

U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report Nos. 50-277/88-05  
50-278/88-05

Docket Nos. 50-277  
50-278

License Nos. DPR-44  
DPR-56

Priority --

Category C

Licensee: Philadelphia Electric Company  
2301 Market Street  
Philadelphia, Pennsylvania 19101

Facility Name: Peach Bottom Atomic Power Station

Inspection At: Delta Pennsylvania

Inspection Conducted: February 8-12, 1988

Inspectors: H. J. Bicehouse  
H. J. Bicehouse, Radiation Specialist

March 28, 1988  
date

Approved by: W. J. Pasciak  
W. J. Pasciak, Chief  
Effluents Radiation Protection Section

3-29-88  
date

Inspection Summary: Inspection on February 8-12, 1988 (Combined Report  
Nos. 50-277/88-05; 50-278/88-05)

Areas Inspected: Routine, unannounced inspection of the licensee's solid radioactive waste and radioactive material shipping programs including: previously identified items, management controls, quality assurance/quality control, radiochemistry and implementation of the programs. Mr. S. Maingi of the Pennsylvania Department of Environmental Resources accompanied the inspector on February 11-12, 1988.

Results: Apparent violations of 10 CFR 30.41(c) and Technical Specification 6.8 related to a shipment of 52 solidified oil drums to Quadrex-HPS, Inc. on November 25, 1987 (Detail 9).

## DETAILS

### 1. Persons Contacted

During the course of this routine inspection, the following personnel were contacted or interviewed:

#### 1.1 Licensee Personnel

- \*F. H. Crosse, Radwaste Shipping Supervisor
- \*G. F. Daebler, Superintendent, Technical
- \*A. B. Donell, Quality Assurance Site Supervisor
- M. Dragoo, Radwaste Projects Engineer
- \*J. E. Hesler, Radwaste Engineering Supervisor
- \*W. J. Knapp, Director, Radwaste Management Section (corporate)
- \*D. P. LeQuia, Superintendent, Plant Services
- R. Lubaszewski, Radwaste Shipping Engineer
- \*J. F. Mitman, Senior Engineer, Radwaste
- \*D.L. Oltmans, Senior Chemist

Other licensee and contractor personnel were also contacted or interviewed.

#### 1.2 Pennsylvania Department of Environmental Resources

- \*S. Maingi, Nuclear Engineer

#### 1.3 NRC Personnel

- T. P. Johnson, Senior Resident Inspector
- \*L. E. Myers, Resident Inspector
- \*R. J. Urban, Resident Inspector

\*Attended the exit interview on February 12, 1988

### 2. Scope

This routine safety inspection reviewed the licensee's solid radioactive waste (radwaste) processing and preparation and radioactive materials packaging and shipping programs (as implemented by the licensee) from October 25, 1986 through February 12, 1988. During that period, the licensee averaged 22 radioactive materials shipments per month (predominantly solid radwaste materials sent for disposal at two Agreement State-licensed low-level waste burial sites). A total of 16 shipments (including 13 radwaste and 3 other radioactive material shipments) were selected and reviewed relative to requirements in 10 CFR 71 and 49 CFR 170-189 and, for radwaste shipments, 10 CFR 20.311, 10 CFR 61.55-56 and the licensee's technical specifications and approved procedures. In addition, solid radwaste processing and preparation facilities and equipment and previously identified items were reviewed.

### 3. Previous Identified Items

#### 3.1 (closed) Unresolved Item (50-278/85-36-01): Fire Analysis For Low-level Radwaste Storage Facility.

The licensee's initial safety evaluation report failed to provide an analysis of the consequences of a fire in a storage cell at the licensee's low-level radwaste storage facility. Each storage cell was designed to contain radioactive material in high integrity containers (HICs) as dewatered resin. On December 19, 1985, following discussions concerning the possibility of fire in the storage cells, the licensee revised the safety evaluation to include the following:

- Dewatered resin has less than 0.5% freestanding water but contains about 50% by weight interlattice water;
- Testing by Aerojet Energy Conversion Company (to design a resin incinerator) has indicated that a substantial amount of supplemental fuel is required to burn resin because of the interlattice water;
- In order to burn, the stored resin must be subjected to an established fire with sufficient supplemental fuel to vaporize the water; and
- Since the resin is stored in concrete storage cells with minimum combustible material, supplemental fuel to support such a fire wasn't available.

