



UNITED STATES  
 NUCLEAR REGULATORY COMMISSION  
 REGION II  
 101 MARIETTA STREET, N.W.  
 ATLANTA, GEORGIA 30303

JUL 19 1984

Report Nos.: 50-413/84-76

Licensee: Duke Power Company  
 422 South Church Street  
 Charlotte, NC 28242

Docket No.: 50-413

License No.: CPPR-116

Facility Name: Catawba 1

Inspection Date: June 26-28, 1984

Inspection at Catawba site near Rock Hill, South Carolina

Inspector: George B. Kuzo 16 July 1984  
Date Signed  
 G. B. Kuzo

Approved by: D. M. Montgomery 16 July 1984  
Date Signed  
 D. M. Montgomery, Section Chief  
 Division of Radiation Safety and Safeguards

SUMMARY

Areas Inspected

This routine, unannounced inspection involved 28 inspector-hours on site in the areas of confirmatory measurements including review of counting room and chemistry procedures, review of the counting room and chemistry laboratory facilities and results of capability tests.

Results

No violations or deviations were identified.

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## REPORT DETAILS

## 1. Persons Contacted

## Licensee Employees

- \*J. W. Hampton, Plant Manager
- \*J. W. Cox, Technical Services Superintendent
- \*W. P. Deal, Station Health Physicist
- R. Charest, Station Chemist
- \*C. V. Wray, Health Physics Supervisor
- L. Evans, Power Chemistry Coordinator
- \*G. L. Courtney, Staff Health Physicist
- \*M. J. Geer, Corporate Health Physics
- \*C. L. Hartzell, Licensing and Project Engineer
- \*P. G. LeRoy, Licensing Engineer

Other licensee employees contacted included six technicians.

## NRC Resident Inspector

- \*P. H. Skinner

\*Attended exit interview.

## 2. Exit Interview

The inspection scope and findings were summarized on June 28, 1984, with those persons indicated in Paragraph 1 above. The inspector discussed in detail, problems regarding inaccurate tritium and gamma spectroscopy measurements of simulated reactor coolant and effluent samples (Paragraph 5). The inspector noted that training of counting room personnel and revised chemistry and counting room procedures were adequate. The inspector noted that previously identified followup items (IE Reports 50-413/84-14, 50-413/84-42 and 50-413/84-64) were closed during this inspection (Paragraph 6) and two inspector followup items regarding reactor coolant and effluent measurement capability (Paragraph 6) remain open. Cognizant licensee representatives committed to providing a written report evaluating tritium and gamma spectroscopy analysis problems within 30 days to the Region II Office.

Unresolved items were not identified during this inspection.

## 3. Review of Health Physics and Counting Room Procedures (84525)

- a. The inspector reviewed selected portions of the following revised procedures:

- (1) HP/O/B/1001/04, Operation of the ORTEC Model 7044 Multichannel Analyzer, Rev. 1

- (2) HP/0/B/1001/05, Operation and Calibration of the Tennelec LB 5100 Alpha/Beta Counting System, Rev. 2, 5/24/84
- (3) HP/0/B/1001/09, Operation and Calibration of Liquid Scintillation Counters, Rev. 2, 6/24/84
- (4) CP/0/B/8800/01, Reagent Verification and Instrument Check and Calibration, Rev. 1, (Submitted for Approval).

The inspector discussed the procedure review with cognizant licensee representatives and noted no violations nor deviations. Additional results of the procedure review are discussed in Paragraph 6.

