U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Inspection No. 50-387/94-02; 50-388/94-02

Docket Nos. 50-387; 50-388

License Nos. NPF-14; NPF-22

Licensee: Pennsylvania Power and Light Company
2 North Ninth Street
Allentown, Pennsylvania 18101

Facility Name: Susquehanna Steam Electric Station, Units 1 & 2

Inspection At: Berwick, Pennsylvania

Inspection Conducted: January 3-7, 1994

Inspectors: J. Noggle 2/7/94
J. Noggle, Senior Radiation Specialist date
Facilities Radiation Protection Section

Approved by: for B. Bores 2/7/94
B. Bores, Chief, Facilities date
Radiation Protection Section

Areas Inspected: Areas covered in this inspection included a review of: air sampling, respiratory protection, and internal dosimetry programs. In addition, a radiation protection program review was made with respect to the new 10 CFR Part 20 regulations.

Results: The programs reviewed were sound and in most cases, well developed. Some potential program enhancements are described in this report.

DETAILS

1.0 Personnel Contacted

1.1 Licensee Personnel

M. Bell, Health Physics Specialist, Respiratory Protection
* T. Dalpiaz, Manager of Nuclear Maintenance
J. Griswold, Health Physics Specialist, Operations Technology
* D. Hagan, Health Physics Supervisor
J. Jessick, Health Physics Specialist, Operations Technology
R. Kessler, Health Physics Specialist, Dosimetry
* D. McGann, Supervisor, Nuclear Compliance
* W. Morrissey, Radiological Operations Supervisor
* H. Palmer, Jr., Manager of Nuclear Operations
M. Rochester, Senior Health Physicist, Dosimetry Management
* R. Saccone, Manager of Nuclear Systems Engineering
* G. Stanley, Vice President, Nuclear Operations

1.2 NRC Personnel

* D. Mannai, Resident Inspector

* Denotes those present at the exit interview on January 7, 1994.

2.0 Purpose

This inspection was an announced safety inspection of the Susquehanna Steam Electric Station (SSES) internal exposure radiation control programs. In addition, a review of the radiation protection program was made with respect to the new 10 CFR 20 regulations.

3.0 Previously Identified Items

3.1 (Closed) Inspector Followup Item (50-387,388/92-12-04): The inspector reviewed the licensee's actions to investigate the radiological controls and survey frequency associated with tool boxes and gang boxes located within the radiological controlled area (RCA). The licensee had each tool box and gang box opened by its owner and the contents surveyed. No instances were found where loose contamination existed in an uncontrolled fashion. However, several tool containers were found to contain fixed contamination tools and were not labeled as radioactive material storage containers. The licensee has instituted a policy that every tool container in the RCA shall be labeled as radioactive material and during each refueling outage, random surveys of available unlocked tool containers will be made to indicate the relative levels of radiological controls exercised by the workforce. The inspector was satisfied that appropriate actions were taken and this item is now closed.

3.2 (Closed) Violation (50-387/93-21-01): On November 1, 1993, the licensee identified a high radiation area which was inadequately barricaded and not posted and in violation of Technical Specification 6.12.1. The inspector reviewed the corrective actions taken by the licensee during this inspection and, subsequent to the inspection, the licensee's response to the violation contained in a letter to the NRC dated January 27, 1994. The inspector found the licensee's analysis of the event to be thorough and the corrective actions reasonable to prevent recurrence. This violation is closed.

4.0 Air Sampling

The licensee utilizes a broad-based program for sampling of airborne radionuclides. This consists of continuous monitoring of plant ventilation exhausts, local area continuous air monitors (CAMs), stationary grab samplers, and lapel air samplers that are worn by workers. The last two types of air samplers were utilized by the licensee to a large extent during refueling and maintenance outages. During standard plant operations for normal surveillance activities, the first two air monitor types were used. The ventilation exhaust monitors read out in the control room and are provided with alarms and setpoints determined to maintain the offsite dose within regulatory limits. To alert onsite personnel of any unexpected airborne radiological hazards during plant operations, CAMs were used that sample particulate air activities and alarm when the local air concentration exceeds a preset alarm level.

