U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-461/92003(DRSS)

Docket No. 50-461 License No. [illegible]-62

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: March 2-12 and April 7-10, 1992

Inspector: J. E. House 4-28-92
Date

Approved By: William Snell, Chief 4-28-92
Radiological Controls Date
Section

Inspection Summary

Inspection on March 2-12 and April 7-10, 1992 (Report No. 50-461/92003(DRSS))
Areas Inspected: Routine announced inspection of: (1) the chemistry program including procedures, organization and training; (2) reactor systems water quality control programs; (3) quality assurance and quality control programs in the laboratory; (4) nonradiological chemistry comparisons; (5) confirmatory measurements; (6) post accident sampling system (PASS); and (7) the radiological environmental monitoring program (REMP) (IP 84750).
Results: The laboratory quality assurance program was good. Results of the chemistry comparisons and confirmatory measurements were very good. The water quality program is consistent with the BWR Owners Group Guidelines. Chemistry parameters are monitored by trend charts and were generally within industry guidelines. The Chemistry Performance Index (CPI) was at the INPO median for all plants and was improving. The PASS was functional and appeared to meet Technical Specification requirements, however, the licensee was reviewing a potential sampling problem (Open Item). Conduct of the REMP appeared to be very good. Three violations were identified: (1) failure to implement all portions of a procedure; (2) technician performed a surveillance without an approved procedure; and (3) unqualified technicians performed surveillances. Because the provisions of Section V.G.1 of Appendix C to 10 CFR Part 2 have been satisfied, a Notice of Violation will not be issued for violations 2 and 3.

DETAILS

1. Persons Contacted

[1]H. Brophy, Chemist-Nuclear
[1]C. Calhoun, Supervisor, Quality Assurance
[1,2]J. Cook, Plant Manager
[1,2]S. Daniels, Supervisor, Chemistry
[1]J. Eckert, Auditor, Quality Assurance
[1]R. Ehnle, Director, Industrial Safety
[2]R. Frantz, Senior Licensing Engineer, Licensing
[2]M. Gibson, Chemistry Technician
[1]K. Graf, Director, Quality Assurance
[2]S. Hall, Director, Nuclear Program Assessment Group
[2]S. Hall, Chemistry Technician
[1]A. Henriquez, Project Engineer, Nuclear Station Engineering
[1]D. Holtzscher, Director, Nuclear Safety
[1,2]R. Kerestes, Director, Engineering Projects
[1]S. Klein, Chemist-Nuclear
[1]R. Klinzing, Auditor
[1,2]J. Langley, Director, Design & Analysis, Nuclear Station Engineering
[1,2]J. Lewis, Assistant to Vice-President, Nuclear Operations
T. Lones, Chemist-Nuclear
J. Lyons, Chemistry Technician
R. Manganaro, Supervisor, Engineering Projects, NSE
J. Martin, Environmental Technician
[2]R. Maurer, Supervisor, Nuclear Training Department
[1,2]P. Mergen, Chemistry Assistant Supervisor
[1,2]J. Miller, Manager, Nuclear Station Engineering Department (NSE)
[1,2]K. Moore, Director, Technical Department
[1,2]R. Morgenstern, Manager, Nuclear Training
[1]R. Mundlapudi, Supervisor, Systems & Reliability, NSE
[1]M. Niswander, Supervisor, Radiological Environmental
[1,2]P. Otis, Chemistry Assistant Supervisor
[1,2]S. Perry, Vice-President, Nuclear Operations
[1,2]D. Phares, Director, Licensing & Safety
[1,2]M. Reandeau, Licensing & Safety Specialist
[1]H. Rodine, Supervisor, Procedures
[2]W. Shurlow, Supervising Specialist, NSE
[1,2]J. Sipek, Supervisor, Licensing & Safety
[1,2]F. Spangenberg, Manager, Licensing & Safety
[1]J. Wiesemann, Chemistry Technician
[1,2]J. Withrow, Supervisor, Audits
[1,2]R. Wyatt, Manager, Quality Assurance
[2]P. Yocum, Director, Plant Operations
W. Zuchlke, Chemistry Technician

[1,2]P. Brochman, Senior Resident Inspector, NRC

[1]Present at the Exit Meeting on March 12, 1992.
[2]Present at the Exit Meeting on April 10, 1992.

2. Licensee Action on Previous Inspection Findings (IP 84750)

(Closed) Open Item (50-461/89029-01): A portion of the liquid waste sample was analyzed for Gross Beta, Tritium, Iron-55, Strontium-89 and Strontium-90 by the licensee and the results forwarded to Region III for comparison with an analysis by the NRC Reference Laboratory on a split of the same sample. Because this sample had low activity, which resulted in poor counting statistics, no comparisons were made. A spiked liquid sample was sent to the licensee from the NRC Reference Laboratory. The licensee achieved four agreements in five comparisons (Table 1).