#### 4. Review of Records and Logs (84525)

- a. The inspector reviewed selected portions of the following records and logs:

- (1) LS 1800 Liquid Scintillation Counter Nos. 1127 and 1128 instrument Quality Control Logs for June 1984, including:
  - i. Daily Background and Performance Log Sheets
  - ii. Monthly Performance Chart
  - iii. Weekly Calibration Log Sheet
  - iv. Monthly Background Log Sheet
  - v. Monthly Performance Data Sheet
  - vi. Monthly Efficiency Data Sheet
- (2) Alpha/Beta Proportional Counter Nos. CHP-1131 and CHP-1133 Quality Control Logs for June 1984, including:
  - i. Daily Background and Alpha/Beta Performance Check
  - ii. Alpha/Beta Check Source Data Sheet
  - iii. Efficiency and Monthly Performance Worksheet
- (3) Manual Beta/Gamma Counter Nos. CHP-1117 and CHP-1119 Quality Control Logs for June 1984, including:
  - i. Daily Performance and Background Data Sheets and Graphs
  - ii. Check Source Data Sheets
  - iii. Efficiency and Monthly Performance Worksheet
- (4) Ge(Li) Detector System Nos. 24-N-1096, 24-P-94VC, and 24-P-04TC Quality Control Logs for June 1984, including:
  - i. Quality Control Checks
  - ii. Daily Performance Checks
  - iii. Monthly Performance Graph
  - iv. Monthly Performance Evaluation
  - v. Monthly Performance Data Sheet
  - vi. Peak Channel Location Worksheet

- (5) Annual (1984) Ge(Li) Detector Efficiency Calibrations for systems Nos. SN-24-N-1096, SN-P-94VC, and 24-P-04TC including the following geometries: 50 ml bottle, 1000 ml bottle, 2" filter paper, and charcoal cartridge.
- (6) Chemical Analyses Quality Control Accuracy and Precision Charts, Reagent Verification, Instrument Checks, Calibrations and Standard Curves for the following analyses:
  - i. Chloride, April - June 1984
  - ii. Silica, March - June 1984
  - iii. Hydrazine, April - June 1984
  - iv. Chromate, April - June 1984
  - v. Phosphate, March - June 1984

The results of the record review are discussed in Paragraph 4b-c.

- b. The inspector noted that efficiency curves were now being graphed and properly maintained in the counting room quality control records by health physics personnel.
  - c. The inspector noted that efficiency calibrations for gas geometries had not been completed at the time of the inspection. Licensee representatives informed the inspector that an NBS traceable gas source had been purchased and calibration of the gas geometries would be completed in the immediate future.
5. Capability Tests (84525)

The licensee was provided with simulated reactor coolant, liquid waste, particulate filter, and charcoal cartridge sample types for tritium and gamma spectroscopy analyses. The purpose of these sample analyses was to verify the licensee's capability to accurately measure radionuclides in reactor coolant and plant effluents. Results of the tritium analyses are listed in Table 1 with the acceptance criteria in Attachment 1. All initial tritium analysis results for Sample A were in disagreement. The inspector observed the pipetting and subsequent distillation of samples and noted no errors in methodology. However, the inspector noted that calibration of the Liquid Scintillation System was based on a tritiated toluene based standard. The inspector noted that this standard was not representative of the actual sample types provided for capability tests and normal plant effluent measurements. Licensee representatives prepared new efficiency and quench correction determinations using a tritiated aqueous standard. Results for samples analyzed using the new standard were in agreement (Table 1). The inspector noted that results were systematically low by approximately 20 percent. Licensee representatives agreed to utilize aqueous standards for all tritium analyses and also agreed to systematically evaluate the observed bias and report the results to the Region II Office within 30 days. This area regarding H-3 measurement capability was previously identified and will remain open (50-413/84-42-02).

Results of Fe-55 analyses not completed during the last inspection (IE 50-413/84-64) are listed in Table 1. Results for this analyses were in



disagreement. The inspector noted that this analysis is conducted by a licensee approved vendor. The inspector requested that the licensee contact the vendor to affirm accurate sample processing and/or final reporting of data. Results of the licensee followup were not available by the exit interview. Licensee representatives agreed to provide results of their inquiry to the Region II Office in a timely manner.

