

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-272/86-02
50-311/86-02

Docket No. 50-272
50-311

License No. DPR-70
DPR-75 Priority - Category C

Licensee: Public Service Electric & Gas Company

P.O. Box 236

Hancocks Bridge, New Jersey 08038

Facility Name: Salem Nuclear Generating Station

Inspection At: Hancocks Bridge, New Jersey

Inspection Conducted: February 10-14, 1986

Inspectors: Richard K. Struckmeyer 3/8/86
Richard K. Struckmeyer, Radiation Specialist date

Margaret E. Kramaric 3/10/86
Margaret E. Kramaric, Radiation Specialist date

Approved by: Walter J. Pasciak 3/14/86
Walter J. Pasciak, Chief, ERPS date

Inspection Summary: Inspection on February 10-14, 1986 (Combined Inspection Report Nos. 50-272/86-02; 50-311/86-02)

Areas Inspected: Routine, unannounced inspection of the licensee's liquid and gaseous effluents control program, and of the radiochemical measurements program using the NRC:I Mobile Radiological Measurements Laboratory and laboratory assistance provided by DOE Radiological and Environmental Sciences Laboratory. Areas reviewed included: program for the quality control of analytical measurements, performance on radiological analyses of split actual effluent samples, radioactive effluent release records, primary and secondary coolant chemical and radiochemical analyses, testing of air cleaning systems, and procedures for control of these activities. The inspection involved 80 inspector hours on-site by two region-based inspectors.

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Results: Within the areas inspected, no items of non-compliance were identified. A need for improved radiochemistry laboratory quality control was noted (details, section 4). Calibration of gamma spectroscopy equipment for low energy (Xe-133) gaseous samples also requires improvement (details, section 8).

DETAILS

1. Individuals Contacted

- *R. Allen, Technical Supervisor, Chemistry
- P. Behrens, Technical Supervisor, Chemistry
- *E. Browder, Supervisor, Quality Operations
- J. Clancy, Senior Health Physicist, Radiation Protection Services
- *R. Dulee, Station QA
- *R. Dolan, Chemistry Engineer
- P. Glennon, Environmental Health Physicist,
Radiation Protection Services
- H. Miller, Staff, Engineer, Chemistry
- D. Perkins, Manager, Station QA
- *M. Simpson, Health Physicist, Radiation Protection Services
- D. Zak, Technical Supervisor, Chemistry
- *J. Zupko, General Manager, Salem Operations

The inspector also interviewed other licensee employees during the inspection.

* denotes those present at the exit meeting on February 14, 1986.

2. Licensee Action on Previous Inspection Findings

(Closed) Inspector Follow-up Item (50-272/84-27-01; 50-311/84-26-01): Resolution and closeout of 1982 audit findings (licensee audit number S-82-18). The licensee's auditors, in a joint audit conducted by Engineering and Construction Quality Assurance and Nuclear Quality Assurance (S-84-20/H-84-7; November, 1984) followed up on the items from the 1982 audit. Approximately half of the items were closed; with respect to the remaining items, the auditors determined that committed corrective actions either were not implemented or were not effective, and issued new Corrective Action Requests. A subsequent audit (NS-85-054; June, 1985), conducted by Nuclear Quality Assurance, closed out the items for the 1982 audit.

(Closed) Inspector Follow-up Item (50-272/84-27-03; 50-311/84-26-03): Annual REMP reports to be submitted in accordance with Technical Specifications deadline. The 1984 report was submitted within the 90 day period required by Technical Specifications prior to Amendment 59. This amendment changed the requirement to "prior to May 1 of each year". Radiation Protection Services has contracted with the PSE&G Research and Testing Laboratory to provide the Radiological Environmental Monitoring Program. The work order specifies that the laboratory must supply a final report within 90 days of January 1. This will enable the licensee to submit the report to the NRC by the required May 1 deadline.

(Closed) Inspector Follow-up Item (50-272/84-34-01; 50-311/84-34-01): Air filtration system test procedures lack explicit reference to certain data concerning HEPA filter leakage test and carbon sample test. Permanent "On-the-Spot" changes were made to the specific procedures referenced in Inspection Report 84-34 (M9-TVP-CR-001, M9-TVP-AB-011, M9-TVP-AB-012, M9-TVP-AB-013) as well as procedure No. M9-TVP-TC-001. These procedures were the responsibility of the Operational Test Group. Responsibility for filtration system testing has since been returned to the Chemistry Department. Adequacy of Chemistry procedures for these tests will be reviewed in a future inspection.