The inspector determined that there were 23 Eberline AMS-3 CAMs in service throughout the RCA to monitor particulate air activity. Approximately half of these units did not have a functioning strip chart recorder, which will allow an estimation of the air activity directly from the instrument. The licensee indicated that the original strip chart recorders were no longer available, however, by modification of the AMS-3 CAMs, a suitable replacement unit could be used. The licensee was in the process of making these modifications at the time of this inspection. In addition, the licensee had recently acquired several Eberline AMS-4 CAMS, which provide direct readout of air activity without the need for user interpretation of a chart recording. Since instrument calibration had not been completed and use procedures were still under development, these units were not yet deployed in the station.

The inspector reviewed the use of stationary grab samplers by the licensee through direct observation, discussions with the licensee and review of procedure HP-TP-720, Rev. 16. No discrepancies were noted with actual uses during this inspection. The licensee did not have specific guidance on how to obtain representative personnel breathing zone air samples. There was some informal understanding between HP technicians that samples collected within three feet of the worker's head area were acceptable, however, no formal guidance had been established.

Similarly, the licensee had not established specific guidance as to when a personal lapel air sampler was to be used by a worker. NUREG/CR-4033 provides evidence

that under agitating work conducted in a loose contamination environment, a lapel air sampler may be expected to be 35 times higher than a stationary grab sampler placed in the vicinity of the work area. Through discussions with the licensee, the inspector learned that the licensee intends to decrease the current level of respirator use and to depend on air sample measurements to trigger the need for bioassay measurements from which to determine internal exposures of workers. The licensee stated that the need for procedural guidance in this area would be reviewed. In general, the licensee had an effective air sampling program with some opportunity for enhancement in application of the different air sampling equipment depending on radiological environment and work conditions.

4.0 Respiratory Protection

The inspector reviewed the licensee's respiratory protection program by conducting interviews with licensee representatives and through the review of procedures and various licensee records. This review was made with respect to 10 CFR 20 requirements and NUREG-0041, ANSI Z86.1-1972, and ANSI Z88.2-1991 guidelines.

The licensee maintained an effective respiratory protection equipment washing, repairing and testing facility. A commercial dishwasher used detergent and a sanitizing agent to clean and disinfect the respirators. The respirator wash facility utilized a closed cycle water system. The detergent laden water was processed through a demineralizer, which removed the ionic chemicals, but not the detergent. During each wash cycle, additional detergent was added to the wash water and consequently to the amount of detergent already in the wash system. The system alternated a wash cycle (when detergent was added) with a rinse cycle. The rinse used water from the closed cycle system, which typically contained detergents. The inspector was concerned about the purity of the respirator rinse water. The licensee stated that the respirator cleaning facility would be reviewed for possible improvements to this system.

Respirators were dried in a controlled temperature drying cabinet and each was inspected for defects and repaired as necessary. Procedures required air particle penetration testing for respirators that were repaired where leak tightness of the respirator may have been affected and for 10% of new respirators received from a supplier. The approved respirators were bagged, sealed, and stored in cabinets until needed. The respirator filter canisters were discarded after each use and replaced with new ones. The inspector reviewed the technical bases and adequacy of the respirator test procedures and found them adequate.

Federal regulations state that only respiratory protection devices that were certified by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA) may be used. The licensee currently uses the

following respiratory protection devices and the inspector verified the NIOSH/MSHA certifications of each.

- MSA Ultravue respirators, NIOSH/MSHA approval TC-21C-150
- MSA PAPR, NIOSH/MSHA approval 2G-3374-3
- NPO Bubble hoods, SAR 100N, 101, 102, NIOSH/MSHA approval TC-19C-140

The inspector reviewed the breathing air supply controls and air quality testing data provided by the licensee. The station breathing air system is supplied by four oil-free air compressors (two for each Unit). The training center utilizes an oil-free compressor for performing various mockup activities. The station also has two oil lubricated compressors; one for filling bottles of breathing air, and one for the miscellaneous requirements of the "combo" shop. For the two oil lubricated compressors, the licensee utilizes a Del-Monox carbon monoxide filter and alarm unit.

The inspector reviewed laboratory testing results of station breathing air, self-contained breathing air (SCBA) bottle air, training center air supply, and the combo shop air supply systems. All air supply sources were regularly sampled on a monthly basis. The inspector reviewed sample analysis test results for the previous three months of October through December 1993. All air supply sources had been tested during this time period and qualified as Grade D quality air as defined by the Compressed Gas Association.

The inspector reviewed the supplied air hoses, distribution manifolds, and regulators used to support an airline breathing system. Appropriate storage and controls of this equipment were exercised by the licensee. An area for enhancement involved documenting calibration of air pressure regulators on the air distribution manifolds. Station practice requires a secondary standard calibration of each manifold air regulator prior to deployment in the RCA. There is currently no documentation that this is done. The license agreed to evaluate either the use of calibration stickers on the air manifolds or a maintenance record indicating what date the air regulator was calibrated.

