U.S. NUCLEAR REGULATORY COMMISSION REGION I

Report No. 50-311/85-12

Docket No. 50-311

License No. DPR-75

Priority --

Category <u>c</u>

Licensee: Public Service Electric and Gas Co.

P. O. Box 236

Hancocks's Bridge, New Jersey 08038

Facility Name: <u>Salem Unit 2</u>
Inspection At: <u>Hancocks Bridge</u> , New Jersey
Inspection Conducted: April 15-19, 1985
Inspectors: M. Shankey
M. Shankrky M.T. Dragoun, Radiation Specialist
Approved by: <u>M. Shanhaly</u> M. Shanbaky, Chief, PWR

Radiation Protection Section

<u>24/85</u> date 74/85

Inspection Summary: Inspection on April 15-19, 1985 (Report No. 50-311/85-12).

Areas Inspected: Routine, unannounced inspection of the radiation safety program including: status of previously identified items; internal exposure assessment; organization and staffing; routine radiological surveys; abnormal environmental sample; ALARA; calibration and maintenance of survey meters; and personnel dosimetry. The inspection involved 80 inspector-hours on site by two region based inspectors.

Results: No violations were identified.

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DETAILS

1. Persons Contacted

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

1.1 Licensee Personnel

- L. Miller, Assistant General Manager, Salem Operations
- *L. Fry, Operations Manager
- *J. O'Connor, Radiation Protection Engineer
- *W. Ferguson, Senior Supervisor Radiation Protection
- *J. Johnson, Radiation Protection Services
- *D. Perkins, Station Quality Assurance Engineer
- *B. Smith, Associate Engineer
- *D. Dodson, Licensing Engineer

1.2 NRC Personnel

- *R. Summers, Resident Inspector
- *C. Woodard, Region Inspector

*Attended the Exit Interview on April 19, 1985.

2. Purpose

The purpose of the routine inspection was to review the licensee's radiation protection program with respect to the following elements:

- Status of Previously Identified Items
- Internal Exposure Assessment
- Organization and Staffing
- Routine Radiological Surveys
- Environmental Monitoring Abnormal Measurement
- ALARA for a Coolant Pump Inspection
- Calibration and Maintenance of Portable Survey Equipment
- Personnel Dosimetry
- 3. <u>Status of Previously Identified Items</u>
 - 3.1 (Closed) Followup Item (84-09-01) QA Audits per Technical Specification 6.5.2.8 to review performance of the plant staff. The audit

plans for 1984 and 1985 were revised to include a staff performance evaluation.

- 3.2. (Open) Follow-up Item (84-09-03) Implement revised radiation protection procedures. The licensee has shown progress but has not completed this project.
- 3.3 (Closed) Violation (84-13-03) Failure to post and control access to a very high radiation area (Skimmer Filter Room). The licensee has installed locked gates and posted the rooms. Action as described in PSE&G letter dated May 24, 1984 is complete and satisfactory.
- 3.4 (Closed) Followup Item (84-21-01) Radiation Protection Services to issue ALARA Manual. A manual was issued June 15, 1984.
- 3.5 (Open) Followup Item (84-21-02) ALARA Engineer to coordinate man-rem estimates. ALARA procedure AP-7 requires ALARA Engineer review of refined exposure estimates for REP jobs but does not require specific engineer approval of the man-rem goal.
- 3.6 (Closed) Followup Item (84-21-04) Expand procedure for response to CAM alarm. Procedures RP 8.031 and RP 8.042 have been revised to require additional air sampling and analysis in the event of an alarm.
- 4. Internal Exposure Assessment

The adequacy of the licensees internal exposure assessment program was reviewed against criteria contained in:

- 10 CFR 20.103 Exposure of individuals to concentrations of radioactive materials in air in restricted areas
- 10 CFR 20.401 Record of surveys, radiation monitoring, and disposal
- 10 CFR 19.13 Notifications and reports to individuals
- Regulatory Guide 8.9, Acceptable Concepts, Models, Equations and Assumptions for a Bioassay Program
- Regulatory Guide 8.26, Applications of Bioassay for Fission and Activation Products
- ANSI N343, Standard for internal dosimetry for mixed fission and activation products
- RP3.027 Whole Body Counting Frequency and Action Levels.
- RP 3.050 Operation of the APT Whole Body Counter

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• RP 3.051 Calibration of the APT Whole Body Counter

The licensee's performance relative to these criteria was determined from discussion with HP supervisors and a review of selected records.