For gamma spectroscopy analyses, the spiked samples were analyzed using detector Nos. SN-24-N-1096, SN-24-P-94VC, and 24-P-04TC. Results of the gamma spectroscopy analyses are presented in Table 2 with the acceptance criteria in Attachment 1. For the particulate filter, charcoal cartridge and the simulated liquid waste samples, all comparisons were in agreement. For Sample B simulated reactor coolant sample (counting time of 2000s), the Co-60 result was in disagreement for detector No. SN-24-N-1096 and the Ce-144 nuclide was not reported for the data output for three detectors utilized in the comparisons. The inspector noted that for the Sample B analyses, the Ce-144 nuclide was detected but not included in the final results due to licensee established sensitivity limits (30%) for data reporting. For Sample A analyses (counting time 600s), Co-60 was not detected by system Nos. SN-24-N-1096 and SN-P-04TC. Preliminary calculations determined that the known nuclide concentrations were within detection limits. The inspector noted that subsequent analyses of a single sample resulted in highly variable data, i.e., data inclusion for one analysis and exclusion during a subsequent analysis. Following discussion of the observed high variability and Technical Specification Requirements for reactor coolant and effluent measurements, licensee representatives agreed to evaluate the following areas for the gamma spectroscopy systems: inaccurate quantification of Co-60 by System No. SN-24-N-1096 in liquid samples; capability to meet Technical Specification Lower Limit of Detection requirements for selected geometries; and reactor coolant nuclide identification requirements. The previously identified inspector followup item regarding calibration and testing of the gamma spectroscopy systems will remain open (50-413/84-64-02).

6. Review of Inspector Followup Items (92701)

- a. (Closed) 83-38-03, Counting Room Equipment Procurement. The inspector verified all major counting room equipment was present and undergoing calibration and verification testing in the counting room.
- b. (Closed) 84-14-01 and 84-42-01, Review of QC Program for Radiological Effluents and Counting Room Instrumentation Against Regulatory Guide 4.15. The inspector noted that responsibilities for counting room and chemistry functions are detailed in Station Guideline No. 8 and detailed procedures for implementation of an interlaboratory crosscheck program are detailed in the operating procedures for each type of counting room equipment. Details of the crosscheck procedures include frequency, data reporting, acceptance criteria and followup actions.
- c. (Closed) 84-14-02, The inspector reviewed and discussed changes to HP/O/B/1001/04 "Operation of the ORTEC Model 7044 Multichannel Analyzer." Section 3.6 has been changed to limit dead time to 10 percent.

- d. (Closed) 84-14-03, Review of Alpha/Beta Counting Procedures. The inspector noted that procedure HP/O/B/100i/05 "Operation and Calibration of the Tennelec LB 5100 Alpha/Beta Counting System" specifies Am-241 and Cs-137 isotopes for alpha and beta efficiency calibrations of the automatic gas flow proportional counters. Cognizant licensee representatives informed the inspector that an actual evaluation of plant specific contaminants will be conducted following startup to determine the appropriate radionuclides to be utilized for calibration purposes.
- e. (Closed) 84-42-04 and 84-42-05, Frequency of Chemistry Standard Curve Preparation and Update of Chemistry Records. The inspector discussed CP/O/B/8800/01, "Reagent Verification and Instrument Check and Calibration" with cognizant licensee representatives and verified changes had been implemented. Standard curves for selected chemical tests are prepared annually and a review of the chemistry laboratory records indicated that all records are being properly labelled and maintained.