3. E-Bar Determination (IP 84750)

a. Failure to Implement Procedure

The inspector reviewed and discussed with licensee representatives, licensee Condition Report 1-92-01-025, Quality Assurance Hotline calls and internal investigations regarding an E-Bar surveillance which began September 24, 1991. The E-Bar surveillance was required by Technical Specification 4.4.5 and was conducted using CPS Procedure No. 9945.02, E-Bar Determination, that also required that a gross beta analysis be performed. The surveillance was assigned to a chemistry technician by a Chemist-Nuclear (first line supervisor). This technician: (1) did not perform the required gross beta analysis, but did enter a result for the gross beta analysis on the data sheet at a later date; (2) was not qualified on the E-Bar procedure; and (3) did not have an official working copy of the procedure when he began the surveillance.

(1) Licensee Investigation

On November 14, 1991, a call (#1391) was placed on the licensee's QA Hotline stating, in part, that the gross beta analysis was missed. As a result, a QA inquiry was forwarded through plant management to the Chemistry Department. Subsequently, Chemistry Department management gave the same Chemist-Nuclear who was responsible for assigning the technician to perform the E-Bar surveillance the task of investigating and responding to the issue. After investigating, a written response was prepared by chemistry management and forwarded to the QA group stating that the department believed that the analysis had been performed. A short time later a QA representative, in the presence of chemistry management, interviewed the technician involved and the technician stated that he had performed the gross beta analysis. Quality Assurance then posted their findings which stated that the analysis had been performed. Following this posting, additional QA Hotline calls relating to the adequacy of the QA investigation of this matter were received.

During this time period, the technician who was originally assigned the E-Bar surveillance told another QA auditor that he in fact had not performed the gross beta analysis. This was reported to plant management and resulted in a second QA

investigation which confirmed the gross beta had not been performed. In addition, this second investigation also determined that the technician was not qualified on the procedure, and did not have a copy in his possession when he performed it. Following this investigation, the technician was terminated and the Chemist-Nuclear supervisor resigned.

(2) Licensee Corrective Actions

The inspector discussed two major weaknesses in the initial QA investigation of this incident with licensee representatives. The first weakness was requesting the Chemistry Department to investigate a problem internal to their department and the second weakness was chemistry management assigning the Chemist-Nuclear supervisor responsible for the E-Bar surveillance to investigate the QA inquiry. Quality Assurance representatives stated that they also recognized these problems and had subsequently developed written guidelines for handling Quality Concern Hotline responses and a checklist for the preliminary evaluation of a Hotline call. These changes appeared adequate for performing future QA investigations. During discussions with Chemistry Department representatives, the inspector noted that this inquiry should not have been given to the Chemist-Nuclear who was directly involved. Chemistry representatives stated that, in the future, QA concerns or inquiries would be resolved by higher level management in the department. Although the licensee's initial QA investigation of the record falsification was inadequate, the subsequent investigation appeared to have been thorough and licensee action (personnel termination) based on this investigation was prompt. (Violation 50-461/92003-01)

b. Use of Procedures

The licensee had determined, during the investigation of the E-Bar incident, that the technician did not have the procedure in hand when he initiated the surveillance. Performing a surveillance without an official copy of the appropriate procedure in hand is a violation of procedure CPS No. 6000.01, Section 8.1. Discussions with licensee representatives, including chemistry managers and technicians, indicated that they were aware of this requirement and the incident appeared to be due to personnel error and an isolated occurrence. Pursuant to Section V.G.1 of Appendix C to 10 CFR Part 2, a Notice of Violation will not be issued for this violation.

c. Surveillances

Condition Report (CR) 1-92-01-025, discussed previously, referred to an unqualified technician performing the E-Bar surveillance. Two additional Condition Reports, 1-92-02-006, and 3-92-03-001 described surveillances performed by technicians who were not qualified on those procedures. CR 3-92-03-001 involved a chemistry technician performing procedure CPS 9981.01, Diesel Fuel Oil Sampling and Analysis on two storage tanks (separate occasions). CR 3-92-02-006 referred to an unqualified technician performing a level check

(volume determination) of the Standby Liquid Control (SLC) Tank, CP 9215.01. Personnel performing surveillances for which they are not qualified is a violation of procedure CPS No. 6000.01, Section 8.2.

Licensee representatives stated that when technicians become shift qualified they can perform routine surveillances but may not be qualified on those surveillances that occur less frequently. Licensee representatives stated that it was the responsibility of both supervisors and technicians to be aware of procedure qualifications. These violations occurred during a relative short time period (four months) and did not appear to be widespread. Corrective action taken to prevent recurrence included: (1) posting an updated training matrix for first line supervisors to review prior to making assignments; (2) discussing the importance of the training matrix with the first line supervisors; (3) developing a list of technicians and the surveillances that they need qualification on, so that supervisors can concentrate (during the outage) on their qualification; and (4) the Training Department was developing a more user friendly access to comupterized technician training records so that the supervisors can check an individual technician's records prior to making assignments. As this violation was licensee identified, pursuant to Section V.G.1 of Appendix C to 10 CFR Part 2, a Notice of Violation will not be issued for this violation.

