

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-454/90006(DRSS); 50-455/90005(DRSS)

Docket Nos. 50-454; 50-455

Licenses No. NPF-37; NPF-66

Licensee: Commonwealth Edison Company  
Post Office Box 767  
Chicago, IL 60690

Facility Name: Byron Nuclear Power Station, Units 1 and 2

Inspection At: Byron Site, Byron, Illinois

Inspection Conducted: February 12-15, 1990

Inspectors: *[Signature]*  
A. G. Januska

3/6/90  
Date

*[Signature]*  
J. E. House

3/6/90  
Date

Approved By: *[Signature]*  
M. C. Schumacher, Chief  
Radiological Controls and  
Chemistry Section

3/6/90  
Date

Inspection Summary

Inspection on February 12-15, 1990 (Reports No. 50-454/90006(DRSS);  
50-455/90005(DRSS))

Areas Inspected: Routine unannounced inspection of confirmatory measurements including: review of an open item (IP 92701); audits and surveillances; implementation of the quality assurance and confirmatory measurements programs and post-accident sample analyses (IP 84750).

Results: Laboratory quality assurance was generally good. The post-accident sampling system is used daily to collect routine primary coolant samples. Results of the radiological confirmatory measurement program were very good, as were interlaboratory crosscheck results with an independent contractor. No violations or deviations were identified.

## DETAILS

### 1. Persons Contacted

- D. Bump, Senior QA Inspector, CECO
- <sup>1</sup>A. Brotton QA Inspector, CECO
- <sup>1</sup>E. Gossman, Lead Chemist, CECO
- M. Johnson, ChemTech, CECO
- <sup>1</sup>S. Kerr, Chemist, CECO
- M. Kersch, ChemTech, CECO
- <sup>1</sup>K. Orris, Regulatory Assurance, CECO
- <sup>1</sup>W. Pirnat, Opex Administrator, CECO
- <sup>1</sup>R. Pleniewicz, Station Manager, CECO
- <sup>1</sup>F. Pollak, Chemist, CECO
- <sup>1</sup>G. Schwartz, Production Superintendent, CECO
- R. Tucker, ChemTech, CECO
- <sup>1</sup>R. Ward, Technical Superintendent, CECO
- <sup>1</sup>S. Wilson, Chemistry Supervisor, CECO
  
- <sup>1</sup>R. Sutphin, Resident Inspector, NRC

<sup>1</sup>Present at the Exit Meeting on February 15, 1990.

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

(Closed) Open Item (50-454/89013-01; 50-455/89015-01): Licensee to spike reactor water with anions, split samples with Brookhaven National Laboratory (BNL), analyze and send results to Region III. The licensee has completed the split samples with BNL (Table I). Comparison of the licensee's analytical results (reported to Region III on July 7, 1989) with the BNL results (reported to Region III on October 2, 1989) produced agreements for chloride and sulfate, and a disagreement for fluoride. The licensee had preserved the sample and performed additional analyses during the current inspection (February 14, 1990). The second set of licensee results were agreements. It appeared that sample plateout had occurred during the time interval between the licensee's first analysis, the BNL analysis and the licensee's second analysis. In the first comparison the licensee's results were higher than the BNL results while the second comparison showed the licensee results to be lower than BNL. Thus, it appeared that the plateout which occurred between the licensee's first analysis and the BNL analysis was the most likely cause of the fluoride disagreement.

### 3. Confirmatory Measurement (IP 84750)

#### a. Sample Split

Six samples (air particulate, charcoal, crud filter, gas, reactor coolant and liquid waste) were analyzed for gamma emitting isotopes by the licensee and in the Region III Mobile Laboratory onsite.

Comparisons were made on combinations of the licensee's four normally used count room detectors. The Post Accident Radionuclide Analysis Portable System (PARAPS) was not tested because no routine sample geometries are available on the system. Results of the sample comparisons are given in Table 2; the comparison criteria are given in Attachment 2. The licensee achieved 63 agreements out of 63 comparisons.

