U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-483/92003(DRSS)

Docket No. 50-483 License No. NPF-30

Licensee: Union Electric Company
Post Office Box 149 - Mail Code 400
St. Louis, MO 63166

Facility Name: Callaway Plant, Unit 1

Inspection At: Callaway Site, Steedman, Missouri

Inspection Conducted: January 13-17, 1992

Inspector: J. E. House 2-6-92
Date

Approved By: William G. Snell, Chief 2/6/92
Radiological Controls Section Date

Inspection Summary

Inspection on January 13-17, 1992 (Report No. 50-483/92003(DRSS))
Areas Inspected: Routine announced inspection of: (1) the chemistry program including procedures, organization and training; (2) reactor systems water quality control programs; (3) chemistry quality assurance/quality control programs; (4) nonradiological chemistry comparisons; and (5) the radiological environmental monitoring program (REMP) (IP 84750).
Results: The licensee maintains a water quality control program that conforms to the EPRI Steam Generator Owners Group (SGOG) Guidelines and water quality was very good. The nonradiological chemistry comparisons and the radiological interlaboratory comparisons were very good as were the laboratory QA/QC programs. The REMP appeared to be well managed. No violations or deviations were identified.

DETAILS

1. Persons Contacted

[1]F. Eggers, Supervisor, Quality Assurance
[1]J. Gearhart, Superintendent, Quality Assurance
[1]C. Graham, Supervisor, Health Physics Technical Support
[1]M. Greeno, Supervisor, Countroom
[1]A. King, Health Physics Technician
[1]J. Kovar, Engineer, Quality Assurance
[1]E. Olson, Chemical Engineer
[1]J. Peevy, Manager, Operations Support
[1]S. Pettel, Engineer, Quality Assurance
[1]J. Polchow, Superintendent, Chemistry/Radwaste
[1]C. Riggs, Supervisor, Chemistry
[1]R. Roselius, Superintendent, Health Physics
[1]M. Taylor, Assistant Manager, Work Control

[1]B. Bartlett, Senior Resident Inspector, NRC
[1]D. Calhoun, 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 January 17, 1992.

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

a. (Closed) Open Item (50-483/89017-01): The licensee spiked the steam generator (S/G) water with anions, split the sample with Brookhaven National Laboratory (BNL), analyzed one portion and provided Region III with the results. Final results showed all comparisons (Table 1) were agreements.

b. (Closed) Open Item (50-483/89017-02): Licensee considered improvements in QA/QC program, including assessment of control charts and technician testing data. A review of the licensee's QA program (Section 7) indicated that control charts are statistically based, the standard deviations appeared reasonable and QA data is reviewed by laboratory management. The technician test data was closely monitored by a laboratory supervisor and formal acceptance criteria (INPO based) had been implemented.

c. (Closed) Open Item (50-483/90003-01): Licensee prepared a radioactive sample spiked with reactor coolant and split the sample with the Radiological Environmental Sciences Laboratory (RESL). The sample was analyzed by RESL and the licensee for gross alpha, gross beta, Sr-89, Sr-90, Fe-55 and gamma isotopic. Licensee results were submitted to Region III for comparison with the RESL results, (Table 2), which showed six agreements and one no comparison (poor counting statistics) in the gamma isotopic; three agreements, one conservative disagreement (Fe-55) and one

nonconservative (Sr-90) in the beta analyses. The gross alpha result could not be compared due to poor counting statistics.

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

Organization and staffing of the chemistry group had changed since the previous inspection. The Chemistry and Radwaste Supervisors along with the Environmental Engineer report to the Superintendent of Chemistry and Radwaste, who reports to the Plant Manager. Four laboratory (Rad/Chem) supervisors report to the Chemistry Supervisor. Three of these individuals have responsibility for plant systems and the fourth manages the laboratory QA program; they also supervise the 16 Rad/Chem Technicians. Low personnel turnover combined with replacement from a group of qualified Health Physics (HP) technicians has provided stability for the chemistry program. There are 15 technicians qualified to the ANSI/ANS 3.1-1978 standard and one HP qualified technician is in training.