In addition, self-combustion of the resin due to chemical reactions and hydrogen gas generation are controlled by the process and the facility design. Based on these considerations, the licensee concluded that there was little likelihood of resin involvement in a fire providing a substantial radioactive source term for offsite consequences. The inspector noted that dewatered resins in polyethylene HICs will not be stored in the facility in quantities approaching design values unless the licensee is unable to use offsite burial facilities. This item is closed.

#### 3.2 (Closed) Followup Item (50-278/85-36-02): Gas Generation In HICs

The licensee's passive vent design for the HICs was reviewed and accepted by the South Carolina Department of Health and Environmental Control as adequate to prevent container breach during storage, shipment and disposal. Administrative controls for the storage cells include annual venting of any hydrogen gas generated during storage within the cell. Ventilation of the cell area continuously removes any evolved gas preventing buildup to lower explosive limits. This item is closed.

3.3 (Closed) Followup Item (50-278/85-36-03): Preops Testing

Preoperational test results for the low-level radwaste storage facility were reviewed and approved by the Plant Operations Review Committee (PORC). Test exceptions were dispositioned and/or corrected and also reviewed by the PORC. This item is closed.

3.4 (Closed) Followup Item (50-278/86-36-04): Operating Procedures

The licensee has developed and implemented controlled Radwaste (RW-Series) procedures for the low-level radwaste storage facility. This item is closed.

3.5 (Closed) Followup Item (50-277/86-21-01; 50-278/86-22-01):  
Update Scaling Factors

The licensee has developed and implemented procedures to evaluate and incorporate new scaling factors for hard-to-identify radionuclides as additional vendor analysis reports are received. Review indicated that the 1986 updates to scaling factors had been included. Discussion indicated that the 1987 updates (received by the licensee in January 1988) were being reviewed and evaluated for incorporation into procedures. This item is closed.

3.6 (Closed) Violations (50-277/86-21-02; 50-278/86-22-02;  
50-277/86-21-03; 50-278/86-22-03; 50-277/86-21-04; 50-278/86-22-04)  
Iron-55 and Nickel-63 problems with shipment No. 45-86.

The licensee completed actions as described in the licensee's letters dated December 31, 1986 and March 30, 1987. These actions included re-evaluation of the activities, radionuclides and classification of 152 licensee shipments and updates to shipping and disposal records and institution of revised procedures to prevent recurrence of the problem. These items are closed.

4. Management Controls

The licensee's organization, staffing, procedures and training were reviewed relative to licensee commitments and technical specification requirements.

4.1 Organization

The organizational structure of the licensee's solid radwaste processing and preparation (including oversight of contracted dewatering services) and radioactive materials packaging and shipping activities was reviewed and discussed with the licensee. The inspector noted that the station organization was undergoing substantial change. Three related functional areas, (i.e. health physics, chemistry and radwaste), reported through their respective senior engineers to the Superintendent-Services. The recently formed Radwaste Organization (under the Senior Engineer-Radwaste) consolidated waste processing,

classification, inventory, minimization, planning and engineering activities and radioactive materials packaging and shipping into a single organization. Although the licensee hadn't completed all aspects of the reorganization, the inspector noted that roles and responsibilities were being defined and long-standing radwaste problems were being aggressively addressed by the new organization, (e.g. a backlog of about 60,000 cubic feet of radwaste materials had been reduced to less than 10,000 cubic feet since August 1987). Interfaces with other station organizations (e.g. health physics, chemistry, operations and quality assurance/quality control) appeared to be improved in definition of roles and responsibilities and to be better understood by the radwaste staff. Roles of other groups, (e.g. Reactor Engineering regarding fuel pool disposal projects), had also been defined. The reorganization had strengthened and clarified the radwaste functions relative to those groups in ways that addressed long-standing weaknesses in control of those radwaste operations.