The inspector noted that the semiannual calibration of the whole body counter is completed only by selected HP supervisors who possess the pass word to the protected computer analysis program. Eight various radioisotopes are used in mixtures placed in a phantom to align the multichannel analyzer. These isotopes are used singly to establish the detector efficiency factors. The equipment is operated only by qualified senior level HP technicians. The inspector concluded that these measures ensure a high confidence in the internal exposure assessments.

The licensee stated that the responsibility for whole body counting will be re-assigned and the equipment relocated to a new processing center on or about July 1985. This will be reviewed in a future inspection including new personnel qualifications and adequacy of new procedures.

5. Organization and Staffing

The organization and staffing of the radiation protection department were reviewed against criteria contained in:

- Technical Specification 6.2 Organization
- Technical Specification 6.3 Facility Staff Qualifications
- ANST N18.1-1971, "Selection and Training of Nuclear Power Plant Personnel"
- Reg. Guide 1.8, "Personnel selection and training"
- Procedure AP2 Revision 4, "Station Organization"

The licensee's conformance with these criteria was determined by a review of training and experience resumes of HP supervisors and a review of supervisor's job descriptions. Within the scope of this review no violations were observed, however, the following improvement item was noted:

The licensee has significantly expanded the number of supervisory positions in the Radiation Protection Department. This increase will allow increased management oversight of the various program areas within the department. However, the inspector found that some job descriptions were not yet issued, certain functional responsibilities were not assigned, some reporting relationships were not changed to coincide with the new organization and incorrect ANSI N18.1 qualification requirements were referenced in the draft job description.

The licensee stated that the organizational structure was in transition

and that these administrative oversights would be corrected prior to final implementation of the new organization. This matter will be reviewed in a future inspection. (85-12-01)

6. Routine Radiological Surveys

The licensee's radiation survey program to support work in radiologically controlled areas was reviewed against criteria in:

- 10 CFR 20.103 Exposure of individuals to concentrations of radioactive materials in air in restricted areas
- 10 CFR 20.201 Surveys
- 10 CFR 20.401 Records of surveys, radiation monitoring, and disposal
- Technical Specification 6.10 Record Retention
- Licensee procedures RP 1.013, RP4.001, RP4.002, RP4.003, RP4.004, RP3.036 and RP3.040

The licensee performance relative to these criteria was determined by:

- Review of outage surveys conducted of Unit 2 steam generators between October 1984 and March 1985
- Observation of technicians conducting surveys and a review of pertinent records

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

An allegation was received by a Region I inspector on March 8, 1985 that records of alpha surveys performed in the steam generators at Salem had been falsified. The allegation was made by an individual who had not worked at the Salem site since March 1983. The inspector determined that programmatic weaknesses with the licensees alpha surveys had been identified during 1983 in inspection reports 50-272/83-14 and 50-311/83-11. These weaknesses have been corrected by the licensee. A review of current radiation protection procedures and records indicates that the alpha surveys are properly conducted and recorded. The inspector concluded that the allegation is without basis.

7. Environmental Monitoring Abnormal Measurement

In a letter dated March 4, 1985, the licensee advised the Regional Administrator that a sediment sample analyzed on May 21, 1984 indicated Co^{50} and Co^{58} levels greater than ten times the applicable control station values. This analysis was confirmed on February 21, 1985. The cause of these abnormal measurements was not clearly specified in the letter. Discussions with Radiation Protection Services personnel indicate that sediment sample SA-ESS-11A1 may be taken anywhere in a 1000 ft. by 1000 ft. sector centered on the outfall of the discharge pipes. The activity in sediment samples is greatly affected by the following factors:

- channel dredging by the Army Corps of Engineers
- direction of the tide in the Delaware Bay during sampling and the season of the year
- sample location with respect to the ends of the discharge pipes
- penetration depth of the scoop into the sediment

The licensee has attributed the variation in the measured sediment activity at this sample point to these factors rather than abnormal plant discharges.