The inspector reviewed the administrative controls to ensure only qualified individuals were issued the appropriate respiratory equipment for which they were qualified to use. The licensee has four qualification criteria that must be met. The individual must successfully pass the general radiation worker training and respiratory protection training courses within one year. Also on an annual basis, the individual must successfully pass a respirator fit test to ensure that the features of his or her face will allow for a leak free seal with the respirator. On an annual basis, the individual must be examined by a medical nurse or physician and found to be physically fit to wear a respirator. The individual is also required to obtain a whole body count on an annual

basis. The training test results, fit test documentation, medical exam forms, and whole body count dates are routed to the dosimetry department and are maintained in a computer database system, the Radiation Monitoring System, which generates a respirator users' list once per month during routine plant operations, and generally daily during refueling outage peak periods. This list is used to determine whether an individual is authorized to wear a respirator and which size. The inspector verified that the respirator storage area was controlled and that a current respirator users' list was available for use and that the respirator issue log was being used appropriately.

The fit testing of individuals is performed at the training facility. The licensee uses a Portacount instrument to measure the protection factor of the respirator wearer while performing seven different physical exercises. The acceptance criterion is a minimum protection factor of 500 during each of the seven tests. The licensee has three Portacount instruments that are calibrated annually by the manufacturer on a rotational basis.

The inspector witnessed the storage condition of each of the emergency respirator kits on site to ensure emergency response capability is maintained. Four emergency response SCBA units were inspected in the control room and five SCBA units were inspected in the Technical Support Center (TSC). The five SCBA units in the TSC were completely blocked and hidden by two file cabinets. The operations group promptly moved the SCBA units when notified by the inspector. For fire response capability, there were three fire sheds: one on 729-foot elevation of the turbine building, one on the 676-foot elevation of the turbine building, and one at the circulating water pump house. These fire sheds contained 5 SCBA units each with 5 additional replacement SCBA bottles. At each location the air bottles indicated full pressurization and the respirator equipment was ready for use. A check sheet in each emergency kit or fire response shed, indicated that monthly inspections had been carried out regularly.

5.0 Internal Dosimetry

5.1 Internal Exposure Tracking

The inspector reviewed the licensee's DAC-hr tracking system through a review of procedures and through discussions with the licensee. The licensee maintains a computerized tracking of each individual with $\geq$ 4 DAC-hrs in any seven-day period and the accumulated default DAC-hrs (RWP sign-in sheets assume certain default DAC-hr assignments according to respirator use) for any worker for each calendar year. A report lists workers with 160 DAC-hrs or more and flags the licensee that a whole body count of the workers should be performed. The federal regulations require recording of internal exposure for those individuals expected to receive 10% or higher of the annual exposure limit (200 DAC-hrs). The licensee's approval was

conservative in using default DAC-hrs as well as confirmed DAC-hrs from air sampling data.

5.2 Internal Exposure Assessment

The inspector reviewed the licensee's internal exposure assessment, or bioassay program, through licensee demonstrations of the whole body counters calibration methodology, through a review of applicable procedures and calibration records, and through discussions with knowledgeable station personnel. The inspector's review was with respect to the criteria contained within 10 CFR 20, ANSI N343-1978, ICRP 26 and 30.

The licensee utilized two whole body counting systems for the measurement of internally deposited gamma-emitting radioisotopes in the body. The principal counting system was a standup, two-sodium iodide (thalium) detector system, Canberra Fastscan whole body counter. The secondary counting system was a bed geometry, single sodium iodide (thalium) detector, Canberra Accuscan whole body counter. The inspector reviewed the calibration setup utilizing a tissue-equivalent phantom with vials of liquid containing National Institute of Standards Technology (NIST) traceable sources for both counting systems. The inspector reviewed the results from the latest calibration of the whole body counters that was completed on August 18, 1993. Energy and efficiency calibration data were complete for both counters and were used to develop appropriate quality control (QC) charts to plot daily source counts within statistical accuracy limits of ± 2 and ± 3 standard deviations. The inspector reviewed the latest QC charts and verified that the licensee has been performing daily source count verifications of the whole body counters when in use.

