

U. S. NUCLEAR REGULATORY COMMISSION
REGION I

DOCKET/REPORT NOS.: 50-387/95-21; 50-388/95-21

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

FACILITY: Susquehanna Steam Electric Station, Units 1 & 2

INSPECTION AT: Berwick, Pennsylvania

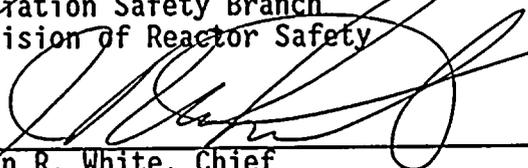
DATES: October 2 - 6, 1995

INSPECTOR:


R. C. Ragland, Jr., Radiation Specialist
Radiation Safety Branch
Division of Reactor Safety

10/23/95
Date

APPROVED BY:


John R. White, Chief
Radiation Safety Branch
Division of Reactor Safety

10/23/95
Date

Areas Inspected: Announced inspection of the radiological controls implemented during the Unit 2 refueling outage. Areas reviewed included audits and appraisals, changes to organization and facilities, training and qualifications, planning and preparation, external exposure control, internal exposure control, control of radioactive materials and contamination, and surveys and monitoring.

Results: Results of the inspection revealed very good overall performance. Audits and appraisals were being performed to identify weaknesses and take corrective actions; staffing levels were adequate to support outage work; training and qualifications of contract health physics technicians were verified and noted to be very good; radiological controls were well planned and effectively implemented; and radioactive materials and contamination were well controlled. Radiological postings continue to be a licensee strength.

Weaknesses, with respect to the performance of receipt of radioactive material surveys, were identified by your staff and reviewed during this inspection (See Section 3.2). Your corrective and preventative actions will be reviewed during the next inspection of this program area.

No violations of regulatory requirements were observed and no response to this letter is required.



DETAILS

1.0 INDIVIDUALS CONTACTED

1.1 PRINCIPAL LICENSEE EMPLOYEES

- *K. Chambliss, Manager, Nuclear Operations
- *T. Dalpiaz, Manager, Nuclear Maintenance
- J. Doxsey, Manager, Effluents
- *M. Friedlander, Outage Manager
- *M. Golden, Supervisor, Nuclear Systems Engineering
- *D. Hagan, Health Physics Supervisor
- J. Jessick, Health Physicist, ALARA & Operations Support
- *R. Kichline, Project Licensing Specialist
- *G. Kuczynski, Nuclear Plant Services Manager
- J. Lex, Training Supervisor
- E. McIlvaine, Health Physics, ALARA
- *W. Morrissey, Supervisor, Radiological Operations
- D. Pfendler, Assistant Foreman, Health Physics
- R. Sutliff, Assistant Foreman, Health Physics
- D. Shane, Assistant Foreman, Health Physics
- *G. Stanley, Vice President, Nuclear Operations
- G. Walker, Assistant Foreman, Health Physics

1.2 NRC Employees

- M. Banerjee, Senior Resident Inspector
- *B. McDermott, Resident Inspector

* Denotes attendance at the exit meeting on October 6, 1995.

The inspector also contacted other licensee personnel during the course of the inspection.

2.0 PURPOSE

The purpose of the inspection was to review the implementation of radiological controls for the Unit 2 refueling outage. Functional areas inspected included the following.

- audits and appraisals
- changes to organization and facilities
- training and qualifications
- planning and preparation
- external exposure controls
- internal exposure controls
- control of radioactive materials and contamination, and surveys and monitoring
- observations and review of outage work
- station tours



3.0 AUDITS AND APPRAISALS

The inspector performed a review of audits and appraisals related to health physics. The licensee's performance was evaluated by a review of condition reports written since the last inspection of occupational radiation exposure.

3.1 General Performance

Overall, very good performance was noted. The licensee was effectively identifying problems requiring corrective actions, problems were being elevated to proper levels of management, detailed analyses such as root cause and barrier analyses were performed as warranted, generic concerns were being addressed, and corrective actions were being implemented.

3.2 Receipt of Radioactive Material Surveys

Condition Report No. 95-0404 raised some concerns relative to the adequacy of receipt of radioactive material surveys. On September 11, 1995, an exclusive use shipment was received and the vehicle was inadvertently released prior to being surveyed. The vehicle was recalled, surveyed and found to be clean. On September 18, 1995, another event occurred where a limited quantity shipment was received at the warehouse. Personnel at the warehouse did not recognize that the package contained radioactive material and the package was processed into the site without a survey. Once this was recognized, a survey was performed and no contamination was found. The licensee initiated an event review team to investigate these occurrences. Past history at Susquehanna and industry events were reviewed; a root cause analysis and a barrier analysis were performed; and actions to prevent recurrence were identified.

