Personnel

K. Borton, Engineer, Radiation Protection Branch
K. Cenci, Senior Engineer, Radwaste
* J. Doering, Plant Manager
* R. Dubiel, Superintendent, Plant Services
* J. Fongheiser, Senior Health Physicist
B. Graber, Instrumentation Physicist
J. Mallon, Dosimetry Physicist
T. Mscisz, Assistant Senior Health Physicist
* D. Shutt, Licensing Engineer
M. Summer, Decon Coordinator/Radwaste
R. Tomlinson, HP Training Supervisor

1.2 NRC Personnel

T. Kenny, Senior Resident Inspector
L. Scholl, Pesident Inspector
* B. Whitacre, Resident Inspector

* Denotes attendance at the exit meeting on February 14, 1992.

2.0 Tours of the Facility

Several tours of the radiological controls areas (RCA) were conducted during this inspection. The RCA was well posted with appropriate and clear signs, and housekeeping was very good. Most of the posted areas (contamination area, radiation area, or higher level postings) were within locked rooms, with access controlled by Health Physics or Operations. Only a few radiologically significant work activities were observed during the tours, and these were found to be conducted in accordance with proper radiological practices. However, several items were observed during the tours that indicated that better attention to detail may be needed.

- Several workers in protective clothing (PC) were observed to be dressed in a manner that was not in accordance with procedural requirements. Specifically, workers on the

refueling floor were observed wearing hoods that were not taped to their coveralls. Procedure HP-510, "Selection and Use of Anti-Contamination Clothing", Step 6.2.35, requires that hoods be taped ".. to coveralls by attaching one strip of tape to each side of hood running from front to back of coveralls". The health physics (HP) technician covering the job stated that the contamination levels in the work area were very low and therefore minimal anti-contamination precautions were needed. He stated that the PCs were used only because there was some risk of splashing with slightly contaminated water.

- More than one worker in PCs was observed without any visible dosimetry while working in a posted area. The workers stated that they were wearing their dosimetry inside their protective clothing. This is permitted by Procedure HP-510, "Selection and Use of Anti-Contamination Clothing", which states in Step 6.2.12 that "Dosimetry devices may be worn on a chain inside coveralls". However, Procedure HP-603, "Guidelines for Placement of Dosimetry on Plant Personnel" provides somewhat different guidance. In Step 6.1.2 it states that "If anticontamination clothing is worn, then whole body TLDs can be worn on the outside of clothing, but the preferred location is inside of clothing on a break-away chain. DRDs shall be worn on the outside of clothing".

- One worker was observed working on a water sampling system that was inside a posted and roped contamination area. The worker was standing in a clean area and was wearing rubber gloves and reaching into the contamination area to perform the work. This practice is permitted; however, the worker was observed working intermittently in the clean area while wearing the same gloves he used for working in the contaminated area. In another instance, a pair of used rubber gloves were observed left in an area outside of and adjacent to a posted contaminated water sampling panel rather than being discarded in the appropriate waste container.

- A number of yellow catch containers were observed in use to catch water dripping from leaking plumbing. The use of yellow containers for both clean and contaminated systems may lead to some uncertainty regarding their contamination status. In addition, the postings on the containers were not uniform. Some of the containers were posted with radioactive

material stickers placed on the edge of the funnel and some were not, even though in both cases the tube leading from the container to the floor drain was attached to the floor with radioactive material tape. In some cases the plastic tubing leading from the container to the floor drain was attached to the floor over its entire length with radioactive material tape, whereas in other cases only the last few inches at the floor drain was taped in this manner, with no posting anywhere else on the system. The licensee stated that they use yellow containers throughout the plant but that they would ensure that postings in the future are uniform and well understood by plant personnel.

The inspector noted during the tours that there was no access control by HP into the RCA. The only requirement to enter the RCA was to use the key card at the access point. In addition, the health physics office was located in a separate building outside the plant, or "power block", and some distance from it. The HP office is the location in which HP technician's offices are located and from which instrumentation is issued. Workers are also expected to go to the HP office for briefings, to sign radiation work permits (RWP) when the work requires an RWP, or for any guidance needed from HP. The inspector stated that the minimal access control into the RCA coupled with the remoteness of the HP staff from the plant may be cause for concern. The licensee stated that this system works well because most of the radiation and contaminated areas are locked and permission is needed either from HP or from Operations to enter these areas. In addition, the radiation fields in most areas of the plant are very low and most of the accessible areas are clean and do not require any kind of contamination control. The inspector stated that the plant tours supported these statements and that the current system appears to be adequate as long as the radiological status of the plant remains unchanged.

The licensee stated that they will review the above findings and will take appropriate action where needed. These items will be reviewed during future inspections.

3.0 Dosimetry

A review of the personnel dosimetry system used on site was conducted during this inspection. This system included the direct reading dosimeters (DRD) as well as the dosimetry of record. The dosimetry of record is a thermoluminescent dosimetry (TLD) system operated by a corporate organization that serves the utility's two nuclear power plant sites. The licensee is currently accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) in all test categories. However, although accredited in the mixed neutron plus high energy gamma radiation category (Category VIII), the licensee uses the services of an outside vendor to provide neutron dosimetry for use during low power entries into the drywell. Such entries are normally made after reactor startup to perform surveillances of the reactor systems at system pressures of 500 and 1000 psi. The dosimetry program appeared to be well run and technically adequate. However, the following items were noted.