One violation, two non-cited violations and no deviations were identified.

4. Management Controls, Organization and Training (IP 84750)

The Chemistry Department is managed by the Supervisor-Chemistry with two Assistant Supervisors, one for personnel (Assistant Supervisor-Laboratory) and the other for support functions (Assistant Supervisor-Support). The Assistant Supervisor-Laboratory has two Chemist Nuclear positions reporting to him and 12 chemistry technicians report to these two Chemists-Nuclear. The Assistant Supervisor-Support has two Chemical Engineering Specialists and one contractor specialist reporting to him. Of the 12 chemistry technician positions, nine are filled with shift qualified individuals, there are two trainees and one position is vacant, although the licensee is searching for a qualified candidate. During the training period, technicians are qualified on routine analyses to become shift qualified. However, technicians were not always qualified on non-routine procedures such as the E-Bar surveillance which is conducted semiannually (Section 3). All management positions are presently staffed, however one of the Chemists-Nuclear is on loan from the Training Department. This position will be filled permanently in the near future. Chemistry technicians appeared knowledgable and capable of discharging their responsibilities.

The inspector discussed weaknesses in chemistry management with licensee representatives. From interviews with chemistry technicians, reviews of QA Hotline calls and investigation of the E-Bar incident it was evident that chemistry management had isolated itself from the technicians. The E-Bar incident (Section 3) was caused, in part, by a lack of communication between technicians and supervisors and could have been

prevented had technicians and supervisors openly discussed the situation. Chemistry Audit 039-92-10 (Section 9) also noted that there was a lack of communication between technicians and supervisors.

Licensee representatives stated that the communication problem had been recognized and that steps were being taken to improve the relationship between technicians and supervisors. Some of these steps were weekly meetings with technicians to discuss concerns, an emphasis of management's open door policy and increased presence of laboratory supervisors in the lab. The Supervisor-Chemistry is more available to the technicians as is the Director of the Technical Department of which chemistry is part. These changes, along with other management modifications being undertaken, should improve the flow of information in chemistry and the results will be reviewed in subsequent inspections.

No violations or deviations were identified.

5. Water Chemistry Control Program (IP 84750)

The inspector reviewed the water chemistry control program as defined in CPS No. 6001.01, Sampling and Analysis Requirements, Revision 10, June 5, 1990 and CPS No. 6004.01, Trending of Chemical Data, Revision 2, April 7, 1988. Operational limits and action levels were consistent with the Electric Power Research Institute (EPRI) BWR Owners Group Guidelines (OGG). Chemistry parameters are reviewed daily by technicians and supervisors. Trend charts are reviewed weekly by laboratory management. Plant management recieves a daily report containing chemistry parameters.

A review of selected records from the past year indicated that water quality was good and that water chemistry parameters were generally maintained within the EPRI Guidelines. The licensee trends the Chemistry Performance Index (CPI), in which reactor water chloride, sulfate and conductivity are normalized to 1.0, which is an indicator of overall plant water quality. The CPI for 1990 was 0.38 which was an improvement over the 1988 value of 0.55 and the 1989 average of 0.41. A review of monthly CPI data for 1991 indicated that the performance continues to improve. However, since the industry median CPI was 0.44 for 1988, 0.38 for 1989 and 0.34 for 1990, water quality was average relative to BWRs across the country. Licensee representatives stated that chromate (approximately 40 ppb) was responsible for elevated reactor water conductivity. The source of this material was thought to be an oxide film on stainless steel tubing in feed water heaters.

Reactor water chloride, sulfate and conductivity were less than 3 ppb, 5 ppb and 0.2 uSiemen/cm (uS/cm) with EPRI achievable guidelines of 15 ppb, 15 ppb and 0.2 uS/cm respectively. Feedwater parameters were generally good. Conductivity was at or below 0.06 uS/cm (the theoretical limit is 0.055 uS/cm); dissolved oxygen averaged approximately 20 ppb (20-50 ppb guideline window); iron averaged 2 ppb and copper 0.05 ppb with guidelines of 2 and 0.1 ppb respectively. Condensate conductivity averaged 0.07 uS/cm (0.08 uS/cm guideline).

The inspector reviewed selected data from 1991 for the Standby Liquid Control System (boron) for compliance with Technical Specification 4.1.5. These results indicated that temperature, concentration and volume of the boron solution were within prescribed limits.