A portion of the liquid waste sample will be analyzed for gross beta, H-3, Sr-89, Sr-90 and Fe-55 by the licensee and the results reported to Region III for comparison with an analysis by the NRC Reference Laboratory on a split of the same sample (Open item 50-454/90006-01; 50-455/90005-01).

b. Audits

The inspectors reviewed Audits QAA-06-89-02, -10 and 06-90-14, and Surveillances QAS-06-89-10, -58, -101, -109, -114, -146, and -267. The audits dealt with implementation of the Quality Assurance Program in the area of chemistry, and activities and documentation associated with T/S, NPDES permit, ODCM and Radiological Effluent Analytical Controls. The surveillances were reviews of procedures and records along with observations of technicians performing laboratory analyses and sample collection. The audits/surveillances were in sufficient depth and were performance oriented. Findings from previous audits had been addressed and corrected.

c. Quality Assurance

The inspectors reviewed the radioactivity measurements laboratory quality assurance program including physical facilities and laboratory operations. Housekeeping was generally good; laboratory and counting room work space was adequate. ChemTechs observed during sample acquisition and preparation appeared to have very good laboratory technique.

The licensee participates in an intercomparison cross-check program with an outside vendor. The inspectors examined the 1989 results and found all agreements.

No violations or deviations were identified

4. Post Accident Sampling (IP 84750)

The inspectors discussed the High Radiation Sampling System (HRSS) and its operation with the licensee representative assigned the responsibility for the system. The system is maintained in accordance with the Post Accident Sampling System Surveillance Frequency NOD Directive NOD-CY.5 which establishes the frequency of calibration and performance checks. The system is used daily to collect reactor coolant samples. The representative produced documentation for the routine mechanical maintenance of items, calibration of all process monitoring equipment,

work request information for the installation of a new Gas Chromatograph and the replacement of plugged sample lines, technician and chemist training records, performance checks and the results of a test to determine the representativeness of samples (dilution factor). The program appears to be comprehensive and well managed. The system in the HRSS room is inspected on an informal basis twice weekly by a Chemist and the remainder of the associated piping is examined by Equipment Attendants during their routine walk-downs. The inspectors also examined the Training Department records for the required six month training/retraining for ChemTechs on the HRSS. The training has been given in accordance with the required frequency and appears to be technically sound.

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 inspectors, 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 3.

6. Exit Interview

The scope and findings of the inspection were reviewed with licensee representatives (Section 1) at the conclusion of the inspection on February 15, 1990. The inspectors discussed the following in detail:

- a. Preliminary confirmatory measurements results.
- b. The post accident sampling system.
- c. The closing of a cold chemistry open item.

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 Split Sample Results, April 1989
2. Attachment 1, Criteria for Comparing Analytical Measurements (Nonradiological)
3. Table 2, Radiological Interlaboratory Split Sample Results, 1st Quarter 1990
4. Attachment 2, Criteria for Comparing Radiological Measurements

TABLE 1

Nonradiological Interlaboratory Split Sample Results  
Byron Nuclear Power Station, Units 1 and 2  
April 1989

Analyte	Analytical Method <sup>b</sup>	NRC <sup>a</sup> Y ± SD	Licensee <sup>a</sup> X ± SD	Ratio Z ± SD	Comparison <sup>c</sup> ±2 SD
<u>Concentration, ppb</u>					
Fluoride Rerun	ICG	46.3 ± 1.4	59.6 ± 3.6	1.287 ± 0.087	D
		46.3 ± 1.4	44.1 ± 2.6	0.952 ± 0.063	A
Chloride Rerun	ICG	51.7 ± 1.6	55.6 ± 4.5	1.075 ± 0.093	A
		51.7 ± 1.6	44.9 ± 3.6	0.868 ± 0.075	A
Sulfate Rerun	ICG	56.0 ± 1.7	62.0 ± 3.7	1.107 ± 0.074	A
		56.0 ± 1.7	50.5 ± 4.0	0.902 ± 0.076	A

- a. Value ± standard deviation (SD):  
Licensee SD is a Relative Standard Deviation (RSD) and was derived from SD of control charts. Fluoride RSD is 6.0%, Chloride and Sulfate RSD is 8.0%.  
BNL SD is an RSD of 3.0%.
- b. Analytical method: ICG - Ion chromatography (Gradient)
- c. A = Agreement  
D = Disagreement

## 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,  $S_y$ .<sup>1</sup> Thus,

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

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

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.

