U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

Region I

Report No. 50-293/81-17

Docket No. 50-293

License No. DPR-35 Priority -- Category C

Licensee: Boston Edison Company

800 Boylston Street

Boston, Massachusetts 02199

Facility Name: Pilgrim Station

Inspection at: Plymouth, Massachusetts

Inspection conducted: July 27-31, 1981

Inspectors: J. J. Kottan 9-14-81
J. J. Kottan, Radiation Specialist — date signed

J. B. Hansell
Radiation Specialist (Co-op) — date signed

_____ date signed

Approved by: Robert J. Bores 9-17-81
R. J. Bores, Chief, Independent Measurements and Environmental Protection Section, EP&PS Branch — date signed

Inspection Summary:

Inspection on July 27-31, 1981 (Report No. 50-293/81-17)
Areas Inspected: Routine, unannounced inspection of the licensee's chemical and radiochemical measurements program using the NRC:I Mobile Laboratory and laboratory assistance provided by DOE Radiological and Environmental Services Laboratory. Areas reviewed included: program for quality control of analytical measurements, audit results, performance on radiological analyses of split actual effluent samples. The inspection involved 58 inspector-hours onsite by two NRC regional based inspectors.
Results: Of the four areas inspected, no items of noncompliance were identified.

DETAILS

1. Individuals Contacted

*R. D. Machon, Nuclear Operations Manager
*P. D. Smith, Chief Technical Engineer
*R. A. Smith, Senior Chemical Engineer
*J. Smallwood, Chemical Engineer
D. Trudeau, Chief Radiological Engineer
E. Rush, Senior QA Engineer
V. Stagliola, Senior QC Engineer

The inspector also interviewed other licensee employees including members of the chemistry and health physics staffs.

*Denotes those present at exit interview.

2. Licensee Actions on Previous Inspection Findings

(Closed) Unresolved Item (79-05-01): Tritium Measurement Disagreement. The results comparison of two samples taken during a previous inspection (79-05) indicated that the tritium measurements were in agreement. See paragraph 5 and Table I.

3. Laboratory QC Program

The inspector reviewed the licensee's program for the quality control of analytical measurements and noted that the licensee's laboratory QC program is detailed in procedure 7.10.1, Radiochemistry Laboratory Quality Control, and procedure 7.10.2, Quality Control of Counting Room Instruments. The inspector reviewed daily source and background checks and counter control charts as required by the above procedures for 1980 and 1981 to date. The inspector also reviewed the results of spiked radiochemical samples sent to the licensee's contract-laboratory. The inspector discussed various aspects of laboratory QC with the licensee. The inspector had no further questions in this area. No items of noncompliance were identified.

4. Audit Results

The inspector reviewed QA Audit No. 81-14 which was conducted on June 14-18, 1981 by the licensee's QA department. The audit covered the licensee's chemistry program and included the area of effluent control. In addition, the inspector also reviewed QA Audit No. 80-20 which was conducted on June 30, 1980 and covered the licensee's contract-laboratory used for effluent analyses. The inspector had no further questions in this area. No items of noncompliance were identified.

5. Confirmatory Measurements

During this inspection actual liquid and airborne effluent samples were split between the licensee and NRC:I for the purpose of inter-comparison. The effluent samples were analyzed by the licensee using his normal methods and equipment, and the NRC using the NRC:I Mobile Laboratory. Joint analysis of actual effluent samples determines the licensee's capability to measure radioactivity in effluent samples.

In addition a liquid effluent sample was sent to the NRC reference labroatory, Department of Energy, Radiological and Environmental Services Laboratory (RESL) for analyses requiring wet chemistry. The analyses to be performed on the sample are: Sr-89, Sr-90, tritium, gross alpha and gross beta. These 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:I during a previous inspection on July 25-27, 1979 (Inspection Report 79-05) were also compared during this inspection.

A routine health physics air sample which was analyzed by the licensee's health physics personnel using the health physics gamma ray spectroscopy system was also compared.

The results of the sample measurements comparison indicated that all of the measurements were in agreement or possible agreement under the criteria used for comparing results. (See Attachment 1) The results of the comparisons are listed in Table I.

6. Health Physics Measurements

The inspector reviewed the calibration and QC data for the licensee's computer based gamma ray spectroscopy system used by the health physics personnel. In addition, a routine health physics air sample was split between the licensee and the NRC:I for comparison. (See Paragraph 5 and Table I). No items of noncompliance were identified in this area.

7. Exit Interview

The inspector met with the licensee representatives (denoted in Paragraph 1) at the conclusion of the inspection on July 30, 1981. The inspector summarized the purpose and scope of the inspection and the inspection findings.

The licensee agreed to perform the analyses listed in Paragraph 5 and report the results to NRC.

TABLE 1

PILGRIM VERIFICATION TEST RESULTS

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		RESULTS IN MICROCURIES PER MILLILITER		
Reactor Coolant 0800 hrs 7-25-79	H-3	(9.06±0.02)E-3	(9.44±0.94)E-3	Agreement
"B" Misc.Waste Tank 1545 hrs 7-25-79	Co-60	(1.17±0.03)E-4	(1.05±0.01)E-4	Agreement
	P-32	(2.3±0.4)E-7	<7E-7	no comparison
	gross beta	(1.24±0.05)E-3	(2.37±0.03)E-3	Possible Agreement
	gross alpha	(3.3±0.5)E-8	<4E-7	no comparison
	Sr-89	(1.2±0.2)E-6	(6.9±1.5)E-7	Agreement
	Sr-90	(4.9±0.2)E-6	(4.8±0.1)E-6	Agreement
	H-3	(2.96±0.02)E-3	(2.87±0.29)E-3	Agreement
	Fe-55	(2.37±0.02)E-4	(2.5±0.1)E-4	Agreement
	Cs-134	(1.35±0.04)E-4	(1.32±0.01)E-4	Agreement
	Cs-137	(9.9±0.3)E-4	(9.77±0.01)E-4	Agreement
	Co-58	(1.3±0.4)E-6	(1.18±0.60)E-6	Agreement
	Mn-54	(1.39±0.06)E-5	(1.20±0.04)E-5	Agreement

TABLE 1

PILGRIM VERIFICATION TEST RESULTS

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
			RESULTS IN TOTAL MICROCURIES	
Main Stack Charcoal Cartridge 1000 hrs 7-28-81	I-131	(2.63±0.04)E-2	(3.25±3.6%)E-2	Agreement
	I-133	(4.17±0.06)E-2	(4.71±3.7%)E-2	Agreement
	I-135	(2.07±0.13)E-2	(2.51±15.6%)E-2	Agreement
Main Stack Particulate Filter 1000 hrs 7-28-81	I-131	(1.2±0.3)E-4	(2.53±40.6%)E-4	Possible Agreement
	Ba-140	(8.2±0.2)E-3	(9.45±3.8%)E-3	Agreement

TABLE 1

PILGRIM VERIFICATION TEST RESULTS

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		RESULTS IN MICROCURIES PER MILLILITER		
"B" Chem Waste Tank 1400 hrs. 7-28-81	Na-24	(1.82±0.08)E-5	(1.35±28%)E-5	Possible Agreement
	Cr-51	(4.1±0.4)E-5	(3.91±21%)E-5	Agreement
	Mn-54	(2.86±0.09)E-5	(2.51±5.2%)E-5	Agreement
	Co-58	(3.16±0.07)E-5	(2.65±5.9%)E-5	Agreement
	Co-60	(2.41±0.02)E-4	(2.46±0.92%)E-4	Agreement
	Mo-99	(4.7±0.4)E-5	(3.67±25%)E-5	Agreement
	Np-239	(3.4±0.3)E-5	(3.76±7.7%)E-5	Agreement
	Sr-91	(1.39±0.04)E-4	(1.66±17%)E-4	Agreement
	I-131	(2.47±0.07)E-5	(2.43±4.8%)E-5	Agreement
	I-133	(1.027±0.010)E-4	(1.08±2.7%)E-4	Agreement
	Cs-134	(3.34±0.07)E-5	(3.39±3.3%)E-5	Agreement
	Cs-137	(2.340±0.016)E-4	(2.59±0.7%)E-4	Agreement
	Ba-140	(1.56±0.03)E-4	(1.61±3.3%)E-4	Agreement

TABLE 1

PILGRIM VERIFICATION TEST RESULTS

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		RESULTS IN MICROCURIES PER MILLILITER		
Offgas 0802 hrs 7-29-81	Kr-85m	(9.3±0.7)E-3	(8.87±6.5%)E-3	Agreement
	Kr-88	(2.9±0.2)E-2	(2.51±13.1%)E-2	Agreement
	Xe-133	(1.20±0.09)E-2	(1.418±4.7%)E-2	Agreement
	Xe-135	(4.64±0.09)E-2	(4.57±1.1%)E-2	Agreement
Reactor Building Vent 1000 hrs. 7-30-81	Xe-135	(2.9±0.3)E-7	(3.3±13%)E-7	Agreement

TABLE 1

PILGRIM VERIFICATION TEST RESULTS

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		RESULTS IN MICROCURIES PER MILLILITER		
Reactor Coolant 0815 hrs 7-29-81	I-131	(5.3±0.6)E-4	(5.05±23%)E-4	Agreement
	I-132	(1.62±0.03)E-2	(1.70±4.3%)E-2	Agreement
	I-133	(6.00±0.10)E-3	(4.79±4.1%)E-3	Agreement
	I-134	(5.02±0.13)E-2	(5.30±17.6%)E-2	Agreement
	I-135	(1.60±0.05)E-2	(1.53±3.9%)E-2	Agreement
	Sr-91	(3.7±0.3)E-3	(4.44±8.4%)E-3	Agreement
	Sr-92	(1.32±0.03)E-2	(1.42±2.7%)E-2	Agreement
	Na-24	(1.23±0.09)E-3	(1.22±8.1%)E-3	Agreement
	Cr-51	(6.2±0.4)E-3	(4.16±19.5%)E-3	Possible Agreement
	Co-58	(1.02±0.08)E-3	(1.11±7.7%)E-3	Agreement
	Np-239	(2.8±0.3)E-3	(3.17±10%)E-3	Agreement

TABLE 1

PILGRIM VERIFICATION TEST RESULTS

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		RESULTS IN MICROCURIES PER MILLILITER		
Health Physics Air Sample (Rad Waste-Clean Waste Pump Room) 1345 hrs. 7-30-81	Co-60	(3.1±0.2)E-9	(3.18±?)E-9	Agreement
	Cs-137	(6.7±1.3)E-10	(8.95±?)E-10	Agreement

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 judgement 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.

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

Resolution	Agreement	Possible Agreement A	Possible Agreement B
<3	0.4 - 2.5	0.3 - 3.0	No Comparison
4 - 7	0.5 - 2.0	0.4 - 2.5	0.3 - 3.0
8 - 15	0.6 - 1.66	0.5 - 2.0	0.4 - 2.5
16 - 50	0.75 - 1.33	0.6 - 1.66	0.5 - 2.0
51 - 200	0.80 - 1.25	0.75 - 1.33	0.6 - 1.66
>200	0.85 - 1.18	0.80 - 1.25	0.75 - 1.33

"A" criteria are applied to the following analyses:

Gamma Spectrometry where principal gamma energy used for identification is greater than 250 Kev.

Tritium analyses of liquid samples.

Iodine on absorbers

"B" criteria are applied to the following analyses:

Gamma Spectrometry where principal gamma energy used for identification is less than 250 Kev.

89Sr and 90Sr Determinations.

Gross Beta where samples are counted on the same date using the same reference nuclide.