The inspector reviewed the licensee's analysis of the data for this sample point for a 5 year period and concluded that although the detected levels may be attributable to normal plant operations, the inspector concurs with the licensee's conclusions that these levels did not result from any abnormal plant discharges. No regulatory limits for liquid discharges were exceeded.

8. ALARA for a Coolant Pump Inspection - Unit 1

The licensee had been experiencing a Coolant Pump Bearing Oil alarm on a Unit 1 pump for several weeks. The alarm could not be correlated by other indications and was believed to be spurious. A management decision was made to visually inspect the pump oil sight glasses while maintaining the plant at 100% power. The licensee's precautions for this work were re-viewed against criteria in:

- Administrative Procedure AP-7 "ALARA"
- RP 1.011 Containment Power Entries
- RP 1.013 REP and EREP Usage
- RP 1.016 Issuance and Control of High Radiation Area Keys
- RP 3.030 Issuance of Neutron Dosimetry
- RP 4.004 Radiation Survey Gamma Dose Rate
- RP 4.005 Radiation Survey Neutron

The licensee's performance relative to these criteria was determined by:

- discussion with supervisors
- review of worker briefings
- review of REP #264
- observation of the containment entry and exit

Due to commendable preplanning the containment entry was completed in a timely fashion and with minimum personnel exposure.

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

9. Radiation Detection Instrumentation Calibration and Use

The licensee's program for calibration and use of portable radiation detection instrumentation was reviewed against the criteria in:

- 10 CFR 20.201, "Surveys"
- 10 CFR 20.202, "Personnel Monitoring"
- 10 CFR 20.401, "Records of Surveys, Radiation Monitoring, and Disposal"
- ANSI N323-1978, "American National Standard Radiation Protection Instrumentation Test and Calibration"
- RP 3.060, "Operating Instructions for the 5.7 Ci AmBe Neutron Calibration Source," Revision 0.
- RP 3.005, "Calibration of Self-Reading Pocket Dosimeters," Revision 6.
- RP 3.044, "Operating Instruction for the Shepherd 3 Curie Model 81 Source Tower," Revision 1.
- RP 9.038, "Calibration of the RO-2 and RO-2A Ion Chamber."

Performance relative to these criteria was determined by inspection of the the maintenance and calibration facilities, verification of current calibration of the various instruments used in performing surveys; discussions with Health Physics supervisors and technicians; a review of records at the instruments issue point; and an observation of the repair and calibration of an RO-2 ion chamber meter.

The licensee maintains a well-designed and properly shielded calibration facility. Radiation monitors and alarms are installed to warn personnel when the calibration source is in an unshielded configuration. Additionally, automatic interlocks, by photocell inactivation, initiate source shielding when personnel enter the vicinity of the exposed source during calibration.

The personnel interviewed appeared to be thoroughly trained and familiar with the instrumentation and current procedures. No items of noncompliance were identified.

10. Personnel Dosimetry Program

The licensee's program for personnel monitoring was reviewed against the criteria contained in:

- 10 CFR 20.202, "Personnel Monitoring"
- 10 CFR 20.401, "Records of surveys, personnel monitoring, and disposal
- ANSI N13.11-1983, "American National Standard for Dosimetry -Personnel Dosimetry Performance - Criteria for Testing."

Performance related to these criteria was determined from interviews with the dosimetry supervisor; review of sections of the dosimetry manual, the computer software, equipment calibrations and quality control trending; and a review of the following procedures:

- RP 3.030, "Issuance of Neutron Dosimetry," Revision 2
- RP 3.056, "Operation of the Panasonic Model UD-710 A Reader," Revision 0.
- RP 3.057, "Element Correction Factor Determination for Panasonic Personnel Issue TLD Material,"
- RP 3.058, "Calibration of the Panasonic UD-710 Automatic TLD Reader
- RP 3.059, "Fade Correction for Panasonic UD-802 TLD Badges."
- Draft procedure, "Spiked TLD Badge Program"
- Draft procedure for resolving differences between TLD results and SRD readings.