No violations or deviations were identified.

6. Confirmatory Measurements (IP 84750)

Five samples (simulated air particulate and charcoal, reactor coolant (RCS), liquid waste and RCS crud filter) were analyzed for gamma emitting nuclides by the licensee and in the Region III Mobile Laboratory on site. Since the licensee was in an outage, simulated air particulate and charcoal unknowns were prepared for the NRC by the Department of Energy's Radiological Environmental Science Laboratory (RESL). Comparisons were made on combinations of the licensee's two chemistry detectors and two radiation protection (RP) detectors. The licensee achieved 83 agreements in 84 comparisons as listed in Table 2; the comparison criteria are given in Attachment 1. Three analyses were not compared due to poor counting statistics. All comparisons made on the chemistry detectors were agreements. The single disagreement, Cobalt-57, occurred on RP detector B. This detector exhibited a negative bias of approximately 12-20% for the simulated air particulate and RCS crud sample geometry. Licensee representatives agreed to run comparison tests of this detector against the chemistry detectors and perform any necessary recalibrations. The licensee performed very well in the radiological confirmatory measurements program.

No violations or deviations were identified.

7. Nonradiological Chemistry Comparisons (IP 84750)

The inspector 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 regulatory and administrative requirements. These samples had been prepared, standardized, and periodically reanalyzed (to check for stability) for the NRC by the Analytical Chemistry Division of Oak Ridge National Laboratory (ORNL). The samples were analyzed by the licensee using routine methods and equipment.

Three dilutions were prepared for each sample by licensee personnel in order to bring the concentrations within the ranges normally analyzed by the laboratory. A single analysis was performed on each dilution in a manner similar to that of routine samples. The results are presented in Table 3 which also contains the criteria for agreement. These criteria are based on ORNL analyses of the standards and on the relative standard deviations (RSD) derived from the results of the plants participating in the 1986 interlaboratory comparisons (Table 2.1 NUREG/CR-5422). The acceptance criteria were that the licensee's value should be within 2 Standard Deviations (SD) of the ORNL value for agreement and between 2 and 3 SD for qualified agreement. A qualified agreement may indicate a deficiency in the assay.

Eight analytes at various concentrations were analyzed (Table 3) and all 23 analyses were agreements (22) or qualified agreements (1). The licensee performed very well in the chemistry comparisons.

No violations or deviations were identified.

8. Implementation of the Chemistry QA/QC Program (IP 84750)

The inspector reviewed the QA/QC program for nonradiological chemistry as defined by Station Operating Manual CPS No. 6000.01, Quality of Chemistry Activities, Revision 10, October 30, 1990; and Station Operating Manual CPS No. 1931.01, Chemistry Group Organization and Responsibilities, Revision 4, April 25, 1989. Multiple point calibration curves and independent controls whose values were plotted on control charts were part of the licensee's QA program. Percent recovery of the independent control was plotted on the chart along with warning and control limits which were set at 2 and 3 SD. A review of selected control charts did not indicate any significant biases. Although most of the charts were statistically based, control charts for the Ion Chromatograph (anions) had administrative limits set at 5% for one SD with warning and control limits set at 10 and 15% respectively. Licensee representatives stated that the fixed limit was smaller than the standard deviation would be. The inspector noted to a licensee representative that control bands for chloride, nitrate and sulfate appeared wide in that all of the control points were inside the ± 10% warning limit. This indicated that the standard deviations for these assays were less than the 5% admimistrative limit and that these assays were performing better then the ±15% control band indicated. Chemistry technicians appeared knowledgable about plotting and monitoring control charts.

The licensee had vendor supplied interlaboratory comparison programs for radiochemistry and nonradiological chemistry. A review of selected data from the past year indicated that performance was very good. The radiological chemistry comparisons were all agreements.

The licensee's technician testing (intralaboratory comparison) program is part of the interlaboratory program in which technicians analyze vendor prepared unknowns. A review of the program indicated that acceptance criteria, based on industry standards, had been added and that the program was well documented. A review of selected records indicated that technicians were being tested in accordance with requirements. This program appeared to be functioning well and will be reviewed in future inspections.

The inspector reviewed a feedwater metals analysis problem with licensee personnel. The procedure required digestion of an ion exchange filter paper prior to instrumental analysis. Low recovery of copper was traced to the digestion procedure which was changed and metal recovery improved. Chemistry technicians had no difficulty analyzing the metals in the chemistry comparisons program and the interlaboratory cross checks for recovery and analysis of metal impregnated filter paper were good.

No violations or deviations were identified.