The Health Physics Technical Support (HPTS) Supervisor reports to the HP Superintendent who reports to the Plant Manager. Three Rad/Chem Supervisors, responsible for counting facilities, environmental and dosimetry, and computing facilities report to the HPTS Supervisor. The eleven Rad/Chem technicians in these areas report to the Rad/Chem Supervisors. Both groups of technicians (Chemistry and HPTS) are qualified for gamma spectroscopy. The licensee has installed an upgraded gamma spectroscopy system which would be operational by 1 February 1992 according to licensee representatives.

No violations or deviations were identified.

4. Water Chemistry Control Program (IP 84750)

The inspector reviewed the water chemistry control program. Operational limits and action levels were consistent with the EPRI Steam Generator Owners Group (SGOG) Guidelines. Chemistry parameters were reviewed daily by technicians and laboratory managers. A monthly report is prepared for plant and corporate management. The corporate chemist also prepares a monthly report of plant chemistry performance.

A review of selected data for the past year indicated that water quality was very good. Reactor coolant chloride, fluoride and dissolved oxygen averaged less than 4, 3 and 1 parts per billion (ppb) with EPRI Guidelines of 150, 150 and 10 ppb respectively. Steam generator (S/G) blowdown levels of sodium, chloride, sulfate and conductibity were less than 2, 2 and 3 ppb; and 0.3 micro Siemen/cm (uS/cm) with EPRI guidelines of 20, 20 and 20 ppb; and 0.8 uS/cm respectively. Feedwater dissolved oxygen averaged less then 4 ppb (5 ppb guideline level); iron averaged less than 8 ppb and copper was 0.1 ppb or less, with guidelines of 20 and 2 ppb respectively.

No violations or deviations were identified

5. Post Accident Sampling System (IP 84750)

The inspector discussed operation of the Post Accident Sampling System (PASS) with licensee representatives. The system is maintained in accordance with CTP-ZZ-08003, Startup, Shutdown and Standardizatin of the Post Accident Sampling System. PASS oversight is assigned to a specific chemistry staff member who monitors routine mechanical maintenance and system performance. Results of analyses performed by PASS instrumentation are compared with laboratory grab sample results using acceptance criteria. A review of selected data indicated that required tests and system maintenance had been performed as required and the acceptance criteria appeared reasonable. The PASS in-line gamma spectroscopy system is less sensitive (by design) than the laboratory counting systems which makes comparison of isotopic PASS data with grab samples difficult. The inspector noted to licensee representatives that isotopic analyses of PASS and grab samples were not being performed on laboratory counting systems and then compared. This is necessary to determine that the PASS sample is representative of the bulk reactor coolant. The licensee agreed that this could be done and would consider it. This will be followed under Open Item 50-483/92003-01.

No violations or deviations were identified.

6. Confirmatory Measurements (IP 84750)

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

A single dilution was prepared 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 3 along with the the acceptance criteria. These criteria are derived from the BNL results of the present samples and the relative standard deviations (RSD) derived from the results of the 1986 interlaboratory comparisons from the various plant laboratories in the comparisons (Table 2.1, NUREG/CR-5422). The acceptance criteria were that the licensee's value should be within + 2 SD of the BNL value for agreement and between 2 and 3 SD for qualified agreement.

The licensee analyzed multiple concentrations of ten analytes (Table 3). All 29 analyses were agreements (26) or qualified agreements (3). There appeared to be a negative bias of approximately 12% for the low and middle ammonia concentrations, however these results were within three standard deviations of the mean value. The licensee performed very well in the chemistry comparisons.

No violations or deviations were identified.

7. Implementation of the Chemistry Quality Assurance Program (IP 84750)

The inspector reviewed the chemistry QA/QC program as defined by the following procedures:

CDP-ZZ-00700, Laboratory Quality Control Program, Revision 10, December 1, 1988

CTP-ZZ-04702, Quality Control Verification Program, Revision 8, March 27, 1991

HDP-ZZ-04700, Count Room Quality Control Program, Revision 4, January 16, 1990

APA-ZZ-00015, Conduct of Operations - Chemistry and Radwaste, Revision 8, August 19, 1991

APA-ZZ-00014, Conduct of Operations - Health Physics, Revision 3, June 14, 1990

Control charts, independent controls and multiple point calibration curves are in use. The control charts were statistically based with control limits set at ± 2 Standard Deviations (SD). A review of selected charts from the past year did not reveal any significant biases and the assays appeared to be in control.

