U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-461/88024(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: September 14-16 and 19-20, 1988 (Onsite)
September 27 and 28, 1988 (Telephone discussions)

Inspectors: R. B. Holtzman — 10/5/88 Date

M. C. Schumacher (September 20) — 10/6/88 Date

Approved By: M. C. Schumacher, Chief
Radiological Effluents and
Chemistry Section — 10/6/88 Date

Inspection Summary

Inspection on September 14-16, 19-20, and 27-28, 1988 (Report No. 50-461/88024(DRSS))
Areas Inspected: Routine announced inspection of the chemistry and environmental radiological monitoring programs, including for chemistry (1) procedures, organization, management, and training (IP 83722, 83723); (2) reactor systems water chemistry control programs (IP 79701); (3) the quality assurance/quality control program in the laboratory (IP 79701); (4) cold chemistry confirmatory measurements (IP 79701); and for the environmental program (1) the QA program, audits and appraisals (IP 80721), (2) changes in organization (IP 83722, 83723) and the ODCM (IP 80721), and (3) review of the Annual Environmental Monitoring Report (IP 80721).
Results: The licensee has an extensive water quality control program that conforms to the EPRI BWR Owners Guidelines. Extensive use was made of chemistry parameter trend charts. The cold chemistry confirmatory measurement results were generally good, but indicated some weaknesses in the chemistry measurements QA/QC program. In the environmental area, a problem was found with air inleakage in the air samples bypassing the filters. The staffing of both the chemistry and environmental groups appeared to be knowledgeable and competent. No violations or deviations were identified.

DETAILS

1. Persons Contacted

[1]R. W. Morganstern, Assistant Plant Manager, Technical, IP
[1]D. W. Miller, Assistant Plant Manager-Rad Protection, IP
[1,3]S. H. Daniel III, Supervisor-Chemistry, IP
[1]G. S. Kephart, Supervisor-Environmental, IP
[1]J. D. Weaver, Director, Licensing, IP
[1]J. A. Brownell, Project Specialist-Licensing, IP
A. Lones, Chemist-Nuclear, IP
J. Stonestreet, Assistant Supervisor-Chemistry, IP
[2]P. Sefrenek, Training, IP
G. Decker, Special Projects, Consultant, Cat.
O. Carter, Project Specialist, Radiological Environmental, IP
D. Trotman, Senior RP Technician, Radiological Environmental, IP
P. R. Otis, Chemist-Specialist, IP
H. H. Brophy, Chemistry Technician, IP
M. Gibson, Chemistry Technician, IP

[1]S. P. Ray, Resident Inspector, NRC

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

[1]Denotes those present at the plant exit interview on September 20, 1988.
[2]Telephone discussion held on September 27, 1988.
[3]Telephone discussion held on September 28, 1988.

2. Licensee Action on Previous Inspection Findings (IP 92701)

(Closed) Open Item 50-461/87021-01: Licensee to consider changes in procedures to address NRC concerns about atomic absorption spectrophotometer (AAS) calibration curves, controls on the boron analysis, dual standards, and reagent preparation logbook. The licensee has improved laboratory practices by the use of multipoint AAS calibration curves, introduction of a performance standard on the boron analysis for the Standby Liquid Control Tank, and the use of dual standards (calibration and performance check standards from different sources). The licensee did not implement a reagent preparation logbook, and in a letter to the NRC, noted that this additional documentation would not improve the traceability of reagents and their preparation. This assertion will be followed further in subsequent routine chemistry inspections.

3. Chemistry Operations

a. Management Controls, Organization and Training (IP 83722, 83723)

There were few changes in the Chemistry Department since the previous inspection in this area.[1] The position of Assistant Supervisor, Chemistry Support is still vacant. A licensee representative noted that they expect to fill this position shortly. There is also an unfilled position of Chemistry Specialist. The laboratory now has 14 Chemistry Technicians (CT), all qualified under the personnel standard ANSI N3.1-1978. A newly-hired, but experienced CT, is undergoing site-specific training. While staffing appears to be adequate to perform the required chemistry duties, the above vacancies appear to impact the timely development and implementation of the QA/QC programs (Section 3.e).

