U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-461/87021(DRSS)

Docket No. 50-461 License No. NPF-55

Licensee: Illinois Power Company
500 South 27th Street
Decatur, IL 62525

Facility Name: Clinton Nuclear Power Station, Unit 1

Inspection At: Clinton Site, Clinton, Illinois

Inspection Conducted: June 1-5, 1987 (Onsite)

Inspector: R. B. Holtzman — 6/22/87 Date

Inspector: J. E. House — 6/22/87 Date

Approved By: M. C. Schumacher, Chief
Radiological Effluents and
Chemistry Section — 6/22/87 Date

Inspection Summary

Inspection on June 1-5, 1987 (Report No. 50-461/87021(DRSS))
Areas Inspected: Routine, announced inspection of the chemistry program, including (1) procedures, training and quality assurance, (2) the chemistry laboratory and water chemistry control, and (3) confirmatory measurements of nonradiolgical samples.
Results: No violations or deviations were identified.

DETAILS

1. Persons Contacted

*D. P. Hall, Vice President, IP
*J. W. Wilson, Manager, CPS, IP
*J. Greenwood, Manager, Power Supply, Soyland/WIPCO
*R. A. Schultz, Director, Planning and Programs - Nuclear Planning and Support, IP
*S. H. Daniel III, Supervisor, Chemistry, IP
*E. A. Till, Director, Nuclear Training, IP
*F. A. Spangenberg, III, Manager, Licensing and Safety, IP
*R. E. Campbell, Manager, Quality Assurance, IP
*J. S. Perry, Manager, Nuclear Programs Coordination, IP
*J. A. Brownell, Project Specialist Licensing, IP
J. R. Stonestreet, Assistant Supervisor, Chemistry Operations, IP
K. L. Harper, Chemist, Nuclear, IP
P. R. Otis, Chemist, Nuclear, IP
P. Hunter, Chemistry Technician, Contractor
H. H. Brophy, Chemistry Techician, IP

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

*Denotes those present at the plant exit interview on June 5, 1987.

2. Management Controls, Organization and Training

The licensee had reorganized the Chemistry Department since the previous inspection.[1] The Supervisor-Chemistry, who reports to the Director-Plant Operations, has two Assistant Supervisors, one for Chemistry Operations and the other for Chemistry Support. Two Chemists-Nuclear under Chemistry Operations supervise the laboratory with 12 plant Chemistry Technicians (CT) and seven contract CTs. Plant management has authorized two more CTs, with the contract CTs to be phased out. The support group has three contractor staff members and a Chemistry Specialist/Engineering, with two more positions in the latter category authorized. The staffing appears to be adequate to perform the required chemistry operations.

The qualifications of the recently hired Supervisor-Chemistry meets the requirements of ANSI 3.1-1978 and of the operational needs of the plant. He has a Ph.D. in Radiochemistry and many years of supervisory experience. Prior to assuming the present position, he headed the Radiochemistry Section at Shoreham Nuclear Power Station for about a year. Several years experience at research reactors and at operating nuclear power plants satisfy the requirements of the ANSI standard.

No violations or deviations were identified.

[1]Region III Inspection Report No. 50-461/87016.

3. Implementation of the Chemistry Program

The inspectors reviewed the chemistry programs, including physical facilities and laboratory operations. The laboratories had adequate bench, floor and fume hood space and the housekeeping was good. The reagents were properly labeled and none had passed its respective expiration date. The laboratory was reasonably well equipped. The instrumentation included an Orion 701 Ionalyzer, an IL 457 AA/EE Spectrophotometer, an HP 5890 Gas Chromatograph, a Dionex 2010i Ion Chromatograph, a Dohrmann Total Carbon Analyzer, and a Perkin-Elmer Lambda 3 UV/VIS Spectrophotometer.

Equipment maintenance schedules for both in-line and laboratory instrumentation were computer generated for weekly and monthly maintenance items. Daily maintenance schedules were controlled by check sheets. While no central logbook was maintained for the documentation of reagent preparation, a record of weighings was maintained at the analytical balance. This concern of a lack of a definite record was discussed with licensee. They agreed to consider a more thorough documentation for reagent preparation. (See Open Item 50-461/87021-01, Section 4).

An interlaboratory crosscheck program is maintained with vendors (Analytics, Inc. and ERA) to assist in the laboratory QA program.

The inspectors reviewed recent results of the CT performance check program. Measurements were made by each of 18 CTs on pH, conductivity and chloride and the results were analyzed and summarized by a supervisor. The pH and conductivity measurements were all within the acceptance limits; four of the chloride results were outside of the limits and were satisfactorily reanalyzed. This program appears to be adequate for testing CT performance capabilities.

No violations or deviations were identified.

5. Water Chemistry Control Program

The inspectors reviewed aspects of the water chemistry program based on Procedure CPS 1819.00, "Plant Water Chemistry Control," Revision 0, January 28, 1986, and the plant Technical Specifications. The sampling and maintenance schedules along with the data were examined and appear to be adequate. Trend charts are plotted for various chemical parameters relating to water quality control, including dissolved oxygen and conductivity measurements to compare in-line values with those of grab samples, and the concentrations of silica, chloride and sulfate. These were determined at various sampling points in the reactor systems, including reactor water, condensate, feedwater and polisher systems. Some control parameters were given on the plots, such as action levels and "achievable" concentrations. As the plant has been operational for only a short time and still coming up to power, the licensee has had difficulties, as is to be expected in a new plant, of maintaining the desirable parameter limits. This program is still under development, so that not all parameters were trended and long-term trends were not available. This program will be followed under the chemistry reviews in future inspections.

No violations or deviations were identified.

6. Non-radiological Confirmatory Measurements

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 Safety and Environmental Protection Division of Brookhaven National Laboratory (BNL). The samples were analyzed by the licensee using routine methods and equipment.

The samples were diluted 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 that of routine samples. The results are presented in Table 1 and the criteria for agreement in Attachment 1. These criteria for agreement are based on comparisons of the mean values and estimates of the standard deviations (s.d.) of the measurements. Consideration was given to the fact that the uncertainties (s.d.) 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. Consequently when the licensee s.d. was less than that of BNL, and a disagreement resulted, the BNL value was substituted for that of the licensee in calculating the s.d. of the ratio Z (S_z in Attachment 1).

While only one of the 27 licensee results was in disagreement with those of BNL, some potential problems did appear. Low-level chloride and iron differed from the BNL values by more than 15%, but because of the high s.d.s in the BNL results, they were agreements. Further, the copper results had biases of more than 10%, which, from their examination of the calibration curves, the inspectors attributed mainly to the nonlinearity of the instrument over the calibration range. The inspectors' replots of the curves using the lower calibration point at 1.0 ppm and the control standard at 3 ppm, gave a three-point straight line through zero; the ratios for the two higher concentrations of 1.12 each, were then reduced to 1.09 and 1.06. The calibration curves of the other metals showed similar effects, but with substantially lower corrections. The boron results had good precision, but the biases of up to 2.7% appeared to be somewhat high for this analysis. The inspectors noted to the licensee representatives that part of this may be due to the CT not reading of the buret to its maximum precision of about 0.01, and to not using a check standard and control chart. The inspectors noted their concerns that the laboratory did not have a policy of using dual stock solutions for the standards, in which the calibration standards were from different lots than the check standards. The chemists agreed, that within two months they would consider procedure changes and laboratory practices relating to the concerns with the nonlinear calibration curves, the lack of controls on the boron analysis, the use of different standard solutions

for the calibrations and control standards, and the implementation of a reagent preparation logbook (Section 3). Progress in these items will be followed in subsequent inspections under Open Item No. 50-461/87021-01.

The licensee also prepared three samples to be split with BNL. To these were added analytes supplied by the inspectors. Reactor water was spiked with the anions, chloride and sulfate, and samples of condensate and feedwater were spiked with copper, iron, nickel and chromium ions. The licensee will determine the analytes in each and the results will be sent to Region III for comparison with the values determined by BNL. This will be followed under Open Item No. 50-461/87021-02.

The licensees QA/QC program using control charts and multipoint calibrations of the instruments appears to have been a substantial factor in accounting for the good agreements achieved.

No violations or deviations were identified.

7. Licensee Internal Audits

The inspectors reviewed the findings of a recent audit from the QA Department. Six findings were listed along with likely corrections to be taken by the Chemistry Department. However, since the reply was not yet due, the audit was not complete. The Supervisor-Chemistry noted that these items were being addressed. The nature of the questions addressed in the findings lead the inspectors to believe that the audit system is adequate.

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 inspectors, and which involve some action on the part of the NRC or licensee, or both. Open items were disclosed during the inspection in Section 4.

9. Exit Interview

The scope and findings of the inspection discussed in Section 4 were reviewed with licensee representatives (Section 1) at the conclusion of the inspection on June 5, 1987.

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

Attachments:
1. Table 1, Non-radiological Interlaboratory Test Results, June 1-5, 1987
2. Attachment 1, Criteria for Comparing Analytical Measurements

TABLE 1
Non-Radiological Interlaboratory Test Results
Clinton Power Station Unit 1
June 1-5, 1987[a]

Analyte	Analysis Method[b]	Dilution, 1:x (x)	NRC Y ± s.d.(n)	Licensee X ± s.d.(n)	Ratio Z ± s.d.	Comparison[c] ±2 s.d.
			Concentration, ppm			
B	Titr	1	985 ± 10(7)	1010 ± 14	1.025 ± 0.018	A
		1	2980 ± 50(7)	3002 ± 15	1.007 ± 0.018	A
		1	4870 ± 60(7)	5005 ± 37	1.027 ± 0.015	A
Cl^-	IC	2000	24.1 ± 3.1(7)	19.9 ± 0.46	0.825 ± 0.108	A
		2000	37.4 ± 1.2(7)	40.3 ± 1.2	1.077 ± 0.048	A
		2000	80.5 ± 2.2(8)	83.44 ± 0.95	1.037 ± 0.031	A
Sulfate	IC	2000	20.0 ± 0.9(7)	19.4 ± 0.71	0.970 ± 0.056	A
		2000	41.0 ± 2.4(8)	40.2 ± 1.14	0.980 ± 0.064	A
		2000	80.8 ± 3.0(7)	82.05 ± 0.84	1.015 ± 0.039	A
Silica	Spec	2000	54.3 ± 5.6(7)	53 ± 5.3	0.976 ± 0.140	A
		2000	109 ± 7(7)	109 ± 4.4	1.000 ± 0.076	A
		2000	160 ± 5(7)	155.7 ± 2.5	0.973 ± 0.034	A
Cu	AAS	10	4.68 ± 0.24(12)	4.6 ± 0.1	0.983 ± 0.055	A
		10	9.66 ± 0.49(14)	10.8 ± 0.6	1.115 ± 0.076	A
		10	14.5 ± 0.6(12)	16.2 ± 0.21	1.117 ± 0.062	A*
Fe	AAS	10	4.89 ± 0.35(13)	4.0 ± 0.11	0.818 ± 0.092	A*
		10	9.55 ± 0.34(14)	9.3 ± 0.60	0.974 ± 0.035	A
		10	14.7 ± 0.42(13)	13.4 ± 0.32	0.912 ± 0.039	D*
Ni	AAS	10	5.09 ± 0.26(6)	5.0 ± 0.0	0.982 ± 0.050	A*
		10	10.2 ± 0.3(7)	10.7 ± 0.06	1.049 ± 0.031	A
		10	15.3 ± 0.4(6)	15.1 ± 0.32	0.987 ± 0.033	A
Cr	AAS	10	5.1 ± 0.3(6)	4.9 ± 0.15	0.961 ± 0.064	A
		10	9.41 ± 0.3(6)	9.8 ± 0.0	1.041 ± 0.046	A
		10	14.3 ± 0.8(6)	14.9 ± 0.12	1.042 ± 0.059	A
Na	AAS	10	4.58 ± 0.5(6)	4.9 ± 0.36	1.070 ± 0.14	A
		10	9.23 ± 0.8(6)	8.9 ± 0.05	0.964 ± 0.084	A
		10	14.4 ± 0.8(6)	13.7 ± 0.15	0.951 ± 0.054	A

a. Value ± standard deviation (s.d.); n is number of BNL analyses. The number of licensee analyses is 3 unless otherwise noted.

b. Analytical methods: Titr - titration
IC - Ion chromatography
Spec - Spectrophotometric
AAS - Atomic absorption spectrophotometry

c. A = Agreement
D = Disagreement

*Substituted the BNL uncertainty for licensee's uncertainty.

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.

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

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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