(Closed) Violation (50-272/84-34-04; 50-311/84-34-04): Failure to re-qualify chemistry technical assistant. The certification of the individual in question was renewed after review of his records. A review of the training files of all Chemistry personnel was undertaken, which resulted in the renewal of all applicable certifications.

3. Management Controls

The inspector reviewed the licensee's management oversight for the chemistry program, including assignment of responsibility and program audits.

3.1 Assignment of Responsibility

In addition to its responsibilities for chemical and radiochemical analyses of primary and secondary coolant and other liquid and gaseous process streams in the plant, Chemistry has responsibilities for control of liquid and gaseous effluents, including offsite dose calculations, and preparation of Semiannual Radioactive Effluent Release Reports. The latter responsibility is shared with the corporate office of Radiation Protection Services. Responsibility for liquid and gaseous releases is shared with Operations. Recently, Chemistry took over duties pertaining to HEPA and charcoal filter system testing. Chemistry had performed these tests, with the aid of a contractor, until mid-1984, when the Operational Test Group (OTG) acquired the responsibility. A recent reorganization eliminated the OTG, and Chemistry was reassigned to perform these tests, again utilizing a contractor organization.

During previous inspections of the licensee's Chemistry organization in 1984, it was noted that the Chemistry Engineer reported through the Technical Manager to the Assistant General Manager and General Manager-Salem Operations. As a result of the recent reorganization, the Chemistry Engineer now reports through the Radiation Protection/Chemistry Manager, who reports directly to the General Manager - Salem Operations.

3.2 Audits

The inspector reviewed audits of Chemistry and program areas for which Chemistry has responsibility, including audits by Nuclear Quality Assurance (PSE&G), and by NUS Operating Services Corporation. The following licensee audits were reviewed: S-84-31, April 9-12, 1984, Gaseous Effluent Monitoring; and NS-85-019, July 22-August 1, 1985, Chemistry Department.

The audits by NUS Operating Services Corporation were its second, third, and fourth audits of Chemistry, and were conducted in August 1984, December 1984, and July 1985, respectively. Additional visits by an NUSOSC representative were conducted during March and May, 1985.

The inspector also reviewed several memos pertaining to "QA Surveillance Overview of Salem Station Chemistry," covering the period December 1984 through October 1985.

The inspector noted that the audit of Gaseous Effluent Monitoring closed three follow-up items from a previous audit, and that no new items were identified. The auditors concluded that "Chemistry personnel are effectively implementing the program for Gaseous Effluent Monitoring." The audit of the Chemistry program (NS-85-019) identified four items as deficiencies and two items as concerns. The resolution of these items will be reviewed in a future inspection (50-272/86-02-01; 50-311/86-02-01).

The audits by NUS Operating Services Corporation identified numerous concerns, including several related to the laboratory quality assurance program. The memos regarding QA Surveillance Overview of Salem Station Chemistry (dated March 5, August 1, and November 20, 1985) apparently refer to an official "assessment" of the Chemistry Department conducted in 1984 by personnel from QA and Radiation Protection Services, with emphasis on activities of the Chemistry counting room. This assessment also pointed out weaknesses in the counting room activities and the need for improved quality control. The November 20, 1985, memo noted that the "recommendation to upgrade the chemistry counting room program in December 1984 has not been addressed." The licensee's actions to address these concerns will be reviewed in a future inspection (50-272/86-02-02; 50-311/86-02-02). This is further discussed in Paragraph 4.