TABLE 1

RESULTS OF H-3 AND Fe-55 CONFIRMATORY MEASUREMENT ANALYSES AT CATAWBA STATION

JUNE 26 - 28, 1984

SAMPLE	ISOTOPE	CONCENTRATION (uCi/Unit)		RESOLUTION	RATIO LICENSEE/NRC	COMPARISON
		LICENSEE	NRC			
(1) Liquid Waste A	H-3	4.41 E-5	6.50±0.20 E-5	32	0.68	Disagreement
(1) Liquid Waste A	H-3	4.65 E-5	6.50±0.20 E-5	32	0.72	Disagreement
(1) Liquid Waste A	H-3	4.82 E-5	6.50±0.20 E-5	32	0.74	Disagreement
(2) Liquid Waste A	H-3	5.33 E-5	6.50±0.20 E-5	32	0.82	Agreement
(2) Liquid Waste A	H-3	4.87 E-5	6.50±0.20 E-5	32	0.75	Agreement
(2) Liquid Waste A	H-3	5.24 E-5	6.50±0.20 E-5	32	0.81	Agreement
(2) Liquid Waste B	H-3	7.57 E-5	9.42±0.28 E-5	34	0.80	Agreement
(2) Liquid Waste B	H-3	7.58 E-5	9.42±0.28 E-5	34	0.80	Agreement
(2) Liquid Waste B	H-3	7.78 E-5	9.42±0.28 E-5	34	0.82	Agreement
Liquid Waste	Fe-55	4.20 E-4	2.88±0.10 E-4	29	1.45	Disagreement

(1) Analyzed Using Tritiated Toluene Based Standard  
 (2) Analyzed Using Tritiated Water Based Standard

TABLE 2

## RESULTS OF GAMMA SPECTROSCOPY MEASUREMENTS AT CATAWBA NUCLEAR STATION

JUNE 26 - 28, 1984

SAMPLE	ISOTOPE	CONCENTRATION ( $\mu\text{Ci}/\text{Unit}$ )		RESOLUTION	RATIO LICENSEE/NRC	COMPARISON
		LICENSEE	NRC			
(1) Particulate Filter	Co-57	1.96 E-2	1.81 $\pm$ 0.04 E-2	45	1.06	Agreement
	Co-60	9.76 E-2	9.05 $\pm$ 0.06 E-2	150	1.08	Agreement
	Sr-85	1.01 E-1	1.07 $\pm$ 0.02 E-1	53	0.94	Agreement
	Y-88	1.92 E-1	1.78 $\pm$ 0.05 E-1	36	1.08	Agreement
	Cd-109	5.43 E-1	4.71 $\pm$ 0.15 E-1	28	1.15	Agreement
	Sn-113	9.11 E-2	8.62 $\pm$ 0.40 E-2	22	1.06	Agreement
	Cs-137	8.42 E-2	7.82 $\pm$ 0.20 E-2	39	1.08	Agreement
	Ce-139	2.42 E-2	2.32 $\pm$ 0.08 E-2	29	1.04	Agreement
(2) Particulate Filter	Co-57	1.82 E-2	1.81 $\pm$ 0.04 E-2	45	1.00	Agreement
	Co-60	8.34 E-2	9.05 $\pm$ 0.06 E-2	150	0.92	Agreement
	Sr-85	1.03 E-1	1.07 $\pm$ 0.02 E-1	53	0.96	Agreement
	Y-88	1.76 E-1	1.78 $\pm$ 0.05 E-1	36	0.99	Agreement