The licensee's response to this event was very comprehensive and noted as very good. Due to the licensee's response and because the actual events were of minor safety significance, this was treated as a non-cited violation in accordance with section IV of the NRC enforcement policy. Corrective actions for these events, and receipt of radioactive material surveys will be reviewed in the next inspection of this program area.

3.3 Elevated Radiation Levels from a "Security" X-ray Machine

Condition Report No. 95-340 pertained to elevated radiation levels found after a post maintenance radiation survey of a "security" x-ray machine; these x-ray machines are used to monitor materials and equipment brought into the protected area of the plant. On August 10, 1995, a health physics post maintenance radiation survey of a South Gate House x-ray cabinet revealed a very localized point of elevated leakage radiation on one of the top edges of the system. One reading was as high as 400 mR/h contact and 100 mR/h at 30 centimeters. Upon further investigation it was determined that four of the five operating x-ray machines had radiation levels exceeding limits specified in 21 CFR 1020.40(c) of 0.5 mrem/h at 5 cm outside the external surface of the x-ray cabinet. Further investigation revealed missing shielding brackets over a gap on the x-ray sensors and this was determined to be the cause of the

excessive radiation levels. Two of the x-ray machines were taken out of service and temporary lead shielding was installed on the top of two of the x-ray cabinets. The licensee also notified the x-ray system vendor, and requested additional shield brackets to reduce external dose rates to the proper levels.

In addition, the licensee initiated a radiation exposure investigation, to determine potential radiation exposures to plant personnel. These exposure investigations evaluated potential radiation exposure scenarios for a plant workers and a visiting minor. The licensee determined that no exposures in excess of 10 CFR 20.1201 limits occurred as a result of operation of the x-ray systems. The inspector reviewed the licensee's radiation exposure evaluation to determine if exposures in excess of NRC dose limits occurred. Due to the small size and relative inaccessibility of the elevated x-ray beam (top of cabinet), and using reasonable assumptions for exposure distances and exposure periods, the inspector was in agreement that no exposures to personnel exceeded 10 CFR 20.1201 limits.

This event raised generic radiation safety concerns because x-ray machines are in wide use at nuclear plants, government buildings, and airports. As a result, Pennsylvania Power & Light notified the Pennsylvania Department of Environmental Resources (PADEP) of these finding in a September 11, 1995, letter from H.G. Stanley (Vice President - Nuclear Operations). In addition, Susquehanna sent this information out on the Nuclear Network in order to alert other organizations within the nuclear industry of this safety concern. This notification included lessons learned for improvements in radiation survey techniques.

The inspector noted that the identification of this safety concern and the licensee's willingness to share this information were commendable.

No violations of NRC requirements were identified.

4.0 CHANGES TO ORGANIZATION AND FACILITIES

There were no significant changes in organization and facilities since the last inspection in this program area. The licensee did augment the health physics staff for the outage with an additional 85 Health Physics contract technicians (59 senior and 26 junior technicians). In addition, several experienced level II technicians were upgraded to assistant foreman to support the ALARA organization and act as control point leaders.

The inspector compared staffing levels with planned work and discussed staffing requirements with cognizant personnel. The inspector concluded that staffing levels were adequate to support planned work and could be adjusted to accommodate changes in work schedule.

No violations of NRC requirements were identified.



5.0 TRAINING AND QUALIFICATIONS

The inspector performed a review of the training and qualification program provided for vendor health physics technicians. The evaluation of the licensee's performance in this area was based on a review of training records and discussions with cognizant personnel.

Six names were randomly selected from a list of 59 level II contract health physics technicians to evaluate experience and qualification. The qualification manuals for the six individuals selected were reviewed to verify that these individuals had required experience and had successfully met qualification requirements to work as a senior (level II) health physics technician. All level II HP technicians selected had documented experience greater than 36 months; all qualification requirements were signed off; and records were neat, complete, and well maintained.

In addition, the inspector interviewed various health physics control point personnel to evaluate knowledge of radiological control activities for the drywell, refueling floor, turbine building condenser bay, and turbine deck.

All of the individuals interviewed were knowledgeable of control point responsibilities, RWPs, radiologically significant work being covered by the control points, and of the outage work schedule. The inspector concluded that the program for training vendor health physics technicians was very good.

