U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-255/89023(DRSS)

Docket No. 50-255 License No. DPR-20

Licensee: Consumers Power Company
212 West Michigan Avenue
Jackson, MI 49201

Facility Name: Palisades Nuclear Generating Plant

Inspection At: Palisades Site, Covert, Michigan

Inspection Conducted: July 26-28 and July 31 through August 1, 1989 (Onsite)

Inspectors: J. E. House — Date: 8-30-89

R. B. Holtzman — Date: 8/30/89

Approved By: M. C. Schumacher, Chief
Radiological Controls and Chemistry Section — Date: 8/30/89

Inspection Summary

Inspection on July 26-28 and July 31 through August 1, 1989 (Report No. 50-255/89023(DRSS))

Areas Inspected: Routine, unannounced inspection of: (1) the chemistry program, including procedures, organization, and training (IP 84750); (2) primary and secondary systems water quality control programs (IP 84750); (3) quality assurance/quality control program in the laboratory (IP 84750); (4) nonradiolgical confirmatory measurements (IP 79701); and (5) the radiological environmental monitoring Program (REMP) (84750). Also reviewed were past open items, audits and the qualifications of the new Chemistry Superintendent.

Results: The licensee's secondary system water quality control program appeared to be adequate to control chemistry parameters. The initial confirmatory measurements results were fair owing to some problems in operation and measurement QA/QC for certain instruments. After recalibration, reanalyses gave substantial improvement and licensee representatives agreed to take additional measures to correct these problems. No violations or deviations were identified.

DETAILS

1. Persons Contacted

*R. M. Rice, Operations Manager, Palisades
*D. D. Hice, Chemistry Superintendent
*T. A. Chartrand, Chemistry Supervisor
*J. R. Brunet, License Analyst
J. E. Paver, Support Supervisor
R. Erickson, Chemical Engineer
C. T. Hillman, Staff Engineer
M. Sullivan, Lead Chemistry Technician

*E. R. Swanson, Senior Resident Inspector, NRC

The inspectors also interviewed other licensee personnel in the course of the inspection.

*Denotes those present at the plant exit interview on August 1, 1989.

2. Licensee Action on Previous Inspection Findings

a. (Closed) Open Item No. 50-255/87017-02: Licensee to implement regular use of QC charts on the gamma spectrometer systems and to use only a few lines in the routine source checks. The licensee is presently using three of the more abundant peaks in the Ho-166m source, at energies of 184, 711 and 810 keV to check energy and sensitivity calibration stability. They also track centroid and peak width (FWHM) on those peaks to assess counter operabilities. The results are stored and processed by a Nuclear Data ND 9900 analyzer system. The control charts of these parameters are plotted monthly and are checked on the terminal at least weekly. Licensee representatives noted that the chart parameters (mean and standard deviation) are updated with each entry (daily). They agreed to consider doing so less frequently, probably quarterly, so that data trends are less likely to be missed. The licensee had agreed previously (Region III Inspection Report No. 50-255/89010) to revise the procedures to reflect laboratory practice . This development will be followed in subsequent inspections under Open Item No. 50-255/89023-01.

b. (Open) Open Item No. 50-255/88015-01: Licensee to investigate analytical disagreements with Brookhaven National Laboratory. Although the licensee's QA/QC program has continued to improve, results from the confirmatory measurements program (21 agreements in 33 analyses initially) indicated that some instrument problems still exist (Sections 6 and 7). Resolution of these problems will be followed under this Open Item.

c. (Closed) Open Item No. 50-255/88015-02: Licensee to implement independent controls and control chart statistics. The licensee has developed statistically-based control charts and is setting up a control program with independent standards (Section 7).

d. (Closed) Open Item No. 50-255/88015-03: Licensee to modify the nonradiological intralaboratory comparison program to include acceptance criteria and to insure that all technicians are tested twice per year. The licensee has implemented acceptance criteria and a review of selected data suggests that technicians are tested twice per year.

e. (Closed) Open Item No. 50-255/88015-04: Licensee to investigate a suspected defective boron standard. The licensee notified the vendor and issued a report under the provisions of 10 CFR Part 21.

3. Management Controls and Organization (IP 84750)

The Chemistry Department's organization was similar to that described in the previous inspection report[1]. The head of the Department, the Chemistry Superintendent is supported by a Laboratory Supervisor, a Support Supervisor and three Chemical Engineers. The Hot and Cold Laboratories are each supervised by Lead Technicians who are supported by 13 technicians. Due to turnover of technicians, only five are qualified under ANSI N 18.1-1971.