	Cd-109	5.16 E-1	4.71 $\pm$ 0.15 E-1	28	1.10	Agreement
	Sn-113	8.74 E-2	8.62 $\pm$ 0.40 E-2	22	1.01	Agreement
	Cs-137	7.56 E-2	7.82 $\pm$ 0.20 E-2	39	0.97	Agreement
	Ce-139	2.19 E-2	2.32 $\pm$ 0.08 E-2	29	0.94	Agreement
(3) Particulate Filter	Co-57	1.92 E-2	1.81 $\pm$ 0.04 E-2	45	1.06	Agreement
	Co-60	8.99 E-2	9.05 $\pm$ 0.06 E-2	150	0.99	Agreement
	Sr-85	1.22 E-1	1.07 $\pm$ 0.02 E-1	53	1.14	Agreement
	Y-88	1.92 E-1	1.78 $\pm$ 0.05 E-1	36	1.08	Agreement
	Cd-109	6.10 E-1	4.71 $\pm$ 0.15 E-1	28	1.30	Agreement
	Sn-113	8.95 E-2	8.62 $\pm$ 0.40 E-2	22	1.04	Agreement
	Cs-137	8.22 E-2	7.82 $\pm$ 0.20 E-2	39	1.05	Agreement
	Ce-139	2.45 E-2	2.32 $\pm$ 0.08 E-2	29	1.06	Agreement
(1) Charcoal Cartridge	Co-57	1.90 E-2	1.81 $\pm$ 0.04 E-2	45	1.05	Agreement
	Co-60	9.64 E-2	9.06 $\pm$ 0.06 E-2	151	1.06	Agreement
	Sr-85	1.09 E-1	1.07 $\pm$ 0.02 E-1	54	1.02	Agreement
	Y-88	2.07 E-1	1.78 $\pm$ 0.05 E-1	36	1.16	Agreement
	Cd-109	4.90 E-1	4.71 $\pm$ 0.16 E-1	29	1.04	Agreement
	Sn-113	9.00 E-2	8.61 $\pm$ 0.40 E-2	22	1.04	Agreement
	Cs-137	8.33 E-2	7.81 $\pm$ 0.20 E-2	39	1.07	Agreement
	Ce-139	2.49 E-2	2.32 $\pm$ 0.08 E-2	29	1.07	Agreement
(2) Charcoal Cartridge	Co-57	1.82 E-2	1.81 E-2	45	1.00	Agreement
	Co-60	8.92 E-2	9.06 E-2	151	0.98	Agreement
	Sr-85	1.06 E-1	1.07 E-1	54	0.99	Agreement
	Y-88	1.86 E-1	1.78 E-1	36	1.04	Agreement
	Cd-109	4.96 E-1	4.71 E-1	29	1.05	Agreement
	Sn-113	8.65 E-2	8.61 E-2	22	1.00	Agreement
	Cs-137	7.90 E-2	7.81 E-2	39	1.01	Agreement
	Ce-139	2.24 E-2	2.32 E-2	29	0.96	Agreement
(3) Charcoal Cartridge	Co-57	1.91 E-2	1.81 E-2	45	1.06	Agreement
	Co-60	6.78 E-2	9.06 E-2	151	0.75	Disagreement
	Sr-85	1.07 E-1	1.07 E-1	54	1.00	Agreement
	Y-88	1.43 E-1	1.78 E-1	36	0.80	Agreement
	Cd-109	5.78 E-1	4.71 E-1	29	1.23	Agreement
	Sn-113	7.48 E-2	8.61 E-2	22	0.87	Agreement
	Cs-137	6.50 E-2	7.81 E-2	39	0.83	Agreement
	Ce-139	2.60 E-2	2.32 E-2	29	1.12	Agreement