The licensee has not yet received INPO accreditation for the CT training program. A licensee representative noted that they plan to present the final program to the INPO board in November 1988. The status of this program will be reviewed in subsequent chemistry and radiochemistry inspections.

No violations or deviations were identified.

b. Implementation of the Chemistry Program (IP 79701)

The inspector 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 laboratory was well equipped; the instrumentation included a Spectronic 601 Spectrophotometer with a 10-cm cell, two atomic absorption spectrophotometers (AAS) (an IL 457 aa/ae Spectrophotometer and a new Thermo Jarell-Ash Video 12E with flame and furnace), and a Dionex 2020i Ion Chromatograph (IC) with a Dionex Model 4270 Integrator that takes multipoint calibrations.

The inspector observed several of the CTs analyze the NRC samples, including those on the IC and AAS, and boron by the mannitol titration method. They all appeared to be knowledgeable about both the chemistry and the methods.

The laboratory was in a radiologically-controlled area, with only a hand-held frisker at the exit, which introduced some delay in exiting. The Supervisor noted that they were scheduled to install a whole-body frisker (PCM) soon.

No violations or deviations were identified.

[1]Region III Inspection Report No. 50-461/88015.

c. Water Chemistry Control Program (IP 79701)

The inspector reviewed the water chemistry program based on Procedures CPS 1819.00, "Plant Water Chemistry Control," Revision 1, January 12, 1988, and CPS 6001.01, "Sampling and Analysis Requirements," Revision 6, June 3, 1988. These procedures implement the requirements of Corporate Nuclear Procedure CNP 6.01, "Chemistry Control Program," and the plant Technical Specifications (T/S). They reference and appear to conform to the BWR Owners Guidelines, 1986 revision. The Plant Manager is authorized to waive actions that are not mandated by the Technical Specifications.

The Supervisor Chemistry, is responsible for plotting trend charts for the various chemical parameters relating to water quality control, including conductivity, the concentrations of silica, chloride, sulfate, iron, copper, dissolved oxygen, and radiological parameters. These are determined at various sampling points in the reactor systems and include the reactor water, condensate, feedwater and polisher systems. The plants also showed applicable guideline values such as action levels and "achievable" concentrations. Sulfate and nitrate ion and Co-60 concentrations showed strong correlations with changes in reactor power levels.

Problems experienced with leakage in condenser tubes appear to have been resolved by staking the tubes to reduce vibrations. The Supervisor noted that the off-gas release rate of 50 µCi/sec is low and represents clean, leak-free fuel.

Chemistry submits a daily report to the Plant Manager for the morning shift with reports on various parameters and significant trends. The plant submits a "Monthly Performance Monitoring Management Report, IPC Nuclear Power Program, Clinton Power Station," which contains a section on chemistry and rad protection that reports values on various parameters. The Supervisor-Chemistry submitted a report with trend charts and detailed discussions to upper management (Vice President Nuclear) in February 1986. The reporting program has been restricted because of lack of staff namely, the unfilled position of Assistant Supervisor-Chemistry (Section 3.a.). The goal for INPO Out-of-Specification (OOS) parameters is 10% of the parameter hours; in August 1988 they were well below this goal with a reported 3.44% of 7740 parameter OOS hours.

No violations or deviations were identified.

d. Nonradiological Confirmatory Measurements (IP 79791)

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 to 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 (SD) of the measurements. Consideration was given to the fact 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. Consequently when the licensee SD was less than that of BNL, and a disagreement resulted, the BNL value was substituted for that of the licensee in calculating the SD of the ratio Z (S_z in Attachment 1).

The licensee also prepared two 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 a sample of condensate was 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. 50-461/88024-01.