#### 4.2 Staffing

The inspector reviewed staffing within the Radwaste Group and noted that approximately 75% of the staff (including but not limited to senior technical/professional staff) was supplied by contractors including Hydro Nuclear Services and Bechtel National, Inc. The long-term stability of the staff was discussed with the licensee and the need for continuity of program was stressed.

#### 4.3 Procedures

The licensee has been extensively revising and updating existing procedures and developing new procedures to support solid radwaste and shipping activities. The new Radwaste (RW) Procedure series include:

- 100 Series procedures which are administrative in nature;
- 200 Series procedures which deal with processing and packaging radioactive materials;
- 300 Series procedures which deal with shipments of radwaste for disposal;
- 400 Series procedures providing instructions for shipping non-waste radioactive material;
- 500 Series procedures for support functions; and
- 600 Series procedures covering plant radwaste system operations.

The inspector selected ten procedures for review relative to 10 CFR 20.311, 10 CFR 61.55-56, 10 CFR 71 and 49 CFR 170-189 requirements:

- RW 110, "10 CFR 61 Compliance Program," Revision 0 (August 1, 1987);
- RW 200, "Control of Containers," Revision 2 (January 11, 1988);

- RW 260, "Operation of Resin Drying (Dewatering) System," Revision 3 (August 1, 1987);
- RW 300, "General Requirements for Exclusive Use Radwaste Shipments," Revision 0 (December 29, 1987).
- RW 330 "Radwaste Shipments to Barnwell," Revision 9 (December 29, 1987);
- RW 380, "Response to Lost Radwaste Shipments," Revision 0 (July, 1987);
- RW 520, "10 CFR 61 Sampling," Revision 2 (November 11, 1987);
- RW 540, "Movement of Radioactive & Non-Radioactive Material for storage at Unit 1 or LLWSF," Revision 0 (May 18, 1987);
- RW 320.1, "Loading and Closing the HN-100 Series 2 or 3 Radioactive waste shipping cask," Revision 1 (January 8, 1988); and
- RW 320.8 "Loading and Closing the CNSI 14-195H Radioactive Waste Shipping Cask," Revision 1 (December 29, 1987).

In addition to the procedures above, the licensee's computer programs used to classify radwaste shipments and to select packaging were reviewed.

Within the scope of these reviews, the following item was identified:

- The licensee uses three MIDAS Fortran IV and one Lotus 1-2-3 Spreadsheet programs to calculate individual and total radioactivities, classify radwastes, select packaging and provide supporting calculations. The programs are supplemented by additional review by Radwaste technical personnel to prepare Waste Manifests and Radioactive Shipping Records. The MIDAS Fortran IV programs are dated and follow nomenclature and methods used prior to 1983 changes to 49 CFR requirements. The Spread Text program is current but misleading (e.g. 10 CFR 61.55, Table I isotopes are treated as though there are Class B limits though Class B limits do not exist for Table I). Discussions with the licensee indicated that the Bechtel PAKRAD program will replace existing programs providing improved radwaste and package selection classifications. Although errors associated with the existing programs weren't noted to have caused regulatory problems in the 16 shipments sampled, implementation of the improved computer program for compliance areas is recommended and will be reviewed during a subsequent inspection 50-277/88-05-01; 50-278/88-05-01.

In other respects, the licensee's procedures were adequate.

#### 4.4 Indoctrination and Training

The indoctrination and training of personnel assigned to the Radwaste organization were reviewed briefly relative to commitments in the licensee's letter (dated September 28, 1979) responding to NRC IE Bulletin No. 79-19. Five members of the licensee's staff were questioned concerning annual retraining in 1987. All five had attended the annual retraining.

Within the scope of this review, no deviations were noted.

### 5. Quality Assurance/Quality Control

The application of the licensee's quality assurance/quality control program to solid radwaste processing and preparation and radioactive materials packaging and shipping activities was reviewed.