The licensee had two vendor supplied interlaboratory comparison programs, one for radiological chemistry and one for analytical (cold) chemistry. Results of the radiological comparisons were very good with approximately 1300 agreements and four disagreements for 1990-1991. This comparison program was extensive and covered routinely used detectors and sample geometries.

The analytical chemistry comparison program is utilized for monitoring the technician's ability to perform assays. Personnel are required to be tested twice annually and those failing a given assay are required to repeat that analysis. Acceptance criteria were based on an INPO standard. A review of selected data for the past year indicated that technicians had been tested as required, overall results were good and had been reviewed by management. This program is managed by a laboratory supervisor. The inspector noted to licensee representatives that while individual technician results were reviewed, there was no overall estimate of laboratory performance. The inspector suggested that a statistical analysis of technician results be computed and a comparison made between the laboratory mean and the results of the vendor's analyses. Licensee representatives stated that they would consider this.

No violations or deviations were identified.

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

The inspector reviewed the REMP, including the 1990 Annual Environmental Report, and toured selected air sampling stations. The Annual Report appeared to comply with the REMP requirements and indicated that all of

the required samples were collected and analyzed except as noted in the report. The results did not indicate a significant contribution to the environment due to plant operations.

The inspector examined four environmental air sampling stations and observed a licensee representative replace the filter media and test the filter trains for air inleakage. Air sampler pumps and filter trains appeared to be operating satisfactorily, both with respect to vacuum and flowrate. Each sampler had a current calibration record attached. The REMP appeared to be conducted in an acceptable manner.

No violations or deviations were identified.

9. Audits and Appraisals (IP 84750)

The Inspector reviewed the most recent quality assurance audit of chemistry, AP91-018, conducted September 3-20, 1991 and audit number AP91-009 conducted June 17-28, 1991 of the REMP. Audit teams reviewed and observed primary and secondary sampling procedures, chemical analyses, in-line monitors and laboratory QA records. The auditors appeared to address in adequate detail the chemistry and REMP quality assurance programs.

No violations or deviations were identified.

10. Exit Interview

The scope and findings of the inspection were reviewed with licensee representatives (Section 1) at the conclusion of the inspection on January 17, 1992. The inspector discussed observations of the laboratory quality control program, control charts, results of the chemistry comparisons, the interlaboratory comparison program, water quality and the REMP. During the exit interview, the inspector 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, August 1989

2. Table 2, Radiological Interlaboratory Split Sample Results, February 1990

3. Table 3, Nonradiological Chemistry Comparison Results January 13-17, 1992

TABLE 1

Nonradiological Interlaboratory Split Sample Results
Callaway Nuclear Generating Plant
August 1989

Analyte	Analytical Method[1]	NRC[2] Y ± SD	Licensee[2] X ± SD	Ratio Z ± SD	Comparison[3] ± 2 SD
		Concentration, ppb			
Fluoride	IC	52.2 ± 3.7	52.0 ± 3.6	0.996 ± 0.099	A
Chloride	IC	54.2 ± 3.8	54.6 ± 3.8	1.007 ± 0.099	A
Sulfate	IC	41.9 ± 2.9	50.8 ± 3.6	1.212 ± 0.120	A

1. Analytical method: IC - Ion chromatography

2. Value ± standard deviation (SD): A Relative Standard Deviation (RSD) of 7%, derived from the licensee's control charts, was used for the comparisons.

3. A = Agreement
   D = Disagreement
   N = No Comparison Possible

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,

$$\frac{S_Z^2}{Z^2} = \frac{S_X^2}{X^2} + \frac{S_Y^2}{Y^2}, \text{ so that}$$

$$S_Z = Z \cdot \left(\frac{S_X^2}{X^2} + \frac{S_Y^2}{Y^2} \right)^{1/2}$$

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.