The licensee analyzed eight analytes of three concentrations each. Of the initial 24 analyses, 20 of the results (83%) were in agreement with those of BNL. The disagreements included the results of the high-level chloride and sulfate analyses, and of the low-level boron and chromium analyses. The silica results, while in agreement, showed a consistent negative bias for each of the samples, which indicated a possible problem with the calibration standards. The causes of the differences in the chromium, chloride and sulfate were not ascertained, but the licensee repeated the chloride and sulfate analyses and achieved agreement for the sulfate and a near agreement for the chloride. The disagreement in the latter is due to the high precision of the results of both parties. Additionally, the fairly constant positive bias in the chloride results indicates a possible problem with the licensee's chloride standard. Progress in resolving these differences will be followed in subsequent inspections under Open Item No. 50-461/88024-02.

The licensee's low-level boron result showed a negative bias of about 4%, with good precision for both the licensee and BNL measurements. This may be due to differences in the analytical methods; the licensee standardized the sodium hydroxide titrant against a boric acid standard with start and end points at pH 7.0, while BNL calibrated the titrant against potassium acid phthalate with an end point of pH 8.6. Similar negative biases were reported on this sample lot by other licensees in Region III. The source of

the bias has not been ascertained; the inspector will try to resolve this problem prior to subsequent inspections under the above Open Item.

The results of the analyses were good. Laboratory personnel demonstrated a willingness and good abilities in doing the analyses and in determining the causes of the problems. The licensee's QA/QC program appears to have contributed to the quality of the results. Improvements in the licensee's performance will be examined in subsequent inspections.

No violations or deviations were identified.

e. Quality Assurance/Quality Control for Nonradiological Chemistry (IP 79701)

The inspector reviewed the nonradiological QA/QC program in the laboratory. This program is controlled by Procedure CPS No. 6000.01, "Quality of Chemistry Activities," Revision 6, June 23, 1988. It addresses various aspects of QA/QC, including the construction and use of control charts, multiple standards, logbooks, CT training and performance testing, and the quality of sampling and analysis. All of the more significant analytical procedures now have control charts, and separate logsheets were implemented for the control chart data. The calibration and control standards are now from different sources, i.e., different manufacturers or different lots. The procedures also take into account possible nonlinearities in the calibration curves.

The control charts for instrument performance appear to be good with warning and control limits at two and three SD, respectively. The chart parameters were recalculated at reasonable times, from the data on the previous chart which contained 50 points. The inspector noted some concerns with them.

(1) The logbook contains only the current control chart; on completion of a chart it is removed from the laboratory notebook, filed in the office and a new chart started. Thus at this point, and for sometime thereafter, essentially no trend data are available to the analyst. To alleviate this problem, several consecutive charts should remain in the instrument logbook and the charts kept together.

(2) Consideration should be given to using control limits at two standard deviations to allow better control of the procedures on the basis that some action should be considered when repeated measurements approach one of the warning limits (two-SD), a low probability occurrence.

(3) The data on the charts should be assessed more frequently according to the standards in Appendix A of Procedure CPS 6000.01, discussed above. Some of the charts showed significant biases in the data: e.g., the silica chart had a recovery of 103 ± 0.8 (SE) relative to the value of 100 on the previous chart (the uncertainty of the mean recovery is determined by the standard

error (SE)); some showed substantial drifts at times, e.g., sulfate; and for some analyses, e.g., nitrate, the variabilities indicated by the control and warning limits were substantially greater than those from the data themselves. These problems are indications that laboratory personnel responsible for the QC program should place more effort into the adjustment and maintenance of the charts and anlytical procedures.

The licensee has a cold chemistry interlaboratory testing program for BWRs with a vendor (NWT). The results appeared to be generally good, close to the means of the other plants and to those of the vendor.