- Procedure HP-510, "Selection and Use of Anti-Contamination Clothing" states that "Dosimetry Devices may be worn on a chain inside the coverall". Procedure HP-603, "Guidelines for Placement of dosimetry on Plant Personnel", states that "If anticontamination clothing is worn, the whole body TLD can be worn on the outside of clothing, but the preferred location is inside of clothing on a break-away chain". These guidelines, however, do not consider the effect of placing dosimetry inside of the PCs on the ability of the dosimetry to measure skin and eye doses in situations where respirators or face shields are not used. Unless appropriate measures are taken, placement of dosimetry inside PCs may lead to significant underestimation of the dose to unprotected eyes and skin. The licensee stated that they will review this matter and take appropriate action.

- Procedure HP-621, "Use of Special Purpose Dosimetry" describes the use of multiple whole body dosimetry. However, the procedure is unclear about the manner in which the whole body dose from several separate entries using multiple dosimetry are to be determined. Whole body dose may either be obtained by adding the maximum doses from each entry, or by taking the highest sum of doses from all the entries, the sum being that of the readings from each entry added separately for each body part monitored. Either method is

acceptable to the NRC, but the procedure did not make clear which method is to be used. The licensee stated that they use the first method, that is, the maximum for each entry.

- Procedure HP-603, "Guidelines for Placement of Dosimetry on Plant Personnel", requires that extremity dosimetry be worn with the whole body TLD when not in use on the extremities. However, since extremity dose is determined by adding the whole body dose recorded by the whole body dosimeter to the doses recorded by the extremity dosimeters, if used, this practice could lead to an overestimation of the extremity doses. Although the practice is conservative, accuracy rather than conservatism is the currently accepted practice in personnel monitoring.

- Procedure HP-603 above specifies that neutron dosimetry shall be worn "...against the body". However, the procedure does not specify what that means or how it is to be implemented. The neutron dosimeter in use is an albedo dosimeter that must be held by some means close to the body to enable it to detect neutrons reflected back from the body. Not meeting this condition could lead to substantial errors in estimating neutron doses. The licensee stated that drywell entries at power are always made with the workers wearing a special vest equipped with pockets designed to hold the neutron dosimetry in place during the entry.

- The suitability of the beta correction factors in use with the various survey instruments and personnel dosimetry is evaluated periodically by measuring the average beta energy of the radioactivity present in the reactor coolant. Changes in the average beta energy would result in an evaluation of the need to modify the beta correction factors. The coolant sample is obtained from a 60-day composite coolant sample. The process is described in Procedure RT-0-111-802-0, "Routine Determination and Update of Plant Average Beta". However, according to this procedure, the determination of the average beta energy is based on a gamma isotopic analysis of the coolant sample. The procedure does not require a review of other sources of information to determine the presence or otherwise of pure beta emitting isotopes. Such isotopes would not be identified by a gamma analysis but they could substantially affect the average beta energy. The licensee stated that they did not believe they have, or have had, pure beta emitters in their coolant,

but they will review incorporation of provisions for ensuring a review for the presence of such isotopes.

- The licensee's TLD is used in a manner that does not permit a direct measurement of the dose to the lens of the eye, at a depth of 300 mg/sq. cm. The licensee stated that the eye dose is determined conservatively by using the dose at 7 mg/sq. cm, except for the beta component of the dose. In the case of the beta component, the dose obtained from the 7 mg/sq. cm. element of the TLD is attenuated to account for the 300 mg/sq. cm depth of the lens of the eye. However, the dose at 7 mg/sq. cm is not necessarily a conservative estimate of the eye dose, and may lead to an underestimation of that dose. This is because the maximum dose equivalent is attained at a depth of up to 1.0 cm or more into the tissue for the higher energy gamma radiation normally encountered at power stations. The dose equivalent at 300 mg/sq. cm. may in some situations be higher than the dose at 7 mg/sq. cm. The exact depth at which this maximum is attained will depend on many factors such as radiation energy and beam size, geometry, and so on. The adequacy of the licensee's assumption of conservatism in estimating eye doses may need to be reviewed.

- The licensee uses two different computer programs to process data from the site dosimeters and from NVLAP testing. The programs differ in their logic and the manner in which they analyze the data. The licensee is accredited in all the eight test categories specified in ANSI N13.11-1983; however, the site version of the software is not capable of analyzing pure beta irradiations, and the neutron dosimetry on site is performed using dosimetry supplied by an outside vendor. The licensee stated that should a dosimeter exposed to pure beta sources be encountered, the program will reject the data as being out of specification. In such a case, the dose would be assessed manually by the dosimetry personnel. The inspector stated that using a separate program for NVLAP testing is not good practice because actual practice does not correspond to that implied by the accreditation certificate issued to the licensee. The licensee stated that, although two separate programs are used, the site program is extensively tested to ensure its accuracy and reliability.