4. Laboratory QA Program

The inspector performed a selected review of the licensee's program for the quality assurance of radioanalytical measurements made by the Chem-

istry Department. The review was performed with respect to criteria contained in the following:

- Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment"
- Principles of Quality Assurance of Chemical Measurements (National Bureau of Standards)

The inspector reviewed the following procedures:

- PD-3.4.015, Rev. 1, MCA Daily Energy/Efficiency and Background Control Chart
- CH-3.8.043, Rev. 0, Interlab Agreement Criterion
- Ch-3.8.004, Rev. 3, Interlab Comparison Analysis
- PD-3.9.043, Rev. 0, Efficiency Calibration of 8100 MCA Systems
- CH-3.3.012, Rev. 5, Use of Canberra 8100 Multichannel Analyzer for Gamma Scans
- CH-3.9.048, Rev. 0, Counting Room Quality Control Requirements
- PD-3.9.042, Rev. 0, Energy Calibration of the 8100 MCA systems
- CH-3.8.039, Rev. 2, Efficiency Determination and Quality Control Charts Preparation and Usage for Counting Room Instrumentation

The inspector also reviewed selected portions of audits performed by the licensee's contractor, NUS Operating Services Corporation, on the following dates:

- August 20-24, 1984
- December 17-21, 1984
- March 4-8, 1985
- May 14-17, 1985

The inspector also reviewed the following quality control data:

- Interlaboratory comparisons from the second quarter 1984.
- Daily source check and background check data for MCAs 1, 2, 3 and 4 for the period November 1985-February 1986.
- Control charts for daily source check for the MCA's.

Within the scope of this review the following concerns were identified:

- Daily source check data and control charts indicate trending, especially for MCA 4. In discussing the apparent bias, the licensee stated that this was due to a poorly regulated power supply in the laboratory. The licensee stated that efforts had been made in the past to obtain a regulated power supply for operation of the laboratory gamma spectroscopy equipment, but that budget considerations had precluded this. The inspector stated that the licensee's efforts to improve its laboratory quality control may be partially negated if the proper performance of the gamma spectroscopy systems cannot be assured.
- The control charts presently maintained have no prescribed warning limits or control limits. The procedure covering the control charts (CH-3.4.015) provides instructions only when values exceed $\pm 15\%$ difference from the certified value and are off the plot. The licensee stated that statistically based control charts would be developed and implemented.
- The current procedure (CH-3.4.015) does not require that the detector resolution (FWHM) be logged and plotted on a daily basis. The procedure also does not require the daily background checks to be plotted on a control chart. The inspector discussed with the licensee the importance of maintaining and plotting important parameters such as background and FWHM. The licensee stated that the procedure would be revised to include the implementation of statistically based control charts for background.
- The intercomparisons reviewed indicated poor agreement with the licensee's participating laboratories. The licensee acknowledged weakness in its intercomparison program and stated that additional efforts will be directed in this area. Currently, the licensee is considering more frequent participation in intercomparison programs.
- The audits by the NUS Operating Services Corporation during August 1984, December 1984, and May 1985, indicated that the licensee previously had been alerted to the issues discussed in this section. In addition the audits also recommended that licensee purchase gas standards for the calibration of the Johnson Bomb geometry.

The licensee stated that improvements will be made in its laboratory Quality Assurance program. The nature and extent of these improvements will be addressed in a letter to the NRC Region I no later than March 15, 1986. This letter will discuss specific areas requiring improvement and dates by which such improvements are expected to be implemented. The areas to be addressed include, but are not limited to, the following:

(1) Inclusion of detector resolution and background checks on control charts; (2) Upgrading of control charts and related procedures to utilize statistical bases, including warning and control limits, and criteria for determining detector bias; (3) Improvement of interlaboratory comparison program, including more frequent participation in such programs, and greater attention to the information these programs provide relative to the licensee's ability to make accurate analyses. The licensee's Quality Assurance program will again be reviewed in a subsequent inspection (50-272/86-02-02; 50-311/86-02-02).

5. Effluent Release Records

The inspector reviewed selected radioactive liquid and gaseous effluent release permits, including initiation and completion forms, and the Semi-annual Radioactive Effluent Release Reports for the last half of 1984 and the first half of 1985. Also reviewed were the new Radiological Environmental Technical Specifications, the Off-Site Dose Calculation Manual, and various procedures covering effluent sampling, and liquid and gaseous effluent calculations, e.g.:

- CH-3.5.020, Rev. 2, Condensor Air Ejector Sampling
- CH-3.5.056, Rev. 2, Air Sampling for Tritium
- CH-3.5.062, Rev. 3, Sampling the Plant Vent
- CH-3.8.051, Rev. 0, Use of Liquid Waste Release Form
- CH-3.8.052, Rev. 0, Gaseous Effluent Release Calculations - Gas Decay Tanks and Containment Purge
- CH-3.8.053, Rev. 0, Gaseous Effluent Release Calculations - Plant Vent and Anomalous
- Operating Procedure II-11.3.2(b), Release of Radioactive Liquid Waste to the Circulating Water System from 11 or 12 Monitor Tanks

The Chemistry department is responsible for tracking release and assuring that Technical Specification limits are not exceeded. The release data is transmitted to Radiation Protection Services, which prepares the Semi-annual Radioactive Effluent Release Reports. The transcription of data is currently being done manually, but the licensee is developing, with the aid of a contractor, a computer program that will enable the data from each release permit to be automatically added into a total for the relevant period. The portion of this program that is used to generate the release permit is already in use, and has been verified.

The inspector reviewed selected release permits and noted that releases were within Technical Specification limits. No violations were noted in this area.

6. Reactor Coolant Water Chemistry

The inspector reviewed selected procedures and records for chemical and radiochemical analyses of primary and secondary coolant. The analyses include those for dissolved oxygen, fluoride, chloride, I-131 dose equivalent, E-bar, and gross activity in the primary coolant, and gross activity and dose equivalent I-131 in the secondary coolant. The inspector also reviewed the licensee's method for scheduling and verifying that required surveillances are performed. The review indicated that all required surveillances were performed on time, and that the results of analyses were within Technical Specification limits. The inspector noted that most analyses are done more frequently than required. No violations were noted.

7. Testing of Air Cleaning Systems

The inspector reviewed the licensee's procedures and selected records pertaining to tests of the air filtration systems required by Technical Specifications. These are the Control Room Emergency Air Conditioning System, the Auxiliary Building Exhaust Air Filtration System, and the Fuel Handling Area Ventilation System. The tests include HEPA filter and charcoal adsorber in-place tests and laboratory tests of carbon samples for methyl iodide removal.

The licensee stated that the responsibility for air filtration system testing, which had been transferred from Chemistry to the Operational Test Group (OTG) in 1984, was recently transferred back to Chemistry due to reorganization and elimination of the OTG. The inspector noted that these tests have been performed at the frequencies required by Technical Specifications, and that limits for filter efficiencies and airflow distribution were met. Due to the elimination of the OTG, the test of the Unit 1 Fuel Handling Building, last performed on April 28, 1984, had not yet been performed as of the time of this inspection; however, the Technical Specifications allow an extension not to exceed 25% of the surveillance interval. The licensee stated that these tests will be performed prior to the end of the extension period. This will be reviewed in a future inspection.

The inspector noted that the results of certain tests were recorded on forms marked "INFO ONLY" and had not received approval by the Station Performance Engineer or review by QA. The test results consist of data sheets from Procedures CH-3.8.033, "Visual Inspection of Ventilation Systems," and CH-3.8.034, "Ventilation In Place Testing." All of the records in question pertain to tests of the 11 and/or 12 FHB Exhaust performed on April 17 and 28, 1984.

The following table lists the specific records in question:

<u>Procedure Number</u>	<u>Record</u>	<u>Affected System</u>	<u>Date</u>
CH-3.8.033	Visual Inspection Check List	11 FHB Exhaust	4-27-84
CH-3.8.034	Velocity Traverse Data Sheet	11 FHB Exhaust	4-28-84
CH-3.8.034	HEPA Test Results	__ FHB Exhaust*	4-28-84
CH-3.8.033	Visual Inspection Check List	12 FHB Exhaust	4-27-84
CH-3.8.034	Velocity Traverse Data Sheet	__ FHB Exhaust*	4-28-84
CH-3.8.034	Airflow Distribution Data Sheet	__ FHB Exhaust*	4-28-84
CH-3.8.034	HEPA Test Results	__ FHB Exhaust*	4-28-84
CH-3.8.034	Carbon Bed F-11 & F-112 Leak Test Data Sheet	12 FHB Exhaust	4-28-84

*11 or 12 not specified

The licensee stated that an attempt would be made to locate the official, approved copies of these results. The inspector stated that the proper completion and administrative review and approval of these surveillance records is considered unresolved pending the licensee's action to demonstrate that the official, approved records are in the licensee's possession (50-272/86-02-03; 50-311/86-02-03).