9. Post Accident Sampling System (PASS) (IP 84750)

The inspector discussed the Post Accident Sampling System (PASS) and its operation with licensee representatives. System Operation is in accordance with T/S 6.8.4.c and CPS No. 1890.30, Post Accident Sampling Program, Revision 6, October 30, 1991. The system is exercised monthly for sample collection and comparison of sample data with grab samples. PASS analyses included conductivity, pH, boron, dissolved oxygen and hydrogen, gamma spectroscopy, and chloride which would be analyzed offsite during accident conditions. A review of data from the past year indicated that monthly sampling and analyses were performed as required, and PASS samples were generally similar to grab samples.

Condition Report 1-92-03-041, March 17, 1992, written by chemistry personnel, described an event that occurred during the monthly operational check of the PASS which involved approximately 2 milliliters (ml) of water (reactor coolant) being drawn into the stripped gas vial which has a volume of approximately 15 ml and is used for hydrogen analysis. The initial dose estimate, based on worst case conditions, indicated that a sampling technician might exceed the extremity dose limit. The licensee subsequently demonstrated with dose calculations that the maximum dose received would be considerably less than the station limits of 3 rem whole body and 18.75 rem extremities. Although the PASS panel is operable, reactor coolant being drawn into the stripped gas vial represents an abnormal condition that could effect long term PASS operability and have ALARA considerations. Licensee representatives stated that they were evaluating PASS operation but had not reached a final decision regarding modifications that would prevent reactor coolant from being drawn into the stripped gas vial. The licensee agreed that, following their review, they would provide Region III with a letter describing any PASS modifications that were to be made. This letter will be submitted by August 3, 1992. Licensee review of the PASS will be followed under Open Item (50-461/92003-01).

No violations or deviations were identified.

9. Audits and Appraisals (IP 84750)

The inspector reviewed internal quality assurance audits Q38-91-09, conducted April 22-26, 1991 and Q38-92-10 conducted February 24-28, 1992, which are required by Technical Specification 6.5.2.8. Audit teams accompanied chemistry personnel during sample collection, reviewed inline monitor operation, observed technicians perform analyses and document data, reviewed the PASS, followed shift turnovers and noted that procedures were followed. Audit Q38-92-10 identified Condition Report 3-92-03-001 which describes sampling performed by unqualified technicians (Section 3). This audit also noted that, from discussions with chemistry personnel, a breakdown in communications within the department had occurred and had been discussed with plant management (Section 3). The audit team appeared to address in adequate detail the chemistry QA/QC program.

No violations or deviations were identified.

10. Radiological Environmental Monitoring Program (REMP)(IP 84750)

The inspector reviewed the REMP, including the 1990 Annual Environmental Report and air sampling sations. The Annual Environmental Report appeared to comply with the REMP requirements. All of the required samples were collected and analyzed, except as noted in the report. The inspector toured ten air sampling stations and observed a licensee representative change out the air particulate filters, charcoal cartridges and test the sample train for inleakage. The technician appeared knowledgable in the details of the REMP. The air samplers were tested for vacuum and flow rate, filter information was properly documented and the samplers had current calibration tags. Overall, the REMP appeared to be operating satisfactorily.

No violations or deviations were identified.

11. Open Items

Open Items are matters which have been discussd 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. An open item disclosed during the inspection is discussed in Section 8.

12. Exit Interview

The scope and findings of the inspection were discussed with licensee representatives (Section 1) at the conclusion of the inspection on March 12 and April 10, 1992. The inspector discussed an Open Item in Section 2, observations on the quality control program, the REMP, confirmatory measurements results and the chemistry comparison results. Details of the failure to complete the E-Bar procedure and Condition Reports were also reviewed.

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 documents or processes reviewed during the inspection as proprietary.

Attachments:
1. Table 1, Radiological Confirmatory Measurements Program Results 3rd Quarter 1989.
   Table 2, Radiological Confirmatory Measurements Program Results 1st Quarter 1992.
2. Table 3, Nonradiological Chemistry Comparison Results 1st Quarter 1992.
4. Attachment 1, Criteria for Comparing Radiological Measurements.

TABLE 1

U.S. NUCLEAR REGULATORY COMMISSION
REGION III
CONFIRMATORY MEASUREMENTS PROGRAM

FACILITY: CLINTON

FOR THE THIRD QUARTER OF 1989

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESULT
LIQUID	H-3	1.74E-05	5.00E-07	1.52E-05	0.00E+00	0.87	34.8	A
WASTE	G.BETA	7.50E-05	2.20E-06	6.61E-05	0.00E+00	0.88	34.1	A
SPLIT	SR-89	7.75E-05	2.30E-06	6.17E-05	0.00E+00	0.80	33.7	A
	SR-90	4.11E-06	1.60E-07	2.81E-06	0.00E+00	0.68	25.7	D
	FE-55	1.61E-05	5.00E-07	1.91E-05	0.00E+00	1.19	32.2	A

TEST RESULTS:

A=AGREEMENT
D=DISAGREEMENT
*=CRITERIA RELAXED
N=NO COMPARISON

TABLE 2

U.S. NUCLEAR REGULATORY COMMISSION
REGION III
CONFIRMATORY MEASUREMENTS PROGRAM

Facility: CLINTON

For the FIRST QUARTER of 1992

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESULT
RESL AP	CO-57	1.41E-02	1.59E-04	1.48E-02	1.73E-04	1.05	88.7	A
SPIKE #1	CO-60	7.06E-02	4.84E-04	7.26E-02	4.45E-04	1.03	145.9	A
CHEM	AM-241	5.50E-02	3.25E-04	4.85E-02	5.26E-04	0.88	169.2	A
DET. A	SR-85	8.10E-02	8.62E-03	6.61E-02	6.36E-03	0.82	9.4	A
	Y-88	1.43E-01	3.22E-03	1.46E-01	2.77E-03	1.02	44.4	A
	CD-109	3.43E-01	2.81E-03	3.76E-01	3.87E-03	1.10	122.1	A
	SN-113	3.48E-02	1.70E-03	3.20E-02	1.60E-03	0.92	20.5	A
	CS-137	5.85E-02	3.32E-04	5.99E-02	3.03E-04	1.02	176.2	A
	CE-139	1.85E-02	4.11E-04	1.93E-02	4.69E-04	1.04	45.0	A
RESL AP	CO-57	1.41E-02	1.59E-04	1.49E-02	2.29E-04	1.06	88.7	A
SPIKE #1	CO-60	7.06E-02	4.84E-04	7.06E-02	4.40E-04	1.00	145.9	A
CHEM	AM-241	5.50E-02	3.25E-04	6.69E-02	5.47E-04	1.22	169.2	A
DET. B	SR-85	8.10E-02	8.62E-03	8.79E-02	8.61E-03	1.09	9.4	A
	Y-88	1.43E-01	3.22E-03	1.39E-01	2.89E-03	0.97	44.4	A
	CD-109	3.43E-01	2.81E-03	3.70E-01	4.42E-03	1.08	122.1	A
	SN-113	3.48E-02	1.70E-03	3.46E-02	1.90E-03	0.99	20.5	A
	CS-137	5.85E-02	3.32E-04	6.08E-02	3.34E-04	1.04	176.2	A
	CE-139	1.85E-02	4.11E-04	1.91E-02	5.29E-04	1.03	45.0	A
RESL AP	CO-57	1.41E-02	1.59E-04	1.11E-02	1.17E-04	0.79	88.7	D
SPIKE #1	CO-60	7.06E-02	4.84E-04	5.67E-02	2.63E-04	0.80	145.9	A
RADPRO	AM-241	5.50E-02	3.25E-04	5.55E-02	3.34E-04	1.01	169.2	A
DET. B	SR-85	8.10E-02	8.62E-03	6.03E-02	5.37E-03	0.74	9.4	A
	Y-88	1.43E-01	3.22E-03	1.20E-01	2.04E-03	0.84	44.4	A
	CD-109	3.43E-01	2.81E-03	3.01E-01	2.47E-03	0.88	122.1	A
	SN-113	3.48E-02	1.70E-03	2.70E-02	1.16E-03	0.78	20.5	A
	CS-137	5.85E-02	3.32E-04	5.01E-02	2.05E-04	0.86	176.2	A
	CE-139	1.85E-02	4.11E-04	1.39E-02	3.15E-04	0.75	45.0	A