The new Chemistry Superintendent replaced the previous one who transferred to a new position. The new Superintendent appears to be adequately qualified as a chemist. He has a B.Sc. in Mechanical Engineering and an A.A. in Chemical Technology. He has had several years experience as a chemistry supervisor at a non-operating nuclear plant (Midland) and four years operations experience at an operating Nuclear Plant. His training included the General Electric BWR Training Program and he has GE and company SRO Hot License Certifications. This transition is being facilitated by his predecessor, the former Plant Chemical Engineer, providing assistance and guidance. The management structure appeared to be adequate.

The licensee is developing a chemistry self assessment program using criteria from the INPO Chemistry Guidelines. Licensee representatives stated that this program should assist the chemistry laboratory in improving the quality of its operations, in general, and the QA/QC program, in particular.

The licensee's Chemical Technician training program is scheduled for re-accreditation next year.

No violations or deviations were identified.

[1]Region III Inspection Report No. 50-255/88015.

4. Water Chemistry Control Program (IP 84750)

The inspectors reviewed the water chemistry control program based on Procedure No. COP 11, "Secondary System Chemistry," Revision 11, March 15, 1988. The specifications of the administrative limits on the parameters of the various systems are derived from and appear to be consistent with the relevant EPRI Steam Generator Owners Group Guidelines (SGOG). Licensee management of secondary water system parameters is similar to that described in the previous inspection report[2].

The licensee had installed a new secondary water sampling panel in the cold chemistry laboratory with in-line monitors for hydrazine, pH, dissolved oxygen, sodium, and specific and cation conductivity. This system also has sampling ports for grab samples to be taken for the laboratory. Data from these samples were used for trending chemistry parameters; data from in-line monitors were also stored in the computer data base and could also be used for trending. A new computer system and software have been acquired by the licensee for data handling. The licensee does not have procedures describing trend charts and their uses. This is a weakness in the trending program. Licensee representatives stated that secondary chemistry parameters were reviewed daily by the Chemistry Superintendent. The Operations Manager reviews chemistry trends mainly when problems or abnormal trends are encountered.

The inspectors reviewed trend charts of chemistry parameters and noted that the plotting of charts appeared to be slow. Licensee representatives stated that this was caused by having only one manual feed plotter available. An additional plotter with automatic paper feed has been ordered to speed the plotting process.

The steam generator (S/G) water quality is maintained by feed and bleed (blowdown) since the plant does not use condensate polishers.

A review of selected data for the previous year indicated that the licensee maintains secondary water chemistry parameters generally within the Owners Group Guidelines and overall secondary water quality appeared to be good.

No violations or deviations were identified.

5. Implementation of the Chemistry Program (IP 84750)

The inspectors reviewed the chemistry programs including physical facilities and laboratory operations. Since the last inspection, construction of a new cold chemistry laboratory was completed and the laboratory was in use. A new computer-controlled gradient ion chromatography (IC) system has been acquired for the cold laboratory. The new laboratory appeared to be well equipped and provided adequate working space.

[2]Ibid.

The inspectors observed several technicians analyze the confirmatory measurements samples. They appeared to be generally knowledgeable about the work, followed the procedures and appeared to do well in the analyses.

Overall, the laboratory appeared to be adequate for the proper operation of the plant and to be operating satisfactorily.

No violations or deviations were identified.

6. Nonradiological Confirmatory Measurements (IP 79701)

The inspectors submitted chemistry samples to the licensee for analysis as part of a program to evaluate the laboratory's capabilities to monitor nonradiological chemistry parameters in various plant systems with respect to various Technical Specification and other regulatory and administrative requirements. These samples had been prepared, standardized, and periodically reanalyzed (to check for stability) for the NRC by the Radiological Sciences Division of Brookhaven National Laboratory (BNL). The samples were analyzed by the licensee using routine methods and equipment.

A single dilution for each sample was made by licensee personnel as necessary to bring the concentrations within the ranges normally analyzed by the laboratory, and run in triplicate in a manner similar to that of routine samples. The results are presented in Table 1 and the criteria for agreement in Attachment 2. These criteria for agreement are based on comparisons of the mean values and estimates of the standard deviations (SD) of the measurements. Modifications made to these criteria (Attachment 1 Notes) are based on the consideration that the uncertainties (SD) of the licensee's results were not necessarily representative of the laboratory's because they were obtained by one analyst over a short period of time.

The licensee also prepared a sample of secondary system water spiked with the anionic analytes fluoride, chloride and sulfate to be split with BNL. The licensee determined the concentrations of the analytes and the results will be compared to those determined by BNL. This will be followed under Open Item No. 50-255/89023-02.

The licensee determined 11 analytes at three concentrations each. The initial results were fair with 21 agreements in 33 comparisons (64%). The disagreements were in the sulfate and the two lower-level chloride samples, the ammonia, iron and middle sodium samples. The chloride and sulfate disagreements appeared to be due, in large part, to software configuration problems in obtaining the baselines with the gradient elution systems used on the IC. The reruns of the chlorides were in agreement, but the analyst believed some of the sulfate results to be unreliable and thus reported only one of the values from the reruns. The disagreements in the ammonia determinations were due to a defective calibration standard, as shown by recalibration with a new standard.

The laboratory personnel noted that they often had difficulties with the iron analyses by graphite furnace atomic absorption spectrophotometry (GFAAS) and they are trying to resolve the problem. This appears to be a generic problem with this type of analysis and may be due to the BNL sample matrix which in addition to the iron contains copper, nickel and chromium. The precision of the sodium analysis is generally poor at the low concentrations used here apparently due to sample contamination.

Some particular problems were identified in this inspection some of which appear to be related to various deficiencies of the QA/QC Program discussed in Section 7. The licensee does not use independent standards, so that a change in a stock standard solution could go unnoticed. The difficulties in the ammonia analyses may have been an example of this lack; this also indicates a need for greater care in the making of the standards. The laboratory is in the process of obtaining standards to implement such a program.

The sulfate analyses appeared to have problems, due possibly to the software operating the ICs, to the calibration standards, or to the QA/QC program in which the control charts appeared to the inspectors to have excessively wide control limits.

Following equipment recalibration the licensee obtained 28 agreements in the 33 analyses (85%). The licensee is in the process of assessing and rectifying the problems identified in the analyses. Progress in the improvements in the analyses will continue to be followed under Open Item No. (50-255/88015-01, Section 2).

No violations or deviations were identified.

7. Implementation of the QA/QC Program in the Chemistry Laboratory (IP 84750)

The inspectors reviewed the nonradiological QA/QC program that is required by the Chemistry Program Manual. The licensee had developed statistically-based control charts for all assays using a computer data base. Although the statistically-based charts were an improvement, the inspectors noted several concerns. The charts lacked mean value lines, apparently a software problem which could be easily modified. Chart parameters, i.e., mean values and standard deviations had been determined approximately one year ago and were still in use. These parameters should be updated quarterly using at least 30 data points obtained during the previous quarter. An additional concern was that the control charts were not reviewed routinely by laboratory personnel. Procedures establishing control charts needed to be upgraded and made consistent with the current computerized data base methods. Licensee representatives agreed to review and improve the quality of the control charts.

Multiple-point calibration curves were in use on most assays; however, single-point curves were still in employed on the atomic absorption spectrophotometer (AAS). Due to non-linear responses in calibration curves, multiple-point curves would provide improved accuracy. The licensee has agreed to investigate the use of multiple-point calibration curves for the AAS.

The licensee had previously agreed to implement independent controls on all or most assays. Although the program was under development and some reagents had been obtained, the procedure needed to implement the program had not been written. The licensee's current practice used function checks prepared from the same stock solutions used for calibration. The independent control program will be reviewed in subsequent inspections.

The licensee has a vendor-supplied interlaboratory comparison program. A review of selected data from the previous year suggested that the licensee had, in general, performed adequately on the quarterly cross checks. Approximately 75% of the analyses were within ±10% of the vendor's value. In a few cases, large biases (~100%) were observed which indicated major analytical problems. Implementation of multiple point calibration curves, independent controls and routine review of control charts should minimize these analytical difficulties.

The inspectors reviewed the technician testing program. From a review of selected data it appeared that all technicians were tested at least semiannually. This program is outlined in a memorandum dated April 12, 1988, "Basis Document for Acceptance criteria of Interlaboratory Cross Check Program" This document establishes a statistically-based acceptance criterion using existing analytical data. One weakness that the inspectors noted was the lack of a procedure defining parameters and acceptance criteria. This will be followed in subsequent inspections.