#### 5.1 Waste Generator Quality Control

Specific quality control requirements are mandated by 10 CFR 20.311 to assure compliance with 10 CFR 61.55-56. RW series procedures were reviewed to determine if appropriate quality control checks were included to ensure classification of radwaste shipments under 10 CFR 61.55 and proper radwaste form under 10 CFR 61.56. Thirteen radwaste shipments were reviewed for implementation of the procedural holdpoints (under current RW or previous HPO/CO series procedures), verification of dewatering for resin shipments and verification of hardness for solidified oils. Audit No. AP 86-111 HPC, "PBAPS 10 CFR 61 Compliance," (November 3 through December 11, 1986), was reviewed to determine its inclusion of attributes related to 10 CFR 61.55-56 compliance, management review of the audit and resolution of findings and recommendations. The inspector noted that the licensee had narrowed the scope of the audit coverage to improve the technical depth in each area of review in response to earlier comments in the 1986 NRC Inspection of this area. Appropriate inspection holdpoints were included in procedures and witnessed by quality control personnel suitably knowledgeable in the radwaste area for the thirteen shipments reviewed. Audit No. AP 86-111 HPC adequately covered attributes of 10 CFR 61.55-56 and had received appropriate management review and resolution of findings.

Within the scope of this review, no violations were identified. The licensee was implementing an effective quality control program under 10 CFR 20.311.

#### 5.2 Radioactive Materials Shipper Quality Assurance/Quality Control

10 CFR 71, Subpart H requires the establishment of a quality assurance program for the packaging and transportation of radioactive materials. A commission-approved Quality Assurance Program (under 10 CFR 50, Appendix B) is acceptable provided it is established,

maintained and implemented for transport packages. The licensee elected to apply the established 10 CFR 50, Appendix B program to packaging and shipping activities. RW and HPO/CO series procedures (previously used) were reviewed to determine quality control attributes verified in receipt and shipping inspections of transport packages. Implementation of those procedures was verified for the sixteen radioactive materials shipments reviewed. Under 10 CFR 71.12, applicable items of the package's Certificate of Compliance must be reviewed and those were verified for shipments made pursuant to 10 CFR 71.12. Surveillance activities of shipping procedures were also reviewed. Audit No. AP 86-02 HPC, "PBAPS Radioactive Waste/Material Storage, Handling and Shipping," was reviewed for inclusion of attributes needed to ensure compliance with 10 CFR 71. The inspector noted that the audit team members were technically qualified in radioactive materials shipping requirements.

Within the scope of this review, no violations were noted. The licensee had applied applicable portions of the Commission-approved 10 CFR 50, Appendix B program to shipping activities.

### 5.3 Process Control Program

Under Technical Specification 3/4.8, the licensee is required to have a Process Control Program (PCP). Under the PCP, solid radwaste sampling and testing requirements are established. The licensee's application of the PCP to centrifuge dewatering, oil solidification and vendor dewatering operations was reviewed and discussed with the Radwaste Engineering Supervisor and a member of his staff. The bases for the program in each area was reviewed and appropriate implementation was verified for the radwaste shipments reviewed.

Within the scope of this review, no violations were noted. The licensee had provided an effective PCP for each of the radwaste processes reviewed.

## 6. Radiochemistry

The "Low-level Waste Licensing Branch Technical Position on Radioactive Waste Classification," (May, 1983, Revision 0), suggests an acceptable sampling and analysis program for power reactors to meet 10 CFR 61.55 Waste Classification requirements for hard-to-identify radionuclides and allows the use of scaling or correlating factors to gamma-emitting radionuclides. Licensee fuel performance and reactor coolant system radioactivities were reviewed to determine the general adequacy of the licensee's sampling and vendor analysis program for hard-to-identify radionuclides. The licensee had generated and shipped Class A and Class B solid radwastes and had sampled the radwaste streams in 1986 and 1987. Review of radiochemistry data showed that substantial changes in fission product and activation product concentrations had not occurred without subsequent sampling and revision of scaling factors. Radiochemical data sufficient to characterize new radwaste processes had been provided.

Within the scope of this review, the licensee was meeting suggested sampling and analysis frequencies.