The inspector reviewed the latest off-site laboratory analytical results of smear samples obtained from the station's contamination areas. These samples, taken on June 23, 1992, indicated the following radioisotopes: manganese-54, cobalt-60, iron-59, iron-55, chromium-51, and zinc-65. The inspector cross-referenced this list with the whole body counter library of radioisotopes list. The normal whole body counter analysis library did not contain iron-59, chromium-51, or zinc-65, which corresponded to approximately 18% of the activity found from the latest in-plant smear samples analyzed in 1992. The inspector found that a secondary, operator selected analysis library contained all of the radioisotopes. The normal library does not use them due to interfering gamma radiation energy levels from these other radioisotopes. Both of the licensee's whole body counting systems exhibit limitations with respect to resolving discrete gamma radiation energy levels due to the sodium-iodide detectors. When the inspector reviewed the library of radioisotopes common to nuclear power plants as indicated by the applicable ANSI standard, there were many interference gamma energy levels that the licensee's counting systems may not be able to identify. The current station mix of radioisotopes represents a very

clean plant without a history of failed fuel or other chemical anomalies. The inspector did not have a concern that the licensee's whole body counters were not capable of providing quality bioassay services, however their capabilities for a more complex radioisotope mixture could be questioned.

6.0 10 CFR 20 Review

The inspector made a general procedural review to determine if the major changes in the 10 CFR 20 regulations were reflected in the licensee's radiation protection program.

The following procedures were reviewed.

NDAP-00-1191, Rev. 2,"ALARA Program and Policy".
This procedure was comprehensive and reflected a high level of management commitment and involvement in the ALARA program.

NDAP-00-624, Rev. 2, "Respiratory Protection Policy and Program".
NDAP-00-626, Rev. 2, "Radiologically Controlled Area Access and Radiation Work Permit System".
NDAP-00-627, Rev. 0, "Radioactive Contamination Control".
The licensee describes "anticipated personnel contaminations" as the result of preplanned internal exposures. These anticipated personnel contaminations are not counted against the annual personnel contamination goal.

HP-TP-222, Rev. 9, "Special Dosimetry Issuance and Criteria".
This procedure requires extremity tracking at 20 rem/hr and 2.5 rem of planned exposure. Perhaps the licensee meant to use the word or in this procedure.

HP-AL-400, Rev. 8, "RWP ALARA Reviews and Evaluations".
The licensee assumes a 20% work effort efficiency increase when not wearing respirators. DAC-hr default values are assigned based on RWP sign-in hours multiplied by the respirator type worn (0.3 DAC for filter respirators and 2.0 DAC for airline respirators). This is a good conservative approach to monitor internal personnel exposures.

HP-TP-209, Rev. 8, "Dose Tracking and the Dose Extension Process".
The licensee has set administrative dose limits at 80% of federal personnel exposure limits.

HP-TP-310, Rev. 13, "Posting and Labeling".
NDAP-00-625, Rev. 2, "Personnel Radiation Exposure Monitoring Program".
HP-TP-720, Rev. 16, "Airborne Concentration Sampling and Evaluation".

Breathing zone air sampling is not specifically defined and there is no guidance as to when to use different air sampling equipment based on the work environment.

HP-TP-223, Rev. 7, "Internal Dose Investigations and Evaluations".
This procedure assumes only a single acute intake and does not include all the qualifying assumptions needed for Attachment A. Also, this procedures assumes a gastro-intestinal intake whenever internally detected radioactivity drops off after 1-2 days post-intake. This typically would occur due to an externally contaminated worker that would wash away after 1-2 days. No methodology is presented to allow a whole body counter operator to discriminate external contamination from internally deposited contamination. This procedure could be developed further.

HP-TP-218, Rev. 15, "Operation of the Whole Body Counter System".
The same comment made above regarding lack of a methodology for discriminating external contamination on a worker. If external contamination is suspect, the procedure requires the worker to change street clothes and wear a paper coverall for a remeasurement. Most station workers do not wear their street clothes into the contamination areas of the plant and if they were externally contaminated, one would expect their skin to be contaminated, not their street clothes. This procedure could be developed further.

HP-TP-758, Rev. 12, "Inspection and Testing of Respiratory Protective Equipment".

The inspector determined that the licensee had made significant program changes to accommodate the new 10 CFR 20 regulations with no inconsistencies noted.

9.0 Exit Meeting

The inspectors met with licensee representative at the conclusion of this inspection, on January 7, 1994. The inspectors reviewed the inspection findings and the licensee acknowledged the results.