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESULT
RESL	CO-57	1.55E-02	1.79E-04	1.65E-02	2.76E-04	1.07	86.4	A
CHAR	CO-60	7.38E-02	5.32E-04	7.51E-02	6.08E-04	1.02	138.6	A
SPIKE	SR-85	7.12E-02	9.53E-03	8.37E-02	1.19E-02	1.18	7.5	A
CHEM	Y-88	1.52E-01	3.65E-03	1.56E-01	4.06E-03	1.03	41.7	A
DET. A	CD-109	3.77E-01	3.17E-03	4.20E-01	6.57E-03	1.12	118.9	A
	SN-113	3.40E-02	1.64E-03	3.59E-02	2.64E-03	1.05	20.7	A
	CS-137	6.21E-02	3.66E-04	6.29E-02	4.40E-04	1.01	169.8	A
	CE-139	2.06E-02	5.10E-04	2.06E-02	7.83E-04	1.00	40.3	A
RESL	CO-57	1.55E-02	1.79E-04	1.65E-02	2.55E-04	1.07	86.4	A
CHAR	CO-60	7.38E-02	5.32E-04	7.50E-02	5.00E-04	1.02	138.6	A
SPIKE	SR-85	7.12E-02	9.53E-03	7.38E-02	9.80E-03	1.04	7.5	A
CHEM	Y-88	1.52E-01	3.65E-03	1.52E-01	3.24E-03	1.00	41.7	A
DET. B	CD-109	3.77E-01	3.17E-03	4.23E-01	5.36E-03	1.12	118.9	A
	SN-113	3.40E-02	1.64E-03	3.64E-02	2.19E-03	1.07	20.7	A
	CS-137	6.21E-02	3.66E-04	6.41E-02	3.69E-04	1.03	169.8	A
	CE-139	2.06E-02	5.10E-04	2.20E-02	6.88E-04	1.07	40.3	A
RESL	CO-57	1.55E-02	1.79E-04	1.70E-02	2.03E-04	1.10	86.4	A
CHAR	CO-60	7.38E-02	5.32E-04	7.80E-02	3.98E-04	1.06	138.6	A
SPIKE	SR-85	7.12E-02	9.53E-03	1.10E-01	1.02E-02	1.55	7.5	A
RADPRO	Y-88	1.52E-01	3.65E-03	1.60E-01	2.77E-03	1.05	41.7	A
DET. A	CD-109	3.77E-01	3.17E-03	4.32E-01	4.20E-03	1.15	118.9	A
	SN-113	3.40E-02	1.64E-03	3.94E-02	1.66E-03	1.16	20.7	A
	CS-137	6.21E-02	3.66E-04	6.97E-02	2.95E-04	1.12	169.8	A
	CE-139	2.06E-02	5.10E-04	2.21E-02	5.08E-04	1.07	40.3	A
RCS	MN-54	1.83E-04	1.11E-06	1.93E-04	1.10E-06	1.01	164.9	A
CHEM	CO-58	8.54E-05	8.67E-07	8.82E-05	8.48E-07	1.03	98.5	A
DET. A	CO-60	1.89E-04	1.24E-06	1.93E-04	1.26E-06	1.02	152.4	A
	ZN-65	2.52E-06	6.62E-07	0.00E+00	0.00E+00		3.8	N
RCS	MN-54	1.83E-04	1.11E-06	1.94E-04	9.17E-07	1.06	164.9	A
CHEM	CO-58	8.54E-05	8.67E-07	9.11E-05	6.53E-07	1.07	98.5	A
DET. B	CO-60	1.89E-04	1.24E-06	1.98E-04	9.99E-07	1.05	152.4	A
	ZN-65	2.52E-06	6.62E-07	0.00E+00	0.00E+00		3.8	N
RCS	MN-54	1.83E-04	1.11E-06	2.06E-04	1.14E-06	1.13	164.9	A
RADPRO	CO-58	8.54E-05	8.67E-07	9.64E-05	9.17E-07	1.13	98.5	A
DET. B	CO-60	1.89E-04	1.24E-06	2.11E-04	1.22E-06	1.12	152.4	A
	ZN-65	2.52E-06	6.62E-07	2.85E-06	8.55E-07	1.13	3.8	N
CRUD	MN-54	2.93E-06	1.44E-07	2.79E-06	1.69E-07	0.95	20.3	A
FILTER	CO-58	1.24E-06	1.05E-07	1.36E-06	1.19E-07	1.10	11.8	A
CHEM	CO-60	3.94E-06	1.71E-07	3.92E-06	2.01E-07	0.99	23.0	A
DET. A								

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESULT
CRUD	MN-54	2.93E-06	1.44E-07	3.13E-06	1.31E-07	1.07	20.3	A
FILTER	CO-58	1.24E-06	1.05E-07	1.20E-06	8.04E-08	0.97	11.8	A
CHEM	CO-60	3.94E-06	1.71E-07	3.88E-06	1.56E-07	0.99	23.0	A
DET. B								
CRUD	MN-54	2.93E-06	1.44E-07	2.54E-06	7.63E-08	0.87	20.3	A
FILTER	CO-58	1.24E-06	1.05E-07	1.03E-06	5.13E-08	0.83	11.8	A
RADPRO	CO-60	3.94E-06	1.71E-07	3.42E-06	9.36E-08	0.87	23.0	A
DET. B								
LIQUID	MN-54	1.33E-04	1.36E-04	1.26E-04	1.26E-06	0.95	1.0	A
WASTE	CO-58	2.74E-05	7.82E-07	2.72E-05	7.31E-07	0.99	35.1	A
CHEM	CO-60	1.32E-04	1.45E-06	1.30E-04	1.46E-06	0.98	90.5	A
DET. A								
LIQUID	MN-54	1.33E-04	1.36E-04	1.34E-04	1.06E-06	1.01	1.0	A
WASTE	CO-58	2.74E-05	7.82E-07	2.84E-05	6.37E-07	1.03	35.1	A
CHEM	CO-60	1.32E-04	1.45E-06	1.36E-04	1.17E-06	1.03	90.5	A
DET. B								
LIQUID	MN-54	1.33E-04	1.36E-04	1.21E-04	1.07E-06	0.91	1.0	A
WASTE	CO-58	2.74E-05	7.82E-07	2.59E-05	7.34E-07	0.94	35.1	A
RADPRO	CO-60	1.32E-04	1.45E-06	1.21E-04	1.16E-06	0.92	90.5	A
DET. A								
CRUD	MN-54	2.93E-06	1.44E-07	3.17E-06	9.35E-08	1.08	20.3	A
FILTER	CO-58	1.24E-06	1.05E-07	1.43E-06	7.12E-08	1.15	11.8	A
RADPRO	CO-60	3.94E-06	1.71E-07	3.85E-06	1.14E-07	0.98	23.0	A
DET. A								
CRUD	MN-54	2.93E-06	1.44E-07	2.54E-06	7.63E-08	0.87	20.3	A
FILTER	CO-58	1.24E-06	1.05E-07	1.04E-06	5.13E-08	0.84	11.8	A
RADPRO	CO-60	3.94E-06	1.71E-07	3.42E-06	9.36E-08	0.87	23.0	A
DET. B								