In summary, the licensee's overall QA/QC system has the basic elements of a satisfactory program and has improved from the last inspection. However, program weaknesses remain which appear to relate to the difficulties noted in the confirmatory measurements comparisons program. Possible improvements to the QA/QC program include reduction of the wide bands on the QC chart control limits to be achieved by more frequent determination of the chart parameters, and by calibrating the instruments more often; more detailed routine assessment of the chart data and hardcopy output of the QC charts; the use of multipoint calibration curves on the AAS; and control of the QA/QC operations by procedure. Licensee representatives agreed to address these matters via letter by October 1, 1989. This will be followed under Open Item No. 50-255/89023-03.

No violations or deviations were identified.

8. Open Items

Open items are matters which have been discussed with the licensee, which will be reviewed further by the inspector, and which involve some action on the part of the NRC or licensee, or both. Open items disclosed during the inspection are discussed in Sections 2, 6 and 7.

9. Exit Interview

The scope and findings of the inspection were reviewed with licensee representatives (Section 1) at the conclusion of the inspection on August 1, 1989. The inspectors discussed the Open Items in Section 2,

observations on the quality control program, the confirmatory measurements and the secondary water trending programs. Licensee representatives agreed to consider modifications and improvements of these programs, as discussed in Sections 6 and 7, and to outline these changes in a letter to Region III by October 1, 1989.

During the exit interview, the inspectors discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspectors during the inspection. Licensee representatives did not identify any such documents or processes as proprietary.

Attachments:
1. Table 1, Nonradiological Interlaboratory Test Results, July 26 through August 1, 1989
2. Attachment 1, Criteria for Comparing Analytical Measurements (Nonradiological)

TABLE 1

Nonradiological Interlaboratory Test Results
Palisades Nuclear Generating Plant
July 26-August 1, 1989

Analyte	Analytical Method[b]	NRC[a] Y ± SD	Licensee[a] X ± SD	Ratio Z ± SD	Comparison[c] ±2 SD
		Concentration ppb			
Fluoride	IC	11.3 ± 1.0	10.1 ± 0.5	0.898 ± 0.091	A
		21.2 ± 0.2	20.3 ± 1.0	0.960 ± 0.048	A
		41.4 ± 0.9	39.9 ± 2.0	0.964 ± 0.052	A
Chloride	IC	9.3 ± 0.1	11.8 ± 0.5	1.276 ± 0.068	D+
		18.6 ± 0.2	20.8 ± 0.2	1.118 ± 0.048	D+
		38.2 ± 0.6	41.1 ± 1.4	1.075 ± 0.040	A
	(rerun)	9.3 ± 0.1	10.1 ± 0.1	1.086 ± 0.048	A+
	"	18.7 ± 0.2	17.4 ± 0.2	0.930 ± 0.037	A+
	"	38.3 ± 0.6	38.5 ± 0.6	1.005 ± 0.022	A
Sulfate	IC	9.75 ± 0.70	14.3 ± 0.4	1.467 ± 0.149	D*
		19.2 ± 1.4	25.3 ± 0.8	1.321 ± 0.132	D*
		39.0 ± 1.2	49.9 ± 2.7	1.279 ± 0.079	D
	(rerun)	9.8 ± 0.7	9.5 ± 0.7	0.969 ± 0.099	A
Fe	AA/FU	9.30 ± 0.25	12.1 ± 0.2	1.301 ± 0.049	D*
		19.9 ± 0.3	22.4 ± 0.1	1.126 ± 0.020	D*
		29.2 ± 0.8	40.3 ± 0.6	1.378 ± 0.050	D*
Cu	AA/FU	10.0 ± 0.2	10.8 ± 0.1	1.080 ± 0.045	A+
		20.2 ± 0.8	20.4 ± 0.1	1.012 ± 0.038	A
		30.0 ± 0.8	30.6 ± 0.3	1.020 ± 0.027	A
Na	AA/FL	6.05 ± 0.70	5.50 ± 0.8	0.909 ± 0.169	A
		10.6 ± 0.6	14.4 ± 0.6	1.358 ± 0.095	D
		15.8 ± 0.9	19.7 ± 1.6	1.247 ± 0.124	A
	(rerun)	10.6 ± 0.6	11.2 ± 0.4	1.057 ± 0.071	A
Li	AA/FL	492 ± 10	516 ± 1	1.048 ± 0.030	A*
		1500 ± 35	1457 ± 25	0.971 ± 0.028	A
		2065 ± 50	1917 ± 21	0.928 ± 0.045	A+
	(rerun)	2065 ± 50	2077 ± 15	1.006 ± 0.025	A
Ammonia	SIE	208 ± 10	330 ± 0	1.587 ± 0.085	D*
		1200 ± 12	2100 ± 0	1.784 ± 0.035	D*
		1968 ± 92	3500 ± 0	1.778 ± 0.092	D*
	(rerun)	208 ± 10	197 ± 3	0.947 ± 0.048	A
	"	1200 ± 12	1177 ± 23	0.981 ± 0.022	A
	"	1968 ± 92	2017 ± 29	1.025 ± 0.050	A

Analyte	Analytical Method[b]	NRC[a] Y ± SD	Licensee[a] X ± SD	Ratio Z ± SD	Comparison[c] ±2 SD
Hydrazine	Spec	9.95 ± 0.15	10.0 ± 0.1	1.005 ± 0.018	A
		24.9 ± 0.3	25.0 ± 0.1	1.002 ± 0.011	A
		50.0 ± 0.5	48.7 ± 0.6	0.974 ± 0.015	A
Silica	Spec	21.1 ± 1.1	20.0 ± 0.1	0.947 ± 0.050	A
		52.0 ± 2.0	50.0 ± 0.1	0.962 ± 0.037	A
		157 ± 2	153 ± 6	0.975 ± 0.040	A
		Concentration, ppm			
Boron[d]	Titr	1002 ± 10	994 ± 3	0.992 ± 0.010	A
		2970 ± 23	3011 ± 4	1.014 ± 0.008	A
		4919 ± 47	4951 ± 10	1.007 ± 0.010	A

a. Value ± standard deviation (SD); number of BNL analyses is 6 to 9. The number of licensee analyses is 3 unless otherwise noted.

b. Analytical methods:
- Titr - titration
- IC - Ion chromatography
- AA/FU - Atomic absorption Spectroscopy (furnace)
- AA/FL - Atomic absorption Spectroscopy (flame)
- SIE - Specific Ion Electrode

c. A = Agreement
D = Disagreement

d. NRC(BNL) values replaced by mean values of plants in Region III.

*Substituted the BNL uncertainty for licensee's uncertainty.
+Substituted 3% relative SD for BNL and licensee's SDs.

ATTACHMENT 1

Criteria for Comparing Analytical Measurements

This attachment provides criteria for comparing results of the capability tests. The acceptance limits are based on the uncertainty (standard deviation) of the ratio of the licensee's mean value (X) to the NRC mean value (Y), where

(1) $Z = X/Y$ is the ratio, and

(2) S_z is the uncertainty of the ratio determined from the propagation of the uncertainties of licensee's mean value, S_x, and of the NRC's mean value, S_y.[1] Thus,

$$\frac{S_z^2}{Z^2} = \frac{S_x^2}{X^2} + \frac{S_y^2}{Y^2}, \text{ so that}$$

$$S_z = Z \bullet \left(\frac{S_x^2}{X^2} + \frac{S_y^2}{Y^2} \right)^{\frac{1}{2}}$$

The results are considered to be in agreement when the bias in the ratio (absolute value of difference between unity and the ratio) is less than or equal to twice the uncertainty in the ratio, i.e.

$$| 1-Z | \leq 2 \bullet S_z .$$

---

1. National Council on Radiation Protection and Measurements, A Handbook of Radioactivity Measurements Procedures, NCRP Report No. 58, Second Edition, 1985, Pages 322-326 (see Page 324).

4/6/87

ATTACHMENT 1

NOTES

I. The uncertainties may be modified in cases of disagreement:

a. If the licensee's SD, S_x is smaller than that of the NRC, the NRC's relative standard deviation (RSD) (S_y/Y) will be substituted for that of the licensee (S_x/X), and the agreement criteria recalculated.

b. If a disagreement and the RSDs appear to be unreasonably low, RSDs of 3% will be substituted for those of both the NRC and the licensee. This will not be done for the boron analyses where the expected RSDs are 0.5-1%.

II. Due to some uncertainties in the values of the 1987 (87) boron standards, the mean values of the concentrations obtained by the plant laboratories in Region III are used as the NRC values. These results appear to have resolved the problem of the consistently negative biases between the licensees and BNL boron analyses. The licensees generally reported similar values of the 1000-ppm standard with a relatively small RSD of ±1.7%, although the analytical methods differed.