These samples were also used for performance testing of the technicians. However, the program does not appear to be fully operational. A program was started last year, but does not appear to have been continued. The licensee representative compiled a report on the accumulated test results of 1987; however, not all CTs were tested or all analytes. The supervisor has an informal program with the results sorted by individual technician, and has stated that this will be submitted to the NRC for review. The inspector expressed his concerns that after several years of discussion on this program it is still not fully operational. The Supervisor stated that it will be formalized by next year, after a full complement of staff personnel is obtained.

Licensee representatives agreed to consider these suggestions and submit their conclusions and proposed actions on the control charts and CT testing to the Region III office. Progress in this will be followed in Open Item No. 50-461/88024-03.

Licensee representatives were aware of the value of a good QA/QC program and they have spent considerable effort on its development and implementation.

No violations or deviations were identified.

f. Operation of the Standby Liquid Control System and ATWS (IP 79701)

The inspector reviewed the operation of the Standby Liquid Control System (SLC) and its relation to 10 CFR Part 50.62, "Requirements for reduction of risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants." Although the flow rate of the licensee's SLC system is only 82.4 gallons per minute at a concentration of 10.2% sodium pentaborate solution compared to the required equivalent of 86 gallon per minute flow rate of 13% sodium pentaborate solution into the reactor vessel, it is in conformity because the vessel is of substantially smaller diameter than that of the reference plant ("Safety Evaluation Report related to the operation of the Clinton Power Station, Unit 1," NUREG-0853, Supplement No. 7, September 1986).

A review of the concentration data of the SLC from February 1987 through July 1988, which ranged from 12.1-13.4%, showed

the concentrations to be within the prescribed T/S and the stricter administrative limits. The volumes and temperatures were also within the requirements.

No violations or deviations were identified.

4. Radiological Environmental Monitoring

a. Management Control and Organization (IP 83722, 83723)

The licensee has recently reorganized the Radiological Environmental Monitoring group. The Supervisor-Radiological Environmental reports to the Assistant Plant Manager-Radiological Protection, and is assisted by a Project Specialist and two Senior Radiation Protection Technicians. The Supervisor appears to be well-qualified for the position; he is a Certified Health Physicist. The members of the group were knowledgeable about the various aspects of the environmental operations.

No violations or deviation were identified.

b. Operation of the Radiological Environmental Monitoring Program (REMP) (IP 80721)

The inspector reviewed selected portions of the REMP, including portions of the 1987 Environmental Report, monthly environmental reports, the air sampling stations and maintenance records, and changes in the Offsite Dose Calculation Manual (ODCM).

The Annual Environmental Report appeared to comply with the REMP requirements. All required samples were collected and analyzed, except as noted in the report, and a perusal of the results showed them to be reasonable. The 1988 monthly reports appeared to be acceptable.

The ODCM was been revised and submitted to the NRC for approval. However, the review found a substantial number of errors and the NRC required further revision (letter of September 6, 1988), which is now complete and in the plant review process.

The inspector toured the air sampling stations around the plant. The maintenance records appeared to be in order and the sampling systems appeared to be well maintained by the environmental group; the calibrations were within the expiration dates and the pump vacuum readings were within the specifications. However, the inspector noted, that the Procedure CPS No. 9911.70, "Radiological Environmental Surveillance Airborne Radioiodine and Particulate Monitoring," Revision 25, July 8, 1988, required only that the pump and not the whole filter train be tested for tightness. The inspector's tests of the systems by blocking the filter faces showed that several Quick-Disconnect fittings leaked; vacuums were less than 20 inches Hg, and flowrates dropped only to 30 CFH (rather than nearly zero) from a normal 60 CFH. Licensee representatives agreed to check the systems, to replace the faulty fittings, and to revise

the procedure to incorporate this test. They will report their corrective actions to the Region III office by November 1, 1988. This will be followed in Open Item No. 50-461/88024-04.

No violations or deviations were identified.

c. Licensee Internal Audits (IP 80721)

The inspector reviewed the findings of several recent audits from the QA Department. In November 1986, they found deficiencies in the vendor's QA/QC program, and followup audits found that these were not completely corrected. As a result, the licensee is planning to submit new bid specifications to tighten the QA/QC requirements.

