U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-219/94-15

Docket No. 50-219

License No. DPR-16

Licensee: GPU Nuclear Corporation
P. O. Box 388
Forked River, New Jersey 08731

Facility Name: Oyster Creek Nuclear Generating Station

Inspection At: Forked River, New Jersey

Inspection Conducted: July 25-29, 1994

Inspectors: J. J. Kottan 8-8-94
J. J. Kottan, Laboratory Specialist date
Effluents Radiation Protection Section (ERPS)

Approved by: J. C. Jang 8-9-94
J. C. Jang, Chief, ERPS date
Facilities Radiological Safety and Safeguards Branch

Areas Inspected: Announced inspection of the radiological chemistry program. Areas reviewed included: Confirmatory Measurements - Radiological, Laboratory QA/QC, and Audits.

Results: The licensee had in place effective programs for measuring radioactivity in process and effluent samples. No safety concerns or violations of regulatory requirements were identified.

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DETAILS

1.0 Individuals Contacted

Principal Licensee Employees

W. Barnshaw, Chemistry Group Supervisor
* P. Cooper, Chemistry Manager
* W. Cooper, Radiological Controls Supervisor
* M. Douches, Lead Auditor, Nuclear Safety Assessment
C. Jordan, Chemistry Group Supervisor
* S. Levin, Director, Operations and Maintenance
G. Mulleavy, Chemist
* J. Rogers, Sr. Licensing Engineer
R. Stoudnour, Chemistry Engineer

NRC Employees

* J. Jang, Chief, Effluents Radiation Protection Section
* S. Pindale, Resident Inspector

* denotes those present at the exit meeting on July 29, 1994.

The inspector also interviewed other licensee personnel including members of the chemistry and radiological controls staffs.

2.0 Purpose

The purpose of the inspection was to review the following areas:

1. The licensee's ability to measure radioactivity in plant systems samples and effluent samples.

2. The licensee's ability to demonstrate the acceptability of analytical results through implementation of a laboratory QA/QC program.

3.0 Radiochemical Confirmatory Measurements

During the inspection, liquid, airborne particulate (filter) and iodine (charcoal cartridge), and gas samples were analyzed by the licensee's chemistry department and the NRC for the purpose of intercomparison. The samples were actual split samples with the exceptions of the particulate filter, charcoal cartridge, and post treatment offgas sample. In these cases, the samples could not be split and the same samples were analyzed by the licensee and the NRC. Where possible, the samples were actual effluent samples or in-plant samples which duplicated the counting geometries used by the licensee for effluent sample analyses. The samples were analyzed by the licensee

using routine methods and equipment and by the NRC Region I Mobile Radiological Measurements Laboratory. Joint analyses of actual effluent samples were used to verify the licensee's capability to measure radioactivity concentrations in effluent and other samples with respect to Technical Specifications and other regulatory requirements.

In addition, a liquid 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, H-3, Fe-55, and gross alpha. The results of these analyses 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 a liquid sample split between the licensee and the NRC during a previous inspection on November 18-22, 1991 (Inspection No. 50-219/91-36) were also compared during this inspection.

The licensee's radiological controls department performed gamma spectrometry analyses of in-plant samples for radiation protection purposes. During this inspection, the charcoal cartridge and particulate filter samples were also analyzed by the licensee's radiological controls department and compared with the NRC results. These types of samples were those normally analyzed by this department.

The comparisons for all of the above sample results that were available indicated that all of the measurements were in agreement under the criteria for comparing results (see Attachment 1 to Table I) with two exceptions. The two exceptions were the H-3 and Fe-55 results from the liquid sample which was split during the previous inspection. The specific reasons for the disagreements could not be determined during this inspection. However, as stated above, a liquid sample was split for Fe-55 and H-3 analysis during this inspection, and those results will be compared as soon as received in order to resolve this discrepancy. Since the licensee does not routinely discharge liquid radioactive effluents, these disagreements would not result in the licensee exceeding Technical Specification effluent release limits.

Additionally, the initial I-134 result from the reactor water sample was in disagreement. This disagreement was apparently due to the fact that the licensee integrated the 847 keV photopeak of I-134 to quantify the I-134 present in the sample. Mn-56 which was also present in the sample interferes with the 847 keV photopeak of I-134. The inspector discussed this matter with the licensee and noted that the 884 keV photopeak of I-134 was free from the Mn-56 interference. The licensee stated that the 884 keV photopeak of I-134 would be used to quantify I-134. The intercomparison data are presented in Table I. The licensee's I-134 result in Table I was that obtained from the integration of the 884 keV photopeak.

No safety concerns or violations were identified in this area.

4.0 Laboratory QA/QC

The inspector reviewed the licensee's laboratory QA/QC program. The program was described in general terms in Procedure 822.1, "Chemistry Quality Control: Program Outline", and specific procedures implemented various aspects of the program. The licensee's laboratory QA/QC program utilized a number of techniques for controlling analytical results including: reagent control, instrument control, vendor laboratory control, and participation in an interlaboratory QC program. Instrument control was accomplished through the use of control charts to trend the performance of the gamma spectrometry and liquid scintillation counting systems. The interlaboratory QC program consisted of the analysis of unknown samples received from an outside laboratory on a quarterly basis. Additionally, the licensee submitted spiked samples to the vendor laboratory used for the analyses of effluent samples requiring radiochemical separations.

The inspector reviewed selected data generated by the licensee's laboratory QA/QC program for 1993 and 1994 to date, and, based on this review, noted that the licensee was implementing the laboratory QA/QC program as required. Of particular note to the inspector were the licensee's semi-annual reports which discussed and evaluated the laboratory QC data. The licensee used the laboratory QA/QC program data in a proactive manner to assess and improve laboratory measurement processes. The inspector stated that this was a noteworthy aspect of the licensee's laboratory QA/QC program.

Also, the inspector noted that the licensee was responsive to issues raised by the inspector during the previous inspection in this area. Specifically, the licensee was using control charts for the gamma spectrometry system which were based on fixed percentage control limits rather than statistical control limits. The licensee had committed to review this practice, and during this inspection the inspector noted that the licensee was using statistical control charts for the gamma spectrometry system. In addition, during the previous inspection, the licensee's radiochemistry interlaboratory QC program consisted of all liquid samples, rather than samples which included all counting geometries used by the licensee. The licensee had again committed to review this area, and during this inspection the inspector noted that the licensee's radiochemistry interlaboratory QC program now consisted of charcoal cartridges and particulate filters as well as liquids.

The inspector had no further questions in this area. No safety concerns or violations were identified.

5.0 Audit Activities

The inspector reviewed Audit No. S-OC-93-04, Plant Chemistry, which was performed from March 11, 1993 to May 18, 1993 and Audit No. S-OC-91-09, Plant

Chemistry, which was performed from July 25, 1991 to April 14, 1992. The inspector also discussed Audit No. S-OC-93-04 with the audit team leader that performed the audit. Based on these reviews and discussion, the inspector determined that the audits were conducted utilizing an audit matrix or plan and a detailed checklist, the audit was performance based, and the audits of chemistry were conducted biennially.

The inspector also reviewed selected monitoring reports (surveillances) of specific chemistry activities which were conducted in 1993 and 1994 to date. The monitoring reports were detailed, and while not performed at a set frequency, performance approximated a quarterly frequency. Areas chosen for surveillance or monitoring activities were based on auditor discussions with chemistry personnel, industry experiences, and auditor experiences.

Based on the above reviews and discussions, the inspector determined there was independent oversight and assessment of chemistry activities. No safety concerns or violations were identified in this area.

6.0 Exit Meeting

The inspector met with the licensee representatives denoted in Section 1 of this report at the conclusion of the inspection on July 29, 1994. The inspector summarized the purpose, scope and findings of the inspection. The licensee acknowledged the inspection findings.

TABLE I

Oyster Creek Radiochemistry Test Results

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		Results in microCuries per milliliter		
Stack Charcoal Cartridge 0816 hrs. 7-26-94 (Detector No. 2)	I-131	(2.1 ± 0.3) E-12	(2.4 ± 0.2) E-12	Agreement
	I-131	(5.3 ± 0.4) E-12	(6.2 ± 0.4) E-12	Agreement
Reactor Water Particulate Filter 0820 hrs. 7-26-94 (Detector No. 1)	Cr-51	(2.93 ± 0.12) E-5	(2.8 ± 0.2) E-5	Agreement
	Mn-54	(2.61 ± 0.03) E-5	(2.61 ± 0.10) E-5	Agreement
	Mn-56	(4.71 ± 0.13) E-5	(5.4 ± 0.3) E-5	Agreement
	Co-58	(6.9 ± 0.2) E-6	(7.9 ± 0.5) E-6	Agreement
	Fe-59	(1.99 ± 0.05) E-5	(2.00 ± 0.11) E-5	Agreement
	Co-60	(1.41 ± 0.03) E-5	(1.50 ± 0.08) E-5	Agreement
	Tc-99m	(4.56 ± 0.14) E-6	(4.2 ± 0.3) E-6	Agreement
Offgas-Post Treatment 1318 hrs. 7-27-94 (Detector No. 1)	Ar-41	(2.01 ± 0.03) E-5	(2.17 ± 0.08) E-5	Agreement
	Kr-85m	(3.22 ± 0.07) E-6	(3.42 ± 0.15) E-6	Agreement
	Xe-133	(1.72 ± 0.15) E-6	(1.6 ± 0.2) E-6	Agreement

TABLE I - Continued

Oyster Creek Radiochemistry Test Results

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		Results in microCuries per milliliter		
Liquid Radioactive Waste (WCT3A) 1055 hrs. 7-26-94 (Detector No. 2)	Mn-54	(5.7 ± 0.6) E-7	(7.6 ± 1.0) E-7	Agreement
	Co-60	(9.37 ± 0.16) E-6	(9.7 ± 0.4) E-6	Agreement
	Cs-137	(1.551 ± 0.015) E-5	(1.56 ± 0.13) E-5	Agreement
	Cs-134	(7.9 ± 0.8) E-7	(9.1 ± 0.9) E-7	Agreement
Offgas 0946 hrs. 7-27-94 (Detector No. 1)	Kr-87	(9.80 ± 0.10) E-4	(9.8 ± 0.8) E-4	Agreement
	Kr-88	(6.2 ± 0.8) E-4	(4.7 ± 0.5) E-4	Agreement
	Xe-135m	(4.6 ± 0.2) E-3	(5.3 ± 0.2) E-3	Agreement
	Xe-135	(9.7 ± 0.4) E-4	(9.4 ± 0.5) E-4	Agreement
	Xe-138	(2.15 ± 0.07) E-2	(2.33 ± 0.11) E-2	Agreement

TABLE I - Continued

Oyster Creek Radiochemistry Test Results

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		Results in microCuries per milliliter		
Reator Water	I-132	(8.2 ± 0.2) E-4	(9.4 ± 0.4) E-4	Agreement
0830 hrs.	I-133	(2.24 ± 0.07) E-4	(2.21 ± 0.10) E-4	Agreement
7-27-94	I-134	(2.96 ± 0.16) E-3	(3.26 ± 0.11) E-3	Agreement
(Detector No. 1)	I-135	(6.2 ± 0.4) E-4	(6.2 ± 0.2) E-4	Agreement
Liquid Radioactive	Fe-55	(3.06 ± 0.02) E-5	(4.6 ± 0.5) E-6	Disagreement
Waste	gross alpha	(1.1 ± 1.5) E-8	<6.8 E-9	No Comparison
(Drywell Sump)	H-3	(2.62 ± 0.03) E-3	(4.1 ± 0.4) E-4	Disagreement
1125 hrs.	Sr-89	(7 ± 2) E-8	<1.3 E-8	No Comparison
11-21-91	Sr-90	(4.9 ± 0.9) E-8	<6.9 E-9	No Comparison

TABLE I - Continued

Oyster Creek Radiochemistry Test Results

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		Results in microCuries per milliliter		
Stack Charcoal Cartridge 0816 hrs. 7-26-94 (Radiological Controls Analysis, Detector No. 1)	I-131	(2.1 ± 0.3) E-12	(1.9 ± 0.2) E-12	Agreement
	I-133	(5.3 ± 0.4) E-12	(5.0 ± 0.4) E-12	Agreement
Reactor Water Particulate Filter 0820 hrs. 7-26-94 (Radiological Controls Analysis, Detector No. 2)	Cr-51	(2.93 ± 0.12) E-5	(3.18 ± 0.10) E-5	Agreement
	Mn-54	(2.61 ± 0.03) E-5	(2.94 ± 0.03) E-5	Agreement
	Co-58	(6.9 ± 0.2) E-6	(7.8 ± 0.2) E-6	Agreement
	Fe-59	(1.99 ± 0.05) E-5	(2.21 ± 0.05) E-5	Agreement
	Co-60	(1.41 ± 0.03) E-5	(1.41 ± 0.03) E-5	Agreement
Stack Charcoal Cartridge 0816 hrs. 7-26-94 (Radiological Controls Analysis, Detector No. 3)	I-131	(2.1 ± 0.3) E-12	(2.32 ± 0.14) E-12	Agreement
	I-133	(5.3 ± 0.4) E-12	(5.9 ± 0.3) E-12	Agreement

TABLE I - Continued

Oyster Creek Radiochemistry Test Results

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		Results in microCuries per milliliter		
Reactor Water Particulate Filter 0820 hrs. 7-26-94 (Radiological Controls Analysis, Detector No. 3)	Cr-51 Mn-54 Co-58 Fe-59 Co-60	(2.93 ± 0.12) E-5 (2.61 ± 0.03) E-5 (6.9 ± 0.2) E-6 (1.99 ± 0.05) E-5 (1.41 ± 0.03) E-5	(2.96 ± 0.10) E-5 (2.73 ± 0.03) E-5 (7.5 ± 0.2) E-6 (2.12 ± 0.05) E-5 (1.38 ± 0.03) E-5	Agreement Agreement Agreement Agreement Agreement

ATTACHMENT 1 TO TABLE I

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 the 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.

Resolution[1]	Ratio for Comparison[2]
< 4	No Comparison*
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

* No comparison due to the large uncertainty of the result.

1. Resolution = (NRC Reference Value/Reference Value Uncertainty)

2. Ratio = (Licensee Value/NRC Reference Value)