TABLE 2 (cont'd)

## RESULTS OF GAMMA SPECTROSCOPY MEASUREMENTS AT CATAWBA NUCLEAR STATION

JUNE 26 - 28, 1984

SAMPLE	ISOTOPE	CONCENTRATION (uCi/Unit)		RESOLUTION	RATIO LICENSEE/NRC	COMPARISON
		LICENSEE	NRC			
(1) Simulated Liquid Waste Sample	Co-57	1.00 E-2	9.34±0.17 E-3	55	1.07	Agreement
	Co-60	4.61 E-2	4.67±0.05 E-2	93	0.99	Agreement
	Sr-85	4.84 E-2	5.63±0.25 E-2	22	0.86	Agreement
	Y-88	9.10 E-2	9.02±0.20 E-2	45	1.01	Agreement
	Cd-109	2.54 E-1	2.27±0.04 E-1	57	1.12	Agreement
	Sn-113	4.59 E-2	4.37±0.10 E-1	44	1.05	Agreement
	Cs-137	3.99 E-2	4.08±0.04 E-2	102	0.98	Agreement
	Ce-139	1.33 E-2	1.14±0.03 E-2	38	1.17	Agreement
(2) Simulated Liquid Waste Sample	Co-57	9.46 E-3	9.34±0.17 E-3	55	1.01	Agreement
	Co-60	4.68 E-2	4.67±0.05 E-2	93	1.00	Agreement
	Sr-85	4.90 E-2	5.63±0.25 E-2	22	0.87	Agreement
	Y-88	8.92 E-2	9.02±0.20 E-2	45	0.99	Agreement
	Cd-109	2.56 E-1	2.27±0.04 E-1	57	1.13	Agreement
	Sn-113	4.61 E-2	4.37±0.10 E-1	44	1.05	Agreement
	Cs-137	3.94 E-2	4.08±0.04 E-2	102	0.96	Agreement
	Ce-139	1.29 E-2	1.14±0.03 E-2	38	1.13	Agreement
(3) Simulated Liquid Waste Sample	Co-57	1.05 E-2	9.34±0.17 E-3	55	1.12	Agreement
	Co-60	4.57 E-2	4.67±0.05 E-2	93	0.98	Agreement
	Sr-85	7.66 E-2	5.63±0.25 E-2	22	1.36	Disagreement
	Y-88	8.96 E-2	9.02±0.20 E-2	45	0.99	Agreement
	Cd-109	2.73 E-1	2.27±0.04 E-1	57	1.20	Agreement
	Sn-113	4.56 E-2	4.37±0.10 E-1	44	1.04	Agreement
	Cs-137	3.86 E-2	4.08±0.04 E-2	102	0.95	Agreement
	Ce-139	1.29 E-2	1.14±0.03 E-2	38	1.13	Agreement
(1) Simulated Reactor Coolant Sample B	Co-60	2.05 E-5	1.62±0.03 E-5	54	1.26	Disagreement
	Cs-137	1.85 E-5	1.67±0.03 E-5	56	1.11	Agreement
	Ce-144	ND	4.56±0.13 E-6	35	NC	NC
(2) Simulated Reactor Coolant Sample B	Co-60	1.77 E-5	1.62±0.03 E-5	54	1.09	Agreement
	Cs-137	1.78 E-5	1.67±0.03 E-5	56	1.06	Agreement
	Ce-144	ND	4.56±0.13 E-6	35	NC	NC
(3) Simulated Reactor Coolant Sample B	Co-60	1.79 E-5	1.62±0.03 E-5	54	1.10	Agreement
	Cs-137	1.89 E-5	1.67±0.03 E-5	56	1.13	Agreement
	Ce-144	ND	4.56±0.13 E-6	35	NC	NC

TABLE 2

RESULTS OF GAMMA SPECTROSCOPY MEASUREMENTS AT CATAWBA NUCLEAR STATION

JUNE 26 - 28, 1984

SAMPLE	ISOTOPE	CONCENTRATION (uCi/Unit)		RESOLUTION	RATIO LICENSEE/NRC	COMPARISON
		LICENSEE	NRC			
(1) Simulated Reactor Coolant Sample A	Co-60	ND	1.12±0.02 E-5	56	NC	NC
	Cs-137	1.13 E-5	1.16±0.02 E-5	58	0.97	Agreement
	Ce-144	ND	3.15±0.09 E-6	35	NC	NC
(2) Simulated Reactor Coolant Sample A	Co-60	1.26 E-5	1.12±0.02 E-5	56	1.12	Agreement
	Cs-137	1.04 E-5	1.16±0.02 E-5	58	0.90	Agreement
	Ce-144	ND	3.15±0.09 E-6	35	NC	NC
(3) Simulated Reactor Coolant Sample A	Co-60	ND	1.12±0.02 E-5	56	NC	NC
	Cs-137	1.23 E-5	1.16±0.02 E-5	58	1.06	Agreement
	Ce-144	ND	3.15±0.09 E-6	35	NC	NC

ND = Not Detected

NC = Not Compared

(1) = Analyzed Using Ge(Li) Detector System No. 24-N-1096

(2) = Analyzed Using Ge(Li) Detector System No. 24-P-94VC

(3) = Analyzed Using Ge(Li) Detector System No. 24-P-04TC