In an audit of November 1987, it was found that the ODCM was inconsistent with the T/S requirements (although the ODCM was more conservative) for monitoring of tritium and alpha activities. They will change this in the new revision of the ODCM.

The audits appear to have adequately monitored the REMP.

No violations or deviations were identified.

5. 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 were disclosed during the inspection in Sections 3.d, 3.e and 4.b.

6. Exit Interview

The scope and findings of the inspection were reviewed with licensee representatives (Section 1) at the conclusion of the inspection on September 20, 1988. The inspector discussed the results of the confirmatory measurements, concerns with the analytical measurements QA/QC program (control charts), and the problems with leaking fittings on the environmental air samplers. Licensee representatives agreed to respond to these concerns by November 1, 1988. Telephone discussions were held with Mr. P. Sefrenek and Dr. S. Daniel on September 27 and 28, 1988, respectively.

During the exit interview, the inspector 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, September 14-20, 1988
2. Attachment 1, Criteria for Comparing Analytical Measurements

TABLE 1

Non-Radiological Interlaboratory Test Results

Clinton Power Station Unit 1

September 15-20, 1988

Analyte	Analytical Method[b]	NRC[a] Y ± SD	Licensee[a] X ± SD	Ratio Z ± SD	Comparison[c] ±2 SD
		Concentration, ppb			
Cl-	IC	9.25 ± 0.05	9.95 ± 0.60	1.076 ± 0.065	A
		18.7 ± 0.3	19.7 ± 0.6	1.053 ± 0.036	A
		38.35 ± 0.6	45.5 ± 1.0	1.192 ± 0.032	D
	(rerun)	38.35 ± 0.6	40.5 ± 0.6	1.057 ± 0.022	D
Sulfate	IC	9.75 ± 0.70	9.65 ± 0.35	0.990 ± 0.080	A
		19.2 ± 1.4	19.9 ± 0.3	1.036 ± 0.079	A
		39.0 ± 1.2	44.6 ± 0.7	1.144 ± 0.048	D*
	(rerun)	39.0 ± 1.2	40.5 ± 1.0	1.038 ± 0.040	A
Fe	AAFL	372 ± 10	408. ± 20	1.097 ± 0.061	A
		796 ± 10	788 ± 18	0.990 ± 0.026	A
		1170 ± 30	1166 ± 100	0.997 ± 0.089	A
Cu	AAFL	400 ± 6	400 ± 16	1.000 ± 0.043	A
		806 ± 30	812 ± 14	1.007 ± 0.041	A
		1200 ± 30	1206 ± 14	1.005 ± 0.027	A
Ni	AAFL	406 ± 12	402 ± 38	0.990 ± 0.098	A
		834 ± 14	822 ± 46	0.986 ± 0.058	A
		1210 ± 50	1168 ± 16	0.965 ± 0.042	A
Cr	AAFL	396 ± 10	328 ± 28	0.828 ± 0.074	D
		770 ± 10	738 ± 32	0.958 ± 0.043	A
		1160 ± 20	1110 ± 44	0.957 ± 0.041	A
Silica	SPEC	52.8 ± 2.8	47.9 ± 2.2	0.907 ± 0.064	A
		104 ± 4	98.4 ± 3.0	0.946 ± 0.046	A
		157 ± 2	148 ± 5	0.943 ± 0.034	A

TABLE 1

		Concentration, ppm			
B	TITR	1040 ± 10	1005 ± 7	0.966 ± 0.013	D*
		3089 ± 41	3000 ± 14	0.971 ± 0.018	A*
		5000 ± 90	4950 ± 36	0.990 ± 0.019	A

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

b. Analytical methods: TITR - titration
IC - Ion chromatography
SPEC - UV/Vis Spectrophotometric
AAFL - Atomic absorption spectrophotometry-flame

c. A = Agreement
D = Disagreement

*Subsittuted 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