TEST RESULTS:

A=AGREEMENT
D=DISAGREEMENT
*=CRITERIA RELAXED
N=NO COMPARISON

TABLE 3
Nonradiological Chemistry Comparison Results
Clinton Nuclear Power Station
March 2-12, 1992

Analyte		Method[1]	Conc[2]	Ratio[3]	Acceptance Ranges[4] ± 2sd	± 3sd	Result[5]
				ppb			
Chloride	A	IC	4	0.963	0.933-1.067	0.900-1.100	A
	B		7	0.991	0.919-1.081	0.887-1.113	A
	C		15	1.076	0.926-1.074	0.895-1.105	A+
Sulfate	A	IC	4	1.021	0.895-1.105	0.842-1.158	A
	B		7	0.963	0.895-1.105	0.868-1.132	A
	C		15	0.943	0.900-1.100	0.867-1.133	A
Iron	G	AA/FL	400	1.010	0.904-1.096	0.854-1.146	A
	H		800	0.985	0.903-1.097	0.857-1.143	A
	I		1500	0.963	0.903-1.097	0.855-1.145	A
Copper	G	AA/FL	400	1.056	0.904-1.095	0.859-1.141	A
	H		800	1.017	0.904-1.096	0.857-1.143	A
	I		1500	0.987	0.904-1.096	0.857-1.143	A
Nickel	G	AA/FL	400	1.031	0.936-1.064	0.906-1.094	A
	H		800	1.003	0.938-1.062	0.907-1.092	A
	I		1500	1.001	0.938-1.062	0.907-1.093	A
Chromium	G	AA/FL	400	1.052	0.905-1.095	0.855-1.145	A
	H		800	1.003	0.903-1.097	0.854-1.146	A
	I		1500	0.985	0.903-1.097	0.853-1.147	A
Silica	S	Spec	50	0.975	0.906-1.094	0.859-1.141	A
	T		100	0.988	0.909-1.091	0.860-1.136	A
				ppm			
Boron	D	Titr	1000	1.013	0.979-1.021	0.968-1.032	A
	E		3000	1.004	0.979-1.021	0.968-1.032	A
	F		5000	1.005	0.979-1.021	0.968-1.032	A

1. Methods: Titr - Titration
   IC - Ion Chromatography
   Spec - Spectrophotometry
   AA/FL - Atomic absorption spectrophotometry (flame)

2. Conc: Approximate concentration analyzed.

3. Ratio of Licensee mean value to NRC mean value.

4. The SD in the fifth and sixth columns represents the coefficient of variation obtained from averaging licensee data from the preceding cycle (Table 2.1 of NUREG/CR-5244). The licensee value is considered to be in agreement if it falls within the ± 2 SD range; a qualified agreement if it lies outside ± 2 SD but within ± 3 SD; and in disagreement if it is outside the ± 3 SD range.

5. Result:
   A = Agreement: Licensee value is within ± 2 SDs of the NRC mean value.
   A+ = Qualified agreement: licensee is between ± 2 and ± 3 SDs of the NRC value.
   D = Disagreement: licensee value is outside ± 3 SDs.

ATTACHMENT 1

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 this program.

In these criteria, the judgment limits are variable in relation to the comparison of the NRC's value to its associated one sigma 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 should be considered acceptable as the resolution decreases. The values in the ratio criteria may be rounded to fewer significant figures reported by the NRC Reference Laboratory, unless such rounding will result in a narrowed category of acceptance.

RESOLUTION	RATIO = LICENSEE VALUE/NRC REFERENCE VALUE
	Agreement
<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

Some discrepancies may result from the use of different equipment, techniques, and for some specific radionuclides. These may be factored into the acceptance criteria and identified on the data sheet.