- A review of the licensee's procedures showed that there was no procedure describing the methods to be used to assess the doses due to clouds of radioactive gases. There was also no data to show the ability of the TLD system to measure the doses in such an environment. The licensee stated that they do not have, and have not had, any significant radioactive gas exposures on site.

The licensee stated that the above findings will be reviewed and action will be taken as appropriate to correct any deficiencies. These items will be reviewed during future inspections.

4.0 Qualifications and Training of HP Technicians

The inspector reviewed the staffing, qualifications requirements, and training of the HP technicians. The program for the licensee's "house" technicians is designed to train applicants with only a high school diploma and no experience in the field. The applicants are trained so they qualify as ANSI or senior HP technicians in accordance with the qualifications requirements of ANSI/ANS 3.1-1978, "Selection, Qualification, and Training of Personnel for Nuclear Power Plants". According to this standard, technicians shall have three years of working experience in their specialty, of which one year should be related technical training. The newly hired person receives 12 weeks of training in fundamentals, followed by a comprehensive examination, then 8 weeks of non-ANSI training on selected health physics topics, followed by another written examination. The technicians are then given a qualification manual and receive on-the-job training. They are expected to complete the manual in a maximum of one year. At the end of that period, the technicians receive 10 weeks of ANSI training in health physics topics, followed by a comprehensive examination. At the end of three years after first entering the program, the technician becomes eligible for promotion to ANSI technician. Passing a qualification board is required for promotion. The licensee stated that they currently do not have any technicians in the training program. The inspector stated that the hiring and training program did not permit hiring of experienced technicians into their house technician staff, and that this practice leads to a staff with experience and training gained solely

on site. The licensee stated that this was the case but that they were working to change this feature of the program to allow hiring of experienced technicians.

The inspector also reviewed the continuing training programs for the site HP staff. The technician program consists of a cyclic training program, a typical year including 5-6 cycles with about 4-5 days of training per cycle. The minimum continuing training time is 48 hours per year, but the licensee stated that the typical time is about 100-120 hours per year. A review of the material presented during the 1990/1991 training sessions showed that the training was relevant and of high quality. Subjects covered included radwaste minimization, shipping and disposal; changes in the high radiation area program; zinc injection; hydrogen water chemistry; 10 CFR Part 20 changes; industry events; procedure changes; review of some reactor systems; and some other topics.

The continuing training program for HP supervisors was not defined and there was no requirement for such training for the supervisors. The licensee stated that this situation has been changed recently and that supervisors are now required to attend the same continuing training that their technicians attend. The training program for the HP technical staff was also not well defined, and there were no specific training goals or requirements for the staff. A review of the training provided during 1991 showed that three technical training sessions were provided: 10 CFR Part 20 changes, hot particles, and radiological and environmental monitoring. These sessions were offered at the licensee's corporate office, close to the site. Attendance at these sessions was not uniform. The licensee stated that attendance at training sessions depended on the individual staff member's current work load and that not all staff members are able to go offsite to attend training. The licensee also stated that they will attempt to improve training of their technical staff in the future.

Temporary contractor HP technicians may be hired as senior, or ANSI qualified, technicians in accordance with the requirements of ANSI/ANS 3.1-1978. Procedure HP-105, "Qualification Review of Vendor Senior HP Technicians" specifies the rules to be used in crediting experience to be used for classification as an ANSI technician. The guidance

provided by the procedure was found to be quite clear and explicit and appeared adequate to ensure selection of experienced technicians. However, the procedure allowed experience gained as a Navy ELT (Engineering Laboratory Technician) to be credited on a 1:1 basis up to a maximum of two years. The inspector stated that accepted practice allows such experience to be credited on a 1:2 basis. The licensee stated that, since an ELT program is typically four years in duration, their method would in effect credit the same experience as would be credited by allowing experience only on a 1:2 basis, namely two years of experience for a typical ELT program. This would not be the case, however, if the person had not completed the full four-year program. The licensee stated that they will review this matter and make appropriate changes.

5.0 Survey Instrument Calibration

The program for calibration and response checking of survey instruments was reviewed during this inspection. The program was found to be well designed and well managed. Calibration of the instruments is performed by the Instrumentation and Control (I&C) department at least once every six months, and response checking is done by health physics every day on active instruments. I&C uses a Cs-137 source in a box type irradiator to calibrate the instruments, and a uranium plaque to determine the appropriate beta correction factors for use with these instruments. Response checking is done using a variety of small sources, mostly beta emitters, attached to suitable irradiation jigs. The jigs are used to position the various instruments in reproducible locations with respect to the sources. Accuracy of calibration follows the guidance provided in ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration".

The licensee's procedures require that the average beta energy of the radioactivity in the reactor coolant be measured on a quarterly basis. The energy is reviewed to determine if there has been a change in energy sufficient to warrant the use of different radiation sources to measure the beta correction factors for the instruments. The licensee stated that they have not had to make such changes to date.

6.0 Exit Meeting

The inspector met with licensee representative at the end of the inspection on February 14, 1992. The inspector reviewed the purpose and scope of the inspection and discussed the inspection findings.