No violations of NRC requirements were identified.

6.0 PLANNING AND PREPARATION

The inspector performed a review of licensee planning and preparation for outage work. The evaluation of the licensee's performance in this area was based on discussions with cognizant personnel and direct inspector observations.

The inspector made the following observations.

- health physics technician staffing levels were sufficient to support outage work
- health physics control points were equipped with computer terminals that could access RWPs
- miscellaneous health physics supplies such as protective clothing, alarming dosimetry, temporary shielding, and radiological postings appeared adequate
- ALARA planning for major jobs was very good including drywell in-service inspections, reactor vessel nozzle mechanical stress improvement program (MSIP), and refuel floor activities
- control point technicians were knowledgeable of the outage schedule
- health physics personnel were assigned to outage planning and maintenance for planning purposes

Based on the above observations, planning and preparation to support the Unit 2 refueling outage were considered very good.



7.0 EXTERNAL EXPOSURE CONTROL

The inspector performed a review of external exposure controls including use of radiological postings, temporary shielding, and reactor vessel nozzle hydrolasing. The licensee's performance in this area was evaluated by a review of procedures and other documents, discussions with cognizant personnel, and direct observations by the inspector.

7.1 Radiological Postings

The inspector reviewed radiological postings used to inform and communicate radiological information to workers. This included the following.

- large drywell maps, with "radiation sources" and "low dose rate areas" highlighted, were posted at the drywell entrance for worker briefings and review
- "Radiation Source, Do Not Loiter" signs were posted to alert personnel of radiation sources that might otherwise go unnoticed
- "lower dose rate area" signs were posted in various areas to alert personnel of areas that could be used to minimize exposure
- 3-sided dose rate range signs were posted in various locations to inform personnel of general area dose rates
- high radiation area postings were locally posted at each high radiation area within the drywell
- doors that were required to be locked were found locked when not in use, and areas were posted and barricaded properly

The inspector noted that radiological postings were very effective in communicating radiological information to plant workers, and radiological postings continue to be a licensee strength.

7.2 Temporary Shielding

The inspector toured the Unit 2 drywell and observed extensive use of temporary lead shielding. Lead blankets were utilized in a variety of shielding designs to reduce job specific and general area dose rates. Shield packages were detailed, appeared to be very well planned, and were effective in reducing work area dose rates. The licensee's use of temporary shielding in the drywell was excellent.

No safety concerns or violations of NRC requirements were identified.

7.3 Reactor Vessel Nozzle Hydrolasing

Hydrolasing accumulated contamination from the thermal sleeves of reactor vessel nozzles is another method that was used to control and reduce dose rates in the drywell during the refueling outage. Numerous groups benefitted from this ALARA measure including non-destructive examination (NDE) personnel, mechanical stress improvement program (MSIP) personnel, insulators, effluents shielding personnel, scaffolding personnel, and health physics personnel.

The inspector reviewed results of reactor vessel nozzle hydrolasing. Very good dose reduction was achieved for the recirculation discharge N2 nozzles (approximately 30 percent reduction), and good results were achieved for the jet pump instrumentation N8 nozzles (approximately 23 percent reduction). The results of the core spray N5 nozzles were mixed.

These results and the effort put forth to control and reduce external dose were noted by the inspector as very good. No violations of NRC requirements were identified.

8.0 OUTAGE EXPOSURE PERFORMANCE

The outage goal of 195 person-rem was reduced to 175 person-rem due to a decrease in work scope (e.g., a recirculation pump shaft replacement was removed from the outage schedule). As of October 4, 1995, at 5:00 p.m., the outage exposure was at approximately 97 person-rem. This is approximately 30 person-rem below the expected outage goal for this stage of the outage. Several reasons for the decreased exposures were cited by licensee representatives and included the following.

- person-hours in the drywell were reduced due to effective planning and implementation
- reactor vessel nozzle hydrolasing was successful for the recirculation discharge N2 and jet pump instrumentation N8 nozzles
- temporary shielding was effective
- good valve performance (i.e., very few valves required maintenance or rework)

The inspector noted that the licensee was closely tracking outage exposure versus outage goals and that very good performance had been achieved to date.

No violations of NRC requirements were identified.

