U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-219/86-16

Docket No. 50-219

License No. DPR-16 Category C

Licensee: GPU Nuclear Corp
100 Interpace Parkway
Parsippany, New Jersey 07054

Facility Name: Oyster Creek Nuclear Generating Station

Inspection At: Forked River, New Jersey

Inspection Conducted: June 3-6, 1986

Inspectors: W. J. Pasciak 7/3/86
H. Zibulsky, Chemist date

Karen L. Rabatin 7/3/86
K. Rabatin, Radiation Specialist date

Approved by: W. J. Pasciak 7/3/86
W. J. Pasciak, Chief, Effluents Radiation Protection Section, DRSS date

Inspection Summary: Inspection on June 3-6, 1986 (Report No.50-219/86-16)

Areas Inspected: Routine, announced inspection of the nonradiological chemistry program. Areas reviewed included measurement control and analytical procedure evaluations.

Results: No violations were identified.

DETAILS

1. Individuals Contacted

*J. Barton, Deputy Director
*C. Halbfoster, Manager, Plant Chemistry
*R. Hillman, Senior Chemist
*W. Dunphy, Senior Chemist
*B. Holman, Licensing Engineer
P. Fiedler, Vice President and Director
J. Sullivan, Director, Plant Operations
E. Donner, Licensing
C. Hager, Plant Engineer

*Denotes those present at the exit interview.

The inspector also interviewed other licensee employees including members of the chemistry staff.

2. Action on Previous Licensee Findings

(Open) 25-00-13 TI-The inspection covered part of this item. Of the two modules included in the TI, Module 79501 was completed.

3. Measurement Control Evaluation

The licensee's measurement control program will be verified through analysis of actual plant water samples. Samples from the liquid poison tank, closed cooling water, make up system water and condensate were taken and duplicate samples were sent to Brookhaven National Laboratory (BNL) for independent verification. The licensee will determine boron conscentration on the liquid poison tank sample, chloride on the closed cooling water sample, silica on the make up water sample and metals on the condensate sample. On completion of the analyses by both laboratories, a statistical evaluation will be made (Inspector Follow-up Item 50-219/86-16-01).

The inspectors reviewed the measurement control charts. Some of the acceptance criteria for the analyses were arbitrary ± 10% without the use of charts. The charts that were generated were for analyst evaluation and used duplicate samples to demonstrate precision and spiked samples to demonstrate accuracy. The control charts did not demonstrate the efficiency or the trends of the measurement system. The inspectors recommended a ± 2 sigma alert criteria and a ± 3 sigma acceptance parameter as was discussed in report number 50-219/84-33. It was also suggested that more control charts be generated for those analytes whose parameters are mentioned in the fuel warranty and vendor requirements. The licensee agreed to generate the necessary control charts (Inspector Follow-up Item 50-219/86-16-02).

The inspectors reviewed the nonradiological interlaboratory and intralaboratory crosscheck programs. These programs are documented in Procedure 822.6 "Quality Control: Vendor Laboratories" and Procedure 822.5 "Quality Control: Analyst Performance". The licensee receives and analyzes nonradiological samples prepared by a vendor laboratory on a quarterly basis. The results are compared to the vendor's known value using statistical methods and predetermined acceptance criteria. Measurements in disagreement are documented and investigated by the Lead Chemist. The intralaboratory cross check program uses duplicate, standard, and spiked samples prepared by the Lead Chemist to evaluate chemistry technician performance and the analytical methods. These quality control samples are rotated through the technicians' weekly assignments. However, the number of quality control analyses is dependent on the analyte of interest and the sampling frequency. The Lead Chemist reviews the results of these analyses and investigates any out of control measurements. As discussed above, the data is plotted on accuracy and precision control charts. Data and control charts from the interlaboratory and intralaboratory programs are documented in the Oyster Creek Chemistry Group Quality Control Report.

The inspectors observed that the licensee used one standard stock solution for calibration and control solutions. Maintenance of two standard stock solutions is needed to provide an analytical cross check on the continuing quality of the stock solutions. The licensee agreed to maintain two standard stock solutions.

The calibration curves were not statistically fit to the data points but were graphically approximated. This could produce as much as 15 percent error as may have been the case in the licensee's analysis of the NRC blind standard for chloride. The licensee agreed to use a statistical method to draw the calibration curves.

The licensee wasn't using the control standard solutions in the same concentration range as the samples. The standard solution concentrations were as much as ten times the expected sample quantity. This prevented the licensee in identifying any anomaly associated with low concentrations of the analyte. The licensee agreed to use an appropriate concentration for the control standards when the new control charts are generated.

4. Analytical Procedures Evaluation

During the inspection, standard chemical solutions were submitted by the inspector to the licensee for analysis. The standard solutions were prepared by BNL for NRC Region 1, and were analyzed by the licensee using normal methods and equipment. The analysis of standards is used to verify the various plant systems with respect to Technical Specification and other regulatory requirements. In addition, the analysis of standards is used to evaluate the licensee's analytical procedures with respected to accuracy and precision.

The results of the standard measurements comparison indicated that seven out of twenty-one comparisons were in disagreement under the criteria used for comparing results (see Attachment 1). The spectrophotometric chloride disagreements were due to the licensee graphically approximating the data points on the calibration curve instead of statistically fitting the curve. The ion chromatography chloride disagreement was due to statistics. The iron disagreement was due to the NRC standard being less than the licensee's lowest standard and as a result the extrapolation introduced error. The nickel and copper disagreements were on the conservative side and equaled to less than 7%. The boron disagreement was a sampling error.

Because the measurement program lacked the control charts with the ± 2 sigma and ± 3 sigma and a single standard stock solution was used, it was difficult to pinpoint the cause of the measurement disagreements.

The licensee is using upgraded analytical procedures and state-of-the-art instrumentation in the laboratory. When the recommendations are incorporated into their measurement systems, the licensee should have an effective measurement program.

5. Exit Interview

The inspectors met with the licensee representatives (denoted in paragraph 1) at the conclusion of the inspection on June 6, 1986, and summarized the scope and findings of the inspection. At no time during this inspection was written material provided to the licensee by the inspectors.

ATTACHMENT 1

Criteria For Comparing Analytical Measurements

This attachment provides criteria for comparing results of capability tests. In these criteria the judgement limits are based on the uncertainty of the ratio of the licensee's value to the NRC value. The following steps are performed:

(1) the ratio of the licensee's value to the NRC value is computed

$$\left(\text{ratio} = \frac{\text{Licensee Value}}{\text{NRC Value}}\right);$$

(2) the uncertainty of the ratio is propagated.[1]

If the absolute value of one minus the ratio is less than or equal to twice the ratio uncertainty, the results are in agreement.
($|1-\text{ratio}| \geq 2$ uncertainty)

[1] $Z=\frac{x}{y}$, then $\frac{Sz^2}{Z^2} = \frac{Sx^2}{x^2} + \frac{Sy^2}{y^2}$

(From: Bevington, P. R., Data Reduction and Error Analysis for the Physical Sciences, McGraw-Hill, New York, 1969)

Capability Test Results
Oyster Creek Nuclear Generating Station

Chemical Parameter	NRC Value	Lic. Value	Ratio (Lic. /NRC)	Comparison
	Results in parts per billion (ppb)			
Chloride (Spectrophotometry)	103±7	72±3	0.70±0.06	Disagreement
	697±30	663±6	0.95±0.04	Agreement
	277±3	267±3	0.96±0.02	Disagreement
Chloride (Ion Chromatograph)	5.15±0.04	5.59±0.17	1.08±0.03	Disagreement
	6.97±0.30	7.10±0.20	1.02±0.05	Agreement
	2.77±0.28	3.29±0.01	1.19±0.12	Agreement
	Results in parts per million (ppm)			
Boron	1014±15	994±1	0.98±0.01	Agreement
	3047±26	2927±13	0.96±0.01	Disagreement
	5040±130	4885±0	0.97±0.03	Agreement
Nickel	1.32±0.16	1.27±0.01	0.96±0.12	Agreement
	3.79±0.07	3.98±0.05	1.05±0.02	Disagreement
	2.58±0.13	2.64±0.07	1.02±0.06	Agreement
Iron	1.28±0.09	1.04±0.03	0.81±0.06	Disagreement
	3.43±0.21	3.72±0.06	1.08±0.07	Agreement
	2.39±0.10	2.46±0.01	1.03±0.04	Agreement
Copper	1.33±0.01	1.35±0.02	1.02±0.01	Agreement
	3.84±0.04	4.12±0.06	1.07±0.02	Disagreement
	2.60±0.04	2.71±0.02	1.04±0.02	Agreement
Chromium	1.20±0.10	1.28±0.02	1.07±0.09	Agreement
	3.74±0.28	3.88±0.05	1.04±0.08	Agreement
	2.69±0.05	2.58±0.01	0.96±0.02	Agreement