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

---

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

REGION III

FACILITY: CALLAWAY

FOR THE 1ST QUARTER OF 1990

SAMPLE	NUCLIDE	NRC VAL.	NRC ERR.	LIC.VAL.	LIC.ERR.	RATIO	RESOL.	RESULT
GAMMA SCAN	CO-58	1.63E-05	7.00E-07	1.60E-05	0.00E+00	0.98	23.3	A
	CO-60	2.10E-07	6.00E-08	2.60E-07	0.00E+00	1.24	3.5	A
	CS-134	8.40E-06	4.00E-07	8.60E-06	0.00E+00	1.02	21.0	A
	CS-137	1.01E-05	4.00E-07	1.10E-05	0.00E+00	1.09	25.3	A
	I-131	2.30E-05	1.20E-06	2.30E-05	0.00E+00	1.00	19.2	A
	LA-140	1.90E-07	6.00E-08	8.40E-07	0.00E+00	4.42	3.2	N
	MN-54	8.70E-07	9.00E-08	8.40E-07	0.00E+00	0.97	9.7	A
BETA	GROSS	2.10E-05	1.00E-06	2.70E-05	0.00E+00	1.29	21.0	A
	FE-55	6.90E-07	4.00E-08	9.70E-07	0.00E+00	1.41	17.3	D
	H-3	7.15E-03	1.00E-04	8.60E-03	0.00E+00	1.20	71.5	A
	SR-89	5.40E-07	4.00E-08	5.20E-07	0.00E+00	0.96	13.5	A
	SR-90	4.70E-08	1.30E-09	1.90E-08	0.00E+00	0.40	36.2	D
ALPHA	GROSS	1.00E-09	2.00E-09	1.10E-08	0.00E+00	11.00	0.5	N

TEST RESULTS:

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

TABLE 3
Nonradiological Chemistry Comparison Results
Callaway Nuclear Plant
January 13-17, 1992

Analyte		Method[1]	Concn[2]	Ratio[3]	Acceptance Ranges[4] ± 2RSD	± 3RSD	Result[5]
				ppb			
Fluoride	A	IC	20	0.954	0.875-1.125	0.813-1.187	A
	B		5	1.139	0.875-1.125	0.813-1.187	A+
	C		8	1.031	0.875-1.125	0.813-1.187	A
Chloride	A	IC	30	1.047	0.933-1.067	0.900-1.100	A
	B		6	1.021	0.917-1.081	0.879-1.121	A
	C		9	0.979	0.926-1.074	0.895-1.105	A
Sulfate	A	IC	20	1.063	0.895-1.105	0.842-1.158	A
	B		3	0.939	0.895-1.105	0.868-1.132	A
	C		6	0.933	0.900-1.100	0.867-1.133	A
Iron	G	AA/FL	2000	0.949	0.904-1.096	0.854-1.146	A
	H		2000	0.990	0.903-1.097	0.857-1.143	A
	I		2000	1.045	0.903-1.097	0.855-1.145	A
Copper	G	AA/FL	2000	0.935	0.904-1.095	0.859-1.141	A
	H		2000	0.948	0.904-1.096	0.857-1.143	A
	I		2000	0.973	0.904-1.096	0.857-1.143	A
Nickel	G	AA/FL	2000	1.010	0.936-1.064	0.906-1.094	A
	H		2000	1.012	0.938-1.062	0.908-1.092	A
	I		2000	1.038	0.938-1.062	0.907-1.093	A
Silica	S	Spec	50	0.947	0.906-1.094	0.859-1.141	A
	T		100	1.029	0.909-1.091	0.860-1.136	A
Ammonia	M	IC	100	0.882	0.902-1.098	0.856-1.147	A+
	N		300	0.871	0.902-1.098	0.856-1.147	A+
	O		500	0.990	0.902-1.098	0.856-1.147	A
Rerun	M		100	0.892	0.902-1.098	0.856-1.147	A+
	N		300	1.042	0.902-1.098	0.856-1.147	A
Hydrazine	P	Spec	10000	0.980	0.922-1.078	0.888-1.118	A
	Q		8000	0.950	0.922-1.078	0.888-1.118	A
	R		8000	0.957	0.922-1.078	0.888-1.118	A
				ppm			
Boron	D	Titr	1000	1.001	0.979-1.021	0.968-1.032	A
	E		3000	1.000	0.979-1.021	0.968-1.032	A
	F		5000	0.996	0.979-1.021	0.968-1.032	A

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

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). A result 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.