9.0 CONTROL OF RADIOACTIVE MATERIALS AND CONTAMINATION, SURVEYS AND MONITORING

The inspector performed a review of the control of radioactive materials and contamination, surveys and monitoring. The inspector evaluated licensee performance in this area by a review of radiological survey data generated during the outage, a review of recent initiatives to reduce radioactive waste volume, by discussions with cognizant personnel, and by direct observations.

9.1 Radiological Survey Data

The inspector performed a review of radiological survey data generated during the outage. Survey documentation was found to be clear and legible, survey schedules were being met, and survey data could be easily interpreted. Very good performance was noted.



9.2 Radwaste Reduction Efforts

The inspector was informed of several recent initiatives to reduce radioactive waste. A "green is clean" program was implemented to separate clean non-radioactive waste from contaminated waste. Color coded waste containers were placed in the plant for clean (uncontaminated) waste materials. These waste bags are collected and monitored prior to disposal. Other initiatives included the following.

- Kevlar gloves were substituted for cotton liners and vinyl gloves. The Kevlar glove is launderable and reusable. For example, in 1994 205,000 cotton liners weighing approximately four tons were disposed of primarily as radioactive waste.
- Implemented use of orange reusable trash bags.
- Implemented use of launderable yellow tarpaulins to replace visqueen.
- Implemented use of green color coded items for use in clean areas. Examples included green drip bags, green mop heads, and green rags.
- Implemented use of large launderable reusable item bags in place of trash bags and Visqueen.
- Implemented use of protective ankle/wrist system (PAWS) wraps to replace ankle/wrist tape normally used with protective clothing PAWS are wraps with buttons that were sewn onto the wrist and ankles of protective clothing to eliminate the need for tape.
- Increased communications to plant personnel relative to radwaste reduction efforts. Examples included publicizing radwaste reduction efforts and staging a bulletin board at the Unit 1 radiologically controlled area (RCA) access to inform plant personnel of radwaste volume reduction initiatives

The inspector noted that these initiatives were very good and are expected to result in significantly reduced radioactive waste volume generation.

No violations of NRC requirements were identified.

10.0 OBSERVATIONS AND REVIEW OF OUTAGE WORK

The inspector performed a review of several major jobs performed during the outage, and performed tours to directly observe in-plant work.

10.1 Suppression Pool Diving Activities

Diving activities were performed in the Unit 2 suppression pool to inspect and remove debris from the suppression pool, and to inspect the RHR suction strainers for clogging/degradation. The inspector evaluated licensee performance in this area by reviewing a document package entitled "SSES Suppression Pool Dive, Unit 2 7th Refueling Outage, and by discussions with cognizant personnel."

The document package was very detailed and included copies of procedures, work authorizations, radiation work permits, ALARA reviews, radiological surveys, dive "remarks log," and lessons learned from previous dives. The inspector noted that planning, coordination, radiological surveys, ALARA measures, oversight by Health Physics personnel, and documentation of diving activities were excellent.

No violations of NRC requirements were identified.

10.2 Mechanical Stress Improvement Program (MSIP) Activities

The inspector attended prejob briefings and observed the performance of MSIP support activities within the drywell (insulation restoration and movement of temporary shielding). The inspector noted very good coordination between work groups, good use of temporary shielding, and very good health physics oversight.

No violations of NRC requirements were identified.

10.3 General Outage Work

The inspector observed various jobs performed in the plant to evaluate worker use and compliance with Radiation Work Permits (RWP). The inspector reviewed RWP numbers, protective clothing requirements, radiological survey requirements, and required ALARA measures.

The inspector noted very good compliance with radiation work permits; correct radiation permits were being used, proper use of protective clothing and contamination controls was observed, and very good communications between plant workers and the health physics staff were observed. The inspector also discussed radiation work permit requirements with several workers and these individuals were knowledgeable of RWP and job requirements.

No violations of NRC requirements were identified.

11.0 PLANT TOURS

The inspector conducted plant tours in the Unit 1 and Unit 2 reactor buildings, Unit 2 drywell, Unit 2 turbine building, and the radwaste building. Radiological postings were informative and radiologically controlled boundaries were well defined. Walkways were uncluttered and areas were well illuminated. The inspector did point out one industrial safety concern to the licensee. A tripping hazard was identified in Unit 2 drywell. Upon notification, this was immediately corrected by licensee personnel.

No violations of NRC requirements were identified.

12.0 EXIT MEETING

The inspector met with licensee representatives denoted in Section 1.0 at the conclusion of the inspection on October 6, 1995. The inspector summarized the purpose, scope and findings of the inspection. The licensee acknowledged the inspection findings.