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

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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

TABLE 2  
 U.S. NUCLEAR REGULATORY COMMISSION  
 OFFICE OF INSPECTION AND ENFORCEMENT  
 CONFIRMATORY MEASUREMENTS PROGRAM  
 FACILITY: BYRON  
 FOR THE 1ST QUARTER OF 1990

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESULT
PRIMARY	NA-24	9.83E-04	5.29E-05	8.80E-04	1.44E-04	0.90	18.6	A
COOLANT	I-131	2.06E-03	4.65E-05	1.80E-03	1.80E-04	0.87	44.3	A
25-P-96Q	I-132	7.54E-03	3.35E-04	6.20E-03	6.40E-04	0.82	22.5	A
	I-133	7.53E-03	6.75E-05	6.70E-03	6.50E-04	0.89	111.6	A
	I-135	1.29E-02	3.68E-04	1.00E-02	7.00E-04	0.78	35.1	A
	MO-99	1.15E-03	1.57E-04	9.60E-04		0.83	7.3	A
	CS-134	2.22E-04	2.00E-05	1.50E-04	3.80E-05	0.68	11.1	A
	CS-137	3.15E-04	2.34E-05	2.10E-04	5.30E-05	0.67	13.5	A
CHARCOAL	BR-82	2.08E-11	1.09E-12	2.10E-11	8.00E-13	1.01	19.1	A
24-P-74S	I-131	1.85E-10	1.47E-12	1.80E-10	1.00E-11	0.97	125.9	A
	I-133	6.84E-11	2.18E-12	6.80E-11	6.10E-12	0.99	31.4	A
AIR	CO-58	3.12E-13	7.21E-14	2.90E-13	6.38E-14	0.93	4.3	A
FART	CS-134	5.31E-13	8.05E-14	4.50E-13	5.80E-14	0.85	6.6	A
27-TP-19	CS-137	3.30E-13	9.56E-14	3.20E-13	7.00E-14	0.97	3.5	N
PRIMARY	NA-24	1.03E-03	5.68E-05	8.90E-04	1.24E-04	0.86	18.1	A
COOLANT	I-131	1.90E-03	4.16E-05	1.70E-03	1.60E-04	0.89	45.7	A
27-TP-19	I-132	7.42E-03	3.73E-04	7.40E-03	7.70E-04	1.00	19.9	A
	I-133	7.52E-03	6.76E-05	6.90E-03	6.40E-04	0.92	111.2	A
	I-135	1.33E-02	3.74E-04	1.10E-02	1.00E-03	0.83	35.6	A
	MO-99	8.41E-04	1.89E-04	9.70E-04	3.17E-04	1.15	4.4	A
	CS-134	1.93E-04	1.67E-05	1.60E-04		0.83	11.6	A
	CS-137	2.71E-04	2.30E-05	1.70E-04	5.10E-04	0.63	11.8	A
CHARCOAL	BR-82	2.08E-11	1.09E-12	2.00E-11	8.00E-13	0.96	19.1	A
25-P-148	I-131	1.85E-10	1.47E-12	1.90E-10	1.00E-11	1.03	125.9	A
	I-133	6.84E-11	2.18E-12	6.70E-11	6.10E-12	0.98	31.4	A
LIQUID	CR-51	2.88E-06	4.22E-07	2.30E-06	4.00E-07	0.80	6.8	A
WASTE	MN-54	5.25E-07	7.85E-08	4.40E-07	7.50E-08	0.84	6.7	A
25-P-96Q	CO-58	8.96E-06	1.65E-07	8.10E-06	7.10E-07	0.90	54.3	A
	CO-60	5.23E-06	1.51E-07	5.10E-06	3.30E-07	0.98	34.6	A
	ZN-65	3.54E-07	1.49E-07	0.00E+00			2.4	N
	ZR-95	3.11E-07	1.14E-07	3.90E-07	8.90E-08	1.25	2.7	N
	NB-95	5.35E-07	6.85E-08	4.20E-07	6.50E+08	0.79	7.8	A

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESULT
	RU-103	1.33E-07	3.94E-08	0.00E+00			3.4	N
	SB-125	1.25E-06	1.66E-07	9.30E-07	1.63E-07	0.74	7.5	A
	CS-134	3.72E-07	8.17E-08	2.40E-07	6.10E-08	0.65	4.6	A
	CS-137	3.35E-07	6.46E-08	2.50E-07	5.70E-08	0.75	5.2	A
GAS	KR-85	4.93E-03	7.73E-04	3.70E-03	1.00E-03	0.75	6.4	A
27-TP-19	XE-131M	1.08E-03	9.13E-05	1.50E-03	2.20E-04	1.39	11.8	A
	XE-133	4.71E-02	1.28E-04	5.00E-02	4.50E-03	1.06	368.0	A
	XE-133M	2.93E-04	2.34E-05	2.60E-04	4.30E-05	0.89	12.5	A
	XE-135	7.27E-06	1.76E-06	9.30E-06	2.69E-06	1.28	4.1	A
LIQUID	CR-51	2.82E-06	4.22E-07	2.20E-06	4.00E-07	0.76	6.8	A
WASTE	MN-54	5.25E-07	7.85E-08	4.60E-07	7.40E-08	0.88	6.7	A
24-P-74S	CO-58	8.96E-06	1.65E-07	7.60E-06	6.60E-07	0.85	54.3	A
	CO-60	5.23E-06	1.51E-07	4.60E-06	3.00E-07	0.88	34.6	A
	ZN-65	3.54E-07	1.44E-07	0.00E+00			2.5	N
	ZR-95	3.11E-07	1.14E-07	2.80E-07	7.70E-07	0.90	2.7	N
	NB-95	5.35E-07	6.85E-08	5.70E-07		1.07	7.8	A
	RU-103	1.33E-07	3.94E-08	1.30E-07	3.80E-08	0.98	3.4	N
	SB-125	1.25E-06	1.66E-07	9.70E-07	1.67E-07	0.78	7.5	A
	CS-134	3.72E-07	8.17E-08	2.40E-07	6.70E-08	0.65	4.6	A
	CS-137	3.35E-07	6.46E-08	2.10E-07	5.70E-08	0.63	5.2	A
GAS	KR-85	4.93E-03	7.73E-04	4.40E-03	1.09E-03	0.89	6.4	A
25-P96Q	XE-131M	1.08E-03	9.13E-05	1.60E-03	2.50E-04	1.48	11.8	A
	XE-133	4.71E-02	1.28E-04	5.20E-02	4.60E-03	1.10	368.0	A
	XE-133M	2.93E-04	2.34E-05	3.80E-04	5.70E-05	1.30	12.5	A
	XE-135	7.27E-06	1.76E-06	8.00E-06		1.10	4.1	A
CRUD	CR-51	7.98E-05	4.91E-06	7.80E-05	8.20E-06	0.98	16.3	A
FILTER	MN-54	7.32E-06	6.52E-07	9.10E-06	9.60E-07	1.24	11.2	A
25-P-148	FE-59	5.45E-06	1.17E-06	5.10E-06	6.90E-07	0.94	4.7	A
	CO-58	1.30E-04	1.19E-04	1.40E-04	1.20E-05	1.08	109.2	A
	CO-60	9.58E-06	8.14E-07	1.00E-05	8.00E-07	1.04	11.8	A
	I-131	3.92E-06	4.95E-07	3.40E-06	5.30E-07	0.87	7.9	A
	I-133	1.33E-06	1.17E-06	4.00E-06		3.01	1.1	N
	ZR-95	8.68E-06	9.83E-07	1.09E-05	1.30E-06	1.15	8.8	A
	ZR-97	6.81E-06	1.46E-06	5.20E-06	1.08E-06	0.76	4.7	A
	NB-95	9.51E-06	5.84E-07	9.50E-06	1.00E-06	1.00	16.3	A
	CS-134	8.47E-06	9.98E-07	8.40E-06	6.90E-07	0.99	8.5	A
	CS-137	7.63E-06	6.40E-07	6.50E-06	1.26E-06	0.85	11.9	A
	BA-140	2.93E-05	3.02E-06	2.50E-05	2.60E-06	0.85	9.7	A
	CE-144	9.32E-06	1.73E-06	8.30E-06		0.89	5.4	A

TEST RESULTS:

A=AGREEMENT

D=DISAGREEMENT

\*=CRITERIA RELAXED

N=NO COMPARISON

ATTACHMENT 2

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.

<u>RESOLUTION</u>	<u>RATIO = LICENSEE VALUE/NRC REFERENCE VALUE</u>
	<u>Agreement</u>
<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 nuclides. These may be factored into the acceptance criteria and identified on the data sheet.