## 7. Solid Radwaste Processing/Preparation

The licensee collects, processes, temporarily stores and prepares dry active waste, deionizer resins, oils and radioactive hardware for offsite disposal at Agreement State-licensed disposal sites. Considerable change had occurred since the last inspection:

- In July 1987, the licensee switched from use of 55 gallon polyethylene HICs to much larger HICs for wet wastes;
- Vendor-supplied dewatering services were used for the larger HICs in place of the installed centrifugation system in the Radwaste Building;
- Modifications were under way to install the azeotropic distillation and polyester solidification process known as AZTEC for operation in 1989;
- Increasing use of the low-level radwaste storage facility necessitated intrasite shipment of dewatered large HICs and dry active waste; and
- Radwaste shipments were made to an offsite vendor for decontamination/recycle and repackaging/disposal operations.

In addition, the licensee was conducting a campaign to characterize, prepare for shipment and dispose of accumulated solid radwaste (some of which had been onsite since 1983). Future planning includes vendor-supplied solidification of decontamination resins used in the Unit 3 pipe replacement project and additional disposal of activated components stored in the fuel pools.

The changes to radwaste processing operations which involved modifications to existing plant equipment were reviewed relative to requirements in 10 CFR 50.59 and consensus standards provided in ANSI/ANS 55.1 - 1979, "American National Standard for Solid Radioactive Waste Processing Systems for Light Water Cooled Reactor Plants."

### 7.1 Modification No. 1750A

This modification provided interface piping and an enclosure building to support operation of a resin dewatering system behind the Unit 2 Reactor Building. The dewatering process included pumping a resin slurry into a large HIC and using an air-driven vacuum pump to extract free-standing liquid. The inspector toured the operation, reviewed procedures and valve alignments and examined the safety evaluation prepared by the licensee to support the modification. The

safety evaluation was reviewed and approved by the PORC (Meeting No. 87-70) under 10 CFR 50.59 and station technical specifications.

Within the scope of this review, no violations were noted.

## 7.2 AZTEC

General Electric Company developed a volume reduction and radwaste solidification system which uses an azeotropic distillation mechanism (to remove water from wet waste) and a polyester solidification process (to provide a suitable waste form). The process has been reviewed and accepted by the NRC and the States of South Carolina and Washington. Since the modification to use this process was incomplete, the process control aspects of the system and the disposal of toluene were discussed with the licensee. The review of the licensee's modification to house the operation, safety review and licensing requirements and normal operation were postponed pending a licensee decision on use of the process.

## 7.3 Low Level Radwaste Storage Facility

The switch from 55 gallon HICs to larger HICs allowed the licensee to use a transfer cask for dewatering and intrasite transfer of the resulting dewatered resins. Final preparations for shipment could be conducted at the licensee's low level radwaste storage facility. On February 10, 1988, the inspector toured the facility and observed a transfer of a dewatered HIC from the transfer cask to a shipping cask in the facility's truck bay area. No problems were noted during this review.

The inspector reviewed licensee records for radioactive material inventory in the facility and noted that stored inventory was well within the facility's design capacity and waste form/packaging were also suitable for the facility. The total inventory stored in the facility amounted to approximately 146 curies.

## 7.4 Unit 3 Turbine Storage Area

On February 10, 1988, the inspector and the Senior Resident Inspector toured the locked high radiation area at the Unit 3 Turbine deck. The area contained approximately 185 drums (about 1300 cubic feet) of stored radioactive materials. Radiation readings associated with the drums ranged from about 40 millirems per hour to about 60 rems/hour contact. The licensee had set up a tent and temporary shield wall to process each drum for eventual disposal. Discussions with the licensee indicated that the licensee planned to characterize, process and ship for disposal as much of the radwaste as possible. However, many of the drums contained radioactive materials for which the licensee had little information necessitating examination and preparation activities. The inspector noted that some of the drums had been onsite since about 1983 and had been stored previously in

the Unit 2 Turbine locked high radiation area. Although the licensee was making a considerable effort to reduce radwaste volume stored onsite, the lack of necessary information on the drums in storage was hampering the effort.

