

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-317/84-09
50-318/84-09

Docket Nos. 50-317
50-318

License Nos. DPR-53 Priority --- Category C
DPR-69

Licensee: Baltimore Gas & Electric Company

Facility Name: Calvert Cliffs Nuclear Power Plant

Inspection At: Lusby, Maryland

Inspection Conducted: April 23-27, 1984

Inspectors: Richard K. Struckmeyer 7/16/84
Richard K. Struckmeyer date
for J. J. Kottan 7-17-84
Jason C. Jang date
for J. J. Kottan 7-17-84
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Approved by: Walter J. Pasciak 7/16/84
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Effluents Radiation
Protection Section

Inspection Summary: Inspection on April 23-27, 1984 (Combined Inspection Report Nos. 50-317/84-09 and 50-318/84-09)

Areas Inspected: Routine, unannounced inspection of the radioactive waste program and of the licensee's chemical and radiochemical measurements program using NRC:I Mobile Radiological Measurements Laboratory and laboratory assistance provided by DOE Radiological and Environmental Sciences Laboratory.

Areas reviewed for the radioactive waste program included: radioactive effluent releases - liquid and gaseous, records and reports of radioactive effluents, testing of air cleaning systems, effluent monitor calibrations, procedures, and audits.

Areas reviewed for the chemical and radiochemical measurements program included: program for quality control of analytical measurements, audit results, performance

on radiological analyses of split actual effluent samples, and effluent control procedures.

The inspection involved 128 inspector-hours onsite by four NRC regionally-based inspectors.

Results: Of the areas inspected, one violation was identified in one area: radiochemistry-failure to have procedures reviewed by POSRC.

DETAILS

1. Individuals Contacted

- *L. B. Russell, Plant Superintendent
- *D. W. Latham, Principal Engineer-Operational Licensing and Safety
- *J. M. Moreira, General Supervisor-Electrical and Controls
- *P. T. Crinigan, General Supervisor-Chemistry
- *A. M. Vogel, Chemist
- *R. E. Sprecher, Supervisor-Plant Chemistry
- *J. E. Thorp, Operational Safety Analyst-Operational Licensing and Safety
- *R. B. Sydnor, Supervisor-Electrical and Controls Engineering
- *R. Androsik, Engineer-Electrical and Controls Engineering
- G. Sack, Supervisor - Test Equipment
- R. Mondulick, Supervisor-Instrument Maintenance, E&C
- R. Wenderlich, Supervisor-Operations QA Auditing Unit
- L. Salyards, Licensing
- J. Carroll, General Supervisor, Operations

* denotes those present at the exit interview on April 27, 1984

2. Licensee Action on Previous Inspection Findings

(Closed) Severity IV (317/83-08-01; 318/83-08-01): Failure to follow strontium analysis procedure. The inspector noted that the licensee no longer performs strontium analysis in-house. The licensee appears to have adequate audit and quality control activities of the vendor now performing the strontium analysis.

(Closed) Severity V (317/83-08-02; 318/83-08-02) Failure to follow gas sampling procedure. The licensee has implemented a revision to procedure RCP-1-502, Sampling of Gases for Activity, to include the use of any approved sampling containers depending on the sensitivity required and minimum volume required.

(Closed) Unresolved Item (317/83-08-03; 318/83-08-03): Collection efficiency for charcoal cartridges. Since the last inspection, the licensee has again switched to a new type of charcoal cartridge. The licensee has test data for the time interval and flow rate used under normal operating conditions and is using the actual collection efficiency for these conditions.

3. Chemistry

The licensee's radiochemistry program was reviewed through discussion with chemistry personnel, review of applicable procedures and review of quality control data with respect to Technical Specifications criteria.

A. Procedures

Procedures were established and implemented for liquid and gaseous waste and for reactor coolant as required in Tables 2.3.1, 3.4-1, 4.4-3 and 4.4-4 of the Technical Specifications. These procedures included representative sampling, analysis, instrument use, instrument

calibration, and quality control checks. During the procedure review the inspector noted that the POSRC had not reviewed any of the procedures covering chemical and radiochemical control, surveillance tests listed on the Technical Specifications or radioactivity determination in liquid and gaseous effluents. The licensee stated that the review of these procedures was declined by the POSRC in accordance with procedures governing the activities of the POSRC. The inspector stated that the Technical Specifications were the governing document, and that failure to review procedures listed in Section 6.8 of the Technical Specifications was an item of noncompliance (317/84-09-01; 318/84-09-01).

The licensee has recently completed an extensive review and revision of its laboratory procedures. Procedures were well stated and in sufficient detail to provide good performance during routine activities and nonroutine occurrences. The procedures included a complete purpose and background, acceptance criteria, corrective actions, reagent preparation, quality controls, calculations and references. The high quality of the procedures reflects a qualified and well motivated staff.

B. Quality Control

Control charts are maintained for the gamma detectors to assure consistent performance. Efficiencies are plotted daily and action limits are provided. Periodic background, resolution, and efficiency calibration checks are made. Proportional counter background and efficiency determinations are performed daily. The data is logged but not plotted on control charts. The inspector suggested separating alpha and beta data in the log book for efficient trend analysis and developing control charts for alpha and beta quality control data. Plateau checks and Chi square tests are performed at appropriate frequencies. Liquid scintillation counter (LSC) standards are prepared weekly and plotted on a control chart. Efficiencies are determined from a quench curve. The inspector stated that the efficiency of the LSC varies from day to day and should be determined at the same frequency that the efficiencies of the proportional counters are determined. The constant efficiency that is incorporated into the quench curve should be removed and the actual efficiency should be used in the calculation and plotted on control charts. The inspector reