

U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report No. 50-354/88-14

Docket No. 50-354

License No. NPF-50 Category C

Licensee: Public Service Electric and Gas Company  
P. O. Box 236  
Hancock's Bridge, New Jersey 08038

Facility Name: Hope Creek Generating Station

Inspection At: Hancock's Bridge, New Jersey

Inspection Conducted: April 18-22, 1988

Inspectors: W. Pasciak 6/20/88  
H. Bicehouse, Radiation Specialist date

Approved by: W. Pasciak 6/20/88  
W. J. Pasciak, Chief, Effluents Radiation date  
Protection Section

Inspection Summary: Inspection on April 18-22, 1988 (Inspection Report No. 50-354/88-14)

Areas Inspected: Routine, unannounced inspection of the licensee's solid radioactive waste (radwaste) processing, preparation, packaging and shipping program including previously identified items, management controls, quality assurance and implementation of the program from January 1987 through April 22, 1988.

Results: Within the areas reviewed, no violations or deviations were noted. The licensee implemented a generally effective solid radwaste program during the first fuel cycle and subsequent refueling outage.

## Details

### 1. Persons Contacted

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

#### 1.1 Licensee Personnel

- \*R. Beckwith, Station Licensing Engineer, Hope Creek Generating Station (HCGS).
- \*T. Cellmer, Acting Radiation Protection/Chemistry Manager, HCGS
- \*J. Clancy, Principal Health Physicist, Radiation Protection/Chemistry Services
- \*E. Devany, Technical Engineer, HCGS
- \*J. Gomeringer, Radiation Protection Supervisor, Salem Nuclear Generating Station (SNGS)
- \*R. Griffith, Principal Engineer, Quality Assurance, HCGS
- \*B. Hunkele, Senior Radiation Protection Supervisor, SNGS
- \*E. Karpe, Senior Radiological Engineer, HCGS
- \*S. LaBruna, General Manager, Hope Creek Operations
- \*D. Mohler, Manager, Radiation Protection/Chemistry Services
- \*G. Morrill, Radiation Protection Supervisor, HCGS
- \*J. Nichols, Technical Manager, HCGS
- \*M. Prystupa, Chemistry Engineer, HCGS
- \*J. Ruckz, Technical Engineer, HCGS
- \*J. Wray, Senior Radiation Protection Supervisor, HCGS

Other licensee personnel were contacted or interviewed during the inspection.

#### 1.2 General Electric Company (GE)

- \*M. Farschon, GE Site Services Manager

#### 1.3 NRC Personnel

- \*G. Meyer, Senior Resident Inspector

\*Attended the exit interview on April 22, 1988

### 2. Scope of the Inspection

The routine safety inspection reviewed the licensee's solid radioactive waste (radwaste) processing, preparation, packaging and shipping program as implemented by the licensee from January 1987 through April 22, 1988. During that period, (i.e. first operating cycle and initial refueling

outage), the licensee made 65 solid radwaste shipments of wastes originating at HCGS. A sample of 16 shipments was selected and reviewed relative to criteria in the licensee's Technical Specifications, radwaste generation requirements in 10 CFR 20.311 and 10 CFR 61.55-56, and radioactive materials shipping requirements in 10 CFR 71 and 49 CFR 170-189. In addition, the licensee's actions regarding previously identified items were also reviewed.

During the first operating cycle and the first refueling outage, the licensee made shipments of three solid radwaste forms, i.e. dry active waste, dewatered bead resins and dewatered powder resins. The licensee collects, compacts and ships dry active waste in "strong-tight" containers, (e.g. CGR Boxes). Bead resins are sluiced to a collection tank, transferred to a liner (or high integrity container), dewatered by a contract vendor, packaged and shipped. Powder resins are backflushed to phase separator tanks, recirculated for mixing, transferred to a liner (or high integrity container), dewatered by a contract vendor, packaged and shipped. In 1987, the licensee shipped approximately 362 curies. Through April 13, 1988, the licensee had shipped approximately 2,254 curies.

### 3. Previously Identified Items

#### 3.1 (Open) Followup Item (50-354/85-44-10): Review test results for solid radwaste system

The licensee's installed solidification/dewatering system, (asphalt), was undergoing tests to provide assurance that a suitable waste form was being provided and to identify and define key process parameters to develop a site-specific process control program (PCP). Although extensive testing had been completed, the test program remained incomplete. This item remains open.

#### 3.2 (Closed) Followup Item (50-354/86-44-02): Procedures to classify, mark, label and manifest solid radwaste materials

Procedures governing the interface agreement between HCGS and SNGS concerning shipment of solid radwaste materials had been finalized and implemented. The procedures were acceptable and defined responsibilities adequately. This item is closed.

#### 3.3 (Closed) Followup Item(50-354/86-44-03): Administrative controls to evoke recharacterization of waste streams

Licensee's procedures, (e.g. RP-TI.ZZ-902(Q)), provided acceptable criteria to ensure that waste streams would be recharacterized if significant changes in Reactor Coolant System (RCS) radioactivities were noted during routine radiochemical surveillances. This item is closed.

3.4 (Closed) Followup Item (50-354/86-44-06): Develop/Implement a site-specific PCP

A waste stream specific process control program had been developed and implemented for wet radwaste materials, (e.g. resins), using vendor-supplied dewatering services. Appropriate inspection holdpoints to assure adequate dewatering were included in the licensee's procedures and had been implemented for radwaste shipments reviewed. This item is closed.

3.5 (Closed) Violation (50-354/87-02-01, 02, 03): Failure to include Fe-59 and Zr-95 in shipping papers.

Actions described in the licensee's letter (dated March 13, 1987), had been implemented. Radioisotopic data were properly incorporated and presented in the 16 shipments reviewed during the inspection. These items are closed.

4. Management Controls

The licensee's management controls were reviewed to determine if clear designations of responsibilities had been made and implemented and controlled procedures were provided for processing, preparation, packaging and shipping activities. Emphasis in the review was placed on the control of the interface between HCGS and SNGS regarding these activities.

4.1 Responsibilities

The inspector reviewed the Letter of Agreement between HCGS and SNGS and noted that it clearly delineated responsibilities. Implementing interface procedures governing transfers of radwaste materials between HCGS and SNGS were in place and being appropriately implemented. The effectiveness of the interface controls between HCGS and SNGS had been improved since NRC Inspection No. 50-354/87-02.

4.2 RADMAN Computer Code

The licensee uses the RADMAN computer code to support the radwaste classifications, prepare waste manifests and maintain the waste-specific database for HCGS. The computer code relies on a waste-specific database to characterize and classify packaged solid radwaste materials. The licensee routinely obtained waste stream samples for inhouse (HCGS) gamma spectroscopy and more detailed radiochemical analyses by a vendor laboratory, (Teledyne). The data were reviewed by the computer code vendor, (WMG, Inc.), and recommendations for licensee action were made by that vendor. The licensee's management (HCGS) reviewed the computer code vendor's report, issued instructions to update the database and verified completion of the updates by SNGS personnel. SNGS personnel entered

gamma spectroscopic analytical results for each of the 16 shipments into the program and provided the computer runs to HCGS personnel for "quality verifications" of the input and output data before shipment. The inspector concluded that the licensee had corrected the weakness noted in this process during the previous inspection, (NRC Inspection No. 50-354/87-02).

#### 4.3 Interface Procedures

The following procedures governing the interface between HCGS and SNGS regarding solid radwaste disposal activities were reviewed relative to regulatory requirements, checked for compatibility with the interface agreement and verified to have been properly implemented for the 16 shipments:

- RP-TI.ZZ-902(Q), "Radioactive Waste Sampling And Classification," Revision 0, (March 13, 1987);
- RP-TI.ZZ-903(Q), "Use of RADMAN," Revision 0, (March 13, 1987);
- RP-TI.ZZ-904(Q), "Dose Curie Conversion Calculations," Revision 0, (March 13, 1987); and
- RP-TI.ZZ-905(Q), "Transfer of Radioactive Waste To SNGS", Revision 1 (November 25, 1987).

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

#### 4.4 Training

In response to NRC IE Bulletin No. 79-19, the licensee committed to annual retraining for personnel involved in solid radwaste packaging and shipping activities. This commitment was extended by the licensee to include HCGS personnel. The inspector briefly reviewed supervisory, technician, quality assurance and quality control training to determine if annual retraining had been completed. Two supervisors, six technicians, two quality control inspectors and two quality assurance engineers involved in one or more of the 16 shipments were selected for review. Each had received training in 1987.

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

#### 4.5 Audits

Under the licensee's quality assurance program, annual audits of the HCGS and SNGS radwaste programs and triennial audits of vendor programs were specified. A joint audit of the HCGS and SNGS radwaste programs was completed by the licensee's Nuclear Department Quality Assurance group from June 22, 1987 through July 10, 1987,

(i.e. Audit NM-87-04). The audit reviewed gaseous, liquid and solid radwaste activities at both SNGS and HCGS, received management review (as required by 10 CFR 20.311(d)(3) for radwaste generation), and was conducted by a team of auditors including a vendor-supplied technical specialist. The inspector noted the broad scope of the audit and suggested limitation of scope in subsequent audits to allow more detailed review. Findings from the audit were resolved in a timely manner by station management.

The inspector selected three vendors who supplied shipping packages, analytical services and the RADMAN computer program to determine if triennial vendor audits of these suppliers had been completed. The licensee had audited the package supplier (Audit NS-85-028, September 1985) and the analytical services laboratory (Audit NM-87-34) but had not audited the computer program supplier. As noted in Detail 4.2, the latter supplier also reviewed and evaluated radioanalytical data and provided recommendations to the licensee. The inspector noted that an audit of that supplier wasn't outside the triennial audit commitment at the time of the inspection.

5. Radwaste Generator Quality Control

Specific quality control (QC) requirements are required by 10 CFR 20.311 to assure compliance with 10 CFR 61.55-56. A process control program for dewatering activities is required by the licensee's Technical Specifications. As noted in the previous inspection, the licensee had incorporated specific inspection holdpoints in procedures governing dewatering of resin shipments by the on-site vendor. Procedural requirements for "Quality Verification" of classifications by HCGS technical personnel have been added to the procedures. In addition, Quality Assurance personnel check classification calculations during periodic surveillances of shipments. The inspector reviewed radwaste manifests and supporting documents to determine if these procedures had been implemented for fourteen resin shipments.

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

6. Radioactive Materials Shipper Quality Assurance/Quality Control

The provisions of 10 CFR 71, Subpart H require the establishment of a quality assurance program for the packaging and transportation of radioactive materials. A Commission-approved quality assurance program which satisfies the applicable criteria of 10 CFR 50, Appendix B and which is established, maintained and executed with regard to transport packages is acceptable to meet the requirements of 10 CFR 71, Subpart H. The licensee elected to apply their currently established 10 CFR 50, Appendix B quality assurance program to the packaging and shipment of radioactive materials. Since SNGS conducted the actual shipment of HCGS radwaste materials, the inspector reviewed implementation of the SNGS program regarding receipt of shipping containers, vehicle and package inspections and assurance of package maintenance for packages and

shipments of HCGS radwaste materials. In addition, control of high integrity containers (HICs), steel liners and "strong-tight" dry active waste (DAW) containers by HCGS were also reviewed.

Within the scope of this review, no violations were noted. The licensee had established a matrix and implemented the applicable portions of the 10 CFR 50, Appendix B program to HCGS radioactive materials shipping containers used in the sixteen shipments reviewed.

#### 7. Chemistry/Radiochemistry

The inspector reviewed HCGS fuel performance, adherence to the licensee's water chemistry control program, powder replacement, bead resin regeneration and disposal and Reactor Coolant System (RCS) radiochemistry to determine the general adequacy of the licensee's sampling and vendor analysis program for difficult-to-identify radionuclides and possible causes for substantial increases in Zinc-65 concentrations in four of the sixteen shipments reviewed.

Within the scope of this review, the following observations were made:

- Fuel performance during the first operating cycle showed no evidence of fuel leakage of fission products sufficient to cause recharacterization of radwaste streams;
- Sulphate intrusions into the RCS were noted (believed by the licensee to be due to incomplete vulcanization of rubber seals);
- Dissolved oxygen was frequently less than the 20 parts per billion (ppb) lower guideline established in consensus guides for boiling water reactors;
- The licensee conducted a hydrogen water chemistry minitest;
- Difficulty in maintaining Zinc injections was experienced with the General Electric Zinc Injection Process (GEZIP); and
- Increases in iron-59 activity accompanied increased zinc-65 activity.

#### 8. Zinc-65 Problem Assessment

Four fuel pool cleanup powder resin radwaste shipments totalled 2,036 curies (46-89% zinc-65 activity) compared with an expected 200-300 curies zinc-65 per year for all radwaste shipments. Based on the review of chemistry/radiochemistry data and the addition of data gathered during review of solid radwaste processing, the inspector noted the following problems due to the large amounts of zinc-65:

- ° The transfer of the powder resins from the fuel pool phase separator tanks to the liners and dewatering resulted in liners with contact dose rates to 184 rads per hour.
- ° Since the solid radwaste system wasn't designed for handling large liners with high radiation fields, unusually high radiation fields were noted in adjacent areas of the licensee's Administration Building causing the imposition of radiation protection controls, (i.e. partial evacuation of the building during liner processing and transfer activities).

#### 9. Powder Sampling Problem

The licensee sampled the fuel pool cleanup powder resins during recirculation and after dewatering in the liners and noted that sample radioanalytical results did not correlate well. The inspector noted that sampling activities (with the high radiation fields associated with the liners) resulted in approximately 600 millirem exposures to the samplers each time. Review of the sampling results from samples obtained from dewatered liners showed little correlation with calculated activities based on dose rate to curie calculations. Review of recirculation times prior to slurry sampling, (i.e. before transfer to the liner) showed that the licensee recirculated approximately 30 minutes total. The inspector noted that other licensees have determined that four hour recirculation times are needed to achieve uniformly mixed slurries of powder resins and ensure thorough powder removal from phase separator tanks. The inspector suggested increasing slurry recirculation times to achieve more uniform mixing, discontinuing sampling of dewatered liners directly for radiation protection reasons and using samples of the powder slurry during recirculation to determine radioisotopic mix.

#### 10. Powder Resin Dewatering Problem

On March 18, 1987, the licensee informed the NRC Resident Inspectors that five of thirteen liners of powder resin previously dewatered and stored up to three months onsite contained free-standing liquid in excess of burial site acceptance criteria. The licensee stated that no shipments of dewatered powder resins would be made if free-standing liquid in excess of burial site acceptance criteria was evident during surveillance prior to shipment and indicated that the dewatering vendor was investigating the cause for the dewatering problem. During this inspection, corrective actions taken by the licensee and the dewatering vendor were reviewed and discussed with the licensee. Dewatering equipment modifications were made by the dewatering vendor and subsequent surveillance activities showed that free-standing liquids in excess of burial site acceptance criteria were not present in subsequent powder resin liners processed. Inspections by the Agreement State of powder resin shipments made by the licensee did not show any shipments with free-standing liquids in excess of burial site acceptance criteria.

### 11. Other Solid Radwaste Processing

The licensee's bead resin and dry active waste solid radwaste processing activities were reviewed. As described in Detail 2, bead resins are dewatered by an on-site contracted vendor. Dry active wastes are collected and compacted prior to shipment. Review of the operations did not note any problems associated with these operations.

### 12. Radwaste Generator Requirements

The inspector reviewed the sixteen shipments sampled 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 waste 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 for difficult-to-identify radionuclides, and calculations) was also reviewed for each shipment relative to the guidance in the Branch Technical Position.

Within the scope of this review, no violations were noted. Adequate technical bases were noted for the shipments. The licensee used appropriate technical assessments for the fuel pool powder resin shipments realizing their similarity to reactor water cleanup powder resins given the circumstances of the zinc-65 problem. The licensee took generally appropriate samples, updated scaling factors in the RADMAN database and correctly classified the shipments as Class A. Appropriate quality control for dewatering activities was also noted.

### 13. Radioactive Materials Shipping Requirements

The sixteen shipment sample was reviewed relative to criteria contained in 10 CFR 71 and 49 CFR 170-189 to determine if transportation requirements had been met. The licensee's selection of packages, preparation for shipment and delivery of packages to carriers were reviewed. Review of records for HCGS shipments by SNGS, discussions with

SNGS radiation protection personnel and observation of Shipment No. 88-17 on April 20, 1988 were used to assess licensee performance in this area.

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

14. Exit Interview

The inspector met with the licensee's representatives (denoted in Detail 1) at the conclusion of the inspection on April 22, 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.