8. Confirmatory Measurements

During the inspection, liquid, particulate filter, charcoal cartridge, and gas samples were split between the licensee and NRC for the purpose of intercomparison. Where possible, the split samples are actual effluent samples, or inplant samples which duplicate counting geometries used by the licensee for effluent sample analyses. The samples were analyzed by the licensee using normal methods and equipment and by the NRC:I Mobile Radiological Measurements Laboratory. Joint analyses of actual effluent samples are used to verify the licensee's capability to measure radioactivity in effluent samples with respect to Technical Specification requirements and other regulatory requirements.

In addition, a liquid effluent sample was sent to the NRC reference laboratory, Department of Energy, Radiological and Environmental Sciences Laboratory (RESL), for analyses requiring wet chemistry. The analyses to be performed on the sample are Sr-89, Sr-90, gross alpha, tritium and

Fe-55. The results will be compared with the licensee's results when received at a later date and will be documented in a subsequent inspection report.

The results of an effluent sample split between the licensee and NRC Region I during a previous inspection on July 23-27, 1984 (Inspection Reports 50-272/84-29 and 50-311/84-28), were also compared during this inspection and are included in Table I. The result of the Fe-55 analysis is not in agreement under the criteria used for comparing results (see Attachment I). Although not in agreement, the licensee's value was high, and therefore conservative with respect to its Technical Specifications limits. The cause of this disagreement could not be unequivocally determined, but may have been related to the licensee's delay in shipping the sample to the NRC reference laboratory, RESL. The sample, which was obtained on July 27, 1984, was mailed in late November 1984. Although the sample was preserved, a delay of this length precludes a valid inter-comparison. The licensee stated that the sample split during this inspection would be shipped promptly. The results of this split sample analysis will be reviewed in a subsequent inspection (50-272/86-02-04; 50-311/86-02-04).

The results of the sample measurements comparison completed during this inspection indicated agreement except for the gas decay tank sample. The results of the comparisons are listed in Table I and the agreement criteria are included as Attachment I.

The gas decay tank sample split resulted in disagreement for the Xe-133 value. This disagreement apparently is due to the licensee's method of calibration for the particular geometry (Johnson Bomb) used for such analyses. During calibration the licensee uses a solid standard to establish the Johnson Bomb geometry. The inspector stated that attenuation corrections should be made when using solid standards to calibrate for gases. The licensee's procedures did not require this correction to be made, resulting in an inaccurate, although conservative measurement of Xe-133 (81 keV). The licensee stated that a gas calibration standard would be purchased and used to re-calibrate the Johnson Bomb geometry. The inspector stated that the gas decay tank analysis and related calibration would be reviewed during a subsequent inspection (50-272/86-02-05; 50-311/86-02-05).

It was noted that at the time of this inspection, the health physics counting room was being remodeled, and that its gamma spectroscopy equipment was temporarily out of service. No intercomparison with Health Physics was possible.

9. Exit Interview

The inspector met with licensee representatives (denoted in Section 1) at the conclusion of the inspection on February 14, 1986. The inspector

summarized the purpose and scope of the inspection and the inspection findings.

The licensee agreed to perform the analyses listed in Paragraph 8 and report the results to the NRC.

ATTACHMENT 1

CRITERIA FOR COMPARING ANALYTICAL MEASUREMENTS

This attachment provides criteria for comparing results of capability tests and verification measurements. The criteria are based on an empirical relationship which combines prior experience and the accuracy needs of this program.

In these criteria, the judgment limits are variable in relation to the comparison of the NRC Reference Laboratory's value to its associated uncertainty. As that ratio, referred to in this program as "Resolution", increases, the acceptability of a licensee's measurement should be more selective. Conversely, poorer agreement must be considered acceptable as the resolution decreases.

$$\text{Resolution} = \frac{\text{NRC REFERENCE VALUE}}{\text{REFERENCE VALUE UNCERTAINTY}}$$

$$\text{Ratio} = \frac{\text{LICENSEE VALUE}}{\text{NRC REFERENCE VALUE}}$$

<u>Resolution</u>	<u>Agreement</u> (Ratio)
<3	0.4 - 2.5
4 - 7	0.5 - 2.0
8 - 15	0.6 - 1.66
16 - 50	0.75 - 1.33
51 - 200	0.80 - 1.25
>200	0.85 - 1.18