10.1 Organization of the Dosimetry Program

The licensee changed over from the Harshaw dosimetry system to a new personnel dosimetry system, supplied by the Panasonic Industrial Company in January, 1985.

The Dosimetry group is part of the Radiation Protection Services group in the Nuclear Services Department, a corporate organization. This group provides dosimetry services to both the Salem and Hope Creek generating stations. The service includes issuing, processing, and terminating personnel TLDs; and maintenance and management of



exposure records.

The licensee is developing a dosimetry manual for NVLAP accreditation, which clearly delineates operating philosophy and organizational responsibilities.

10.2 Qualifications and Training of Personnel

Currently, the dosimetry supervisor is the only individual to have received formal training in Panasonic dosimetry use and processing. A staff Health Physicist is scheduled to attend the next Panasonic training session, and the licensee plans to schedule formal inhouse training for all clerical dosimetry personnel in order to meet NVLAP accreditation requirements.

The licensee has included a well defined training requirement section in the draft dosimetry manual for this group which specifies formal dosimetry training and annual requalification training for all dosimetry processing personnel.

10.3 Facilities and Equipment

The licensee currently maintains two Panasonic model UD-710A dosimeter readers for processing personnel dosimetry. Data from the readers is transmitted to a Hewlett Packard model 1000 A computer where the information is recorded on parallel hard disks and tape using the Panasonic TLD System program. Information from the TLD processing is then transferred to hard disk and tape using the Personnel Radiation Exposure Monitoring System (PREMS) software for personnel dose assignment and recordkeeping.

The licensee is using the Panasonic model UD 802 thermoluminescent dosimeter (TLD) with the Panasonic model 874 hangar. The design is as follows:

Element	Phosphor	Filtration (milligrams per square centimeter)
El	Lithium Borate	14 (mylar, phosphor)
E2	Lithium Borate	320 (plastic, phosphor)
E3	Calcium Sulfate	320 (plastic, phosphor)
E4	Calcium Sulfate	1020 (plastic, lead, phosphor)

An algorithm was developed for the licensee by Phil Plato, Inc. The algorithm was developed using two cesium-137 beam irradiators and two

General Electric X-ray machines as the photon sources. The beta particle sources include strontium-90 and thallium-204 irradiators. A heavy water moderated californium-252 source was the neutron source. The algorithm was developed to meet the requirements of the ANSI N 13.11-1983 standard on personal dosimetry performance.

The licensee determines deep dose with element 2 of this dosimeter; however, element 4 is used to assign deep doses under 25 millirem. Element 3 is used for comparison purposes with element 2 and element 3 and 4 are used to characterize the type of photon energy.

Element 1 is used to assign shallow dose. Additionally, elements 1 and 2 have been incorporated into the algorithm for neutron dosimetry due to the type of phosphor used (natural lithium borate) and its excellent response to neutrons. However, the licensee is using the Landauer Neutrack ER dosimeter as the dosimeter of record for determining dose to neutrons along with actual neutron remmeter measurements.

The licensee is still developing the upper and lower limits of detectability of the dosimeters. The manufacturer has stated that the lower limit of detection for calcium sulfate is 1 millirem. The upper limit of detection based on the lithium borate element is 999 rem. The licensee currently assigns doses as low as 1 millirem for personnel exposure records.

The licensee has empirically determined fading factors for the TLDs to be used in special circumstances when personnel dosimetry must be read immediately. The written procedure states that the dosimetry supervisor will determine when and what fading factors are to be used in such circumstances.

The inspector toured the facilities used by the licensee for the processing of personnel dosimetry. A room has been dedicated for this purpose and bench space and other services appeared adequate. The entire dosimetry department is scheduled to be moved in the near future to the Central Guard House. This facility has been designed to ensure that dosimetry processing will not be affected in the event of an emergency.

10.4 Quality Assurance/Quality Control

The licensee performs calibrations on TLDs with a 3 curie cesium-137 calibration source in the calibration facility, equipped with the appropriate monitors, interlocks, and alarms. A Victoreen R-Chamber is used to measure the delivered dose. Plaques of promethium-147, thallium-204, and strontium/yttrium-90 have been purchased for beta calibrations of the dosimetry.

The TLD reader is checked daily using TLD badges that have been given

a low dose of radiation (approximately 200 to 300 millirem) and blank badges. Badges given a large dose (approximately 5 rem) are read to check the TLD reader on a monthly basis. If the data varies by greater than $\pm 10\%$, the reader is re-calibrated. Daily quality control checks are plotted and analyzed for potential system degradation.

A draft spiked sample procedure has been written for additional quality assurance of the dosimetry measurements. The draft procedure states that at least one spiked TLD badge will be processed for every 500 badges processed.

If the reported dose equivalent varies from the delivered dose equivalent by more than 15%, the dosimetry supervisor will investigate the cause of the discrepancy. At the present time, all results of the spiked samples will be retained to provide indications of reader degradation and reproducibility over time.

Element correction factors (ECFs) were initially determined for all TLDs and will be checked annually to spot problems with TLD element performance. The licensee decided that differences of no more than $\pm 10\%$ from the original ECF values will be acceptable.

At the present time, the licensee also generates glow curves on all processed badges. The glow curves of any element having a dose of greater than 25 millirem are saved on hard disk and tape. These records can then be accessed at a future time in the event of problems with that dosimeter element.

10.5 Dosimetry Processing

The licensee processes all dosimetry for Salem on a monthly basis. The dosimetry department currently processes about 2000 badges per month. An additional 2000-3000 badges is anticipated for processing when Hope Creek loads fuel.

TLDs for Salem are exchanged by the in-plant radiation protection group. Dosimeter losses for Salem are recorded on a Radiological Occurrence Report (ROR). An Unusual Incident Report (UIR) is generated and kept by the dosimetry department which records the evaluation of the dose of the individual whose dosimetry was lost. The UIR additionally allows for re-evaluation of dose if the assigned dose is guestioned.

The results of dosimetry processing are recorded on a hard disk and back-up tape using the Personnel Radiation Exposure Monitoring System (PREMS). This program stores all personnel exposure records.

The dosimetry processing procedure is being revised to list the steps the dosimetry processing personnel must take prior to loading the TLDs into the reader. One step will include a contamination check on the badges prior to processing. This is currently done by the inplant radiation protection group.

10.6 Dose Assessment

A daily assignment of deep dose is recorded on the Personnel Radiation Exposure Monitoring System (PREMS) by station health physics personnel based on self-reading dosimeters (SRDs). These dose assignments are replaced monthly by TLD deep dose readings. However, if the TLD reading differs from the SRD reading by $\pm 20\%$, the computer software flags the discrepancy and this is brought to the attention of the dosimetry supervisor.

A draft procedure for differences between SRD and TLD readings has been written. It is expected that discrepant data will be reviewed by station health physics personnel. At this time, however, the dosimetry department conducts the review and, if the differences cannot be resolved, the most conservative number is recorded on the personnel file.

Extremity dosimetry is assigned by station health physics personnel for special working conditions. The licensee uses the Panasonic TLD badge adapted for the wrist and ankle. The assignment of dose from extremity monitoring is currently performed manually. A computer program is being written to perform and record the assignment of extremity monitoring for personnel.

There were no items of non-compliance identified in this review.

11. Site Access

On several occasions the licensee was advised of the need to provide expedited unfettered site access for Region I Inspectors. During this inspection delays were experienced, particularly with security photobadging. The licensee has issued internal memoranda and special instructions in an attempt to resolved the delays. However, these efforts have been unsuccessful. The licensee stated that this matter will be reviewed again and appropriate steps taken. This problem will be reviewed in a future inspection, (85-12-02).

12. Exit Interview

The inspector met with the licensee personnel denoted in section 1 at the conclusion of the inspection on April 19, 1985. The scope and findings of the inspection were discussed at that time. At no time during this in-spection was written material provided to the licensee by the NRC inspection.