#### 8. Radwaste Generator Requirements

The inspector reviewed thirteen radwaste shipments made by the licensee against each of the following radwaste generator requirements:

- Waste Manifests under 10 CFR 20.311(d)(4) and 20.311(b) and (c);
- Waste Classification under 10 CFR 20.311(d)(3) and 10 CFR 61.55;
- Waste Form and Characterization under 10 CFR 20.311(d)(3) and 10 CFR 61.56;
- Waste shipment labeling under 10 CFR 20.311(d)(2) and 10 CFR 61.55;
- Tracking of radwaste shipments under 10 CFR 20.311(d), (e), (f) and (h); and
- Adherence to disposal site license conditions for Agreement State licenses under 10 CFR 30.41.

The basis for determination of waste class, (e.g. sampling, vendor analyses, scaling factors for hard-to-identify radionuclides and calculations) was also reviewed for each shipment. The basis for concluding that a suitable waste form was provided was also reviewed for each shipment of dewatered or solidified radwaste materials.

Within the scope of this review, no violations were noted. Adequate technical bases were noted for Class A and B routine shipments. The licensee had taken appropriate samples, updated scaling factors using accepted methods and implemented the classification program consistent with NRC regulatory guidance. The process control program, routine tests of process parameters and process quality control inspection holdpoints were implemented for the thirteen shipments.

#### 9. Radioactive Materials Shipping Requirements

Sixteen radioactive material shipments, (i.e. thirteen solid radwaste and three other radioactive materials shipments to other licensees), were reviewed relative to criteria provided in 10 CFR 71 and 49 CFR 170-149 to determine if transportation requirements had been met. General requirements for transfer of radioactive materials under 10 CFR 30.41, 10 CFR 40.51 and 10 CFR 70.42 and adherence to licensee procedures under Technical Specification 6.8 were also reviewed. Performance relative to these criteria was determined by:

- review of procedures, procurement documents, certificates of compliance and radioactive shipping records;
- interviews and discussions with licensee personnel concerning shipment preparation, placarding, radiation/contamination survey techniques, labeling, securing shipments and other matters; and

- direct observation of licensee's shipment No. 12-88 made on February 10, 1988.

Within the scope of this review, the following violation was identified:

- 10 CFR 30.41(c) requires, in part, that each licensee transferring byproduct material verify that the recipient's license authorizes receipt of the type, form and quantity of the byproduct material to be transferred. Technical Specification 6.8 requires, in part, that procedures be implemented. Licensee's Procedure HPO/CO-17 requires verification of the recipient's license prior to transfer.

Contrary to these requirements, on or about November 25, 1987, the licensee transferred 52 solidified drums of waste oil (as shipment No. 82-87) containing an estimated 53.51 millicuries of tritium to Quadrex-HPS, Inc. in Oak Ridge, Tennessee. The Tennessee Radioactive Material License, (Number R-01037-L7), did not authorize the recipient to possess tritium in the form of solidified oil at that time. Amendment 38 to that Tennessee Radioactive Material License authorized receipt of the drums for repackaging and subsequent disposal on December 8, 1987 and was issued as a temporary amendment (to expire on January 8, 1988) to allow receipt of the licensee's shipment. Subsequent recalculation by the licensee reduced the estimated tritium content of the shipment to 0.25 millicuries and a revised radioactive shipping record was sent to Quadrex-HPS, Inc. on December 1, 1987. However, the licensee failed to verify that the recipient could receive tritium contained in oil solidified in Environstone prior to shipping on November 25, 1987. That failure constitutes a violation of 10 CFR 30.41(c) and Technical Specification 6.8. (50-277/88-05-02; 50-278/88-05-02)

#### 10. Exit Interview

The inspector met with the licensee's representatives (denoted in Detail 1) at the conclusion of the inspection on February 12, 1988. The inspector summarized the scope and findings of the inspection as described in this report.

At no time during the inspection was written material provided to the licensee by the inspector. No information exempt from disclosure under 10 CFR 2.790 is discussed in this report.