TABLE 1
SALEM VERIFICATION TEST RESULTS

SAMPLE	ISOTOPE	RESULTS IN MICROCURIES/ML		COMPARISON
		NRC VALUE	LICENSEE VALUE	
#11 WHUT 2/11/86 1530	Co-58	(1.309 ± 0.005)E-3	(1.19 ± 0.01)E-3	Agreement
	Co-60	(1.32 ± 0.02)E-4	(1.24 ± 0.04) E-4	Agreement
	Cs-134	(4.4 ± 0.2)E-5	(4.47 ± 0.63)E-5	Agreement
	Cs-137	(4.6 ± 0.2)E-5	(3.88 ± 0.54)E-5	Agreement
	Mn-54	(2.11 ± 0.11)E-5	(1.77 ± 0.28)E-5	Agreement
Unit 2 RCS	Cr-51	(1.23 ± 0.10)E-4	(1.3 ± 0.1)E-4	Agreement
Crud filter 2/11/86 0905	Mn-54	(3.5 ± 0.9)E-6	(4.4 ± 0.9)E-6	Agreement
	Co-58	(9.1 ± 0.2)E-5	(9.6 ± 0.2)E-5	Agreement
	Co-60	(1.03 ± 0.14)E-5	(1.3 ± 0.1)E-5	Agreement
	I-133	(5.7 ± 1.5)E-6	(5.0 ± 1.5)E-6	Agreement
Unit 1 RCS	I-131	(2.05 ± 0.14)E-3	(2.34 ± 0.49)E-3	Agreement
Water-degassed 2/11/86 1535	I-132	(1.43 ± 0.03)E-2	(1.38 ± 0.05)E-2	Agreement
	I-133	(1.11 ± 0.02)E-2	(9.9 ± 0.5)E-3	Agreement
	I-134	(2.79 ± 0.13)E-2	(2.27 ± 0.09)E-2	Agreement
	I-135	(1.99 ± 0.08)E-2	(1.68 ± 0.12)E-2	Agreement
#11 GDT 2/14/86 0825	Xe-131m	(1.19 ± 0.09)E-3	(1.82 ± 0.20)E-3	Agreement
	Xe-133	(6.270 ± 0.013)E-2	(9.23 ± 0.52)E-2	Disagreement*
	Xe-133m	(2.57 ± 0.27)E-4	(2.76 ± 0.62)E-4	Agreement

*see text, paragraph 8

TABLE 1

SALEM VERIFICATION TEST RESULTS

<u>SAMPLE</u>	<u>ISOTOPE</u>	<u>RESULTS IN MICROCURIES/ML</u>		<u>COMPARISON</u>
		<u>NRC VALUE</u>	<u>LICENSEE VALUE</u>	
#22 CVCMT	H-3	$(8.38 \pm 0.02)E-3$	$(8.9 \pm 0.1)E-3$	Agreement
7/23/64	Sr-89	$(1.3 \pm 0.4)E-7$	$<4E-8$	No comparison
2245	Sr-90	$(0 \pm 4) E-9$	$<9E-9$	No comparison
	Fe-55	$(3.2 \pm 0.5) E-7$	$(1.1 \pm 0.1)E-4$	Disagreement*
	gross alpha	$(2.0 \pm 0.5)E-8$	$<4E-8$	No comparison

*see text, paragraph 8

TABLE 1

SALEM VERIFICATION TEST RESULTS

<u>SAMPLE</u>	<u>ISOTOPE</u>	<u>RESULTS IN TOTAL MICROCURIES</u>		<u>COMPARISON</u>
		<u>NRC VALUE</u>	<u>LICENSEE VALUE</u>	
NRC spiked	Cd-109	(2.5 ± 1.1)E-2	(2.63 ± 0.40)E-2	Agreement
charcoal	Co-60	(9.97 ± 0.11)E-3	(7.97 ± 0.37)E-3	Agreement
cartridge	Cs-137	(1.03 ± 0.08)E-2	(7.61 ± 0.26)E-3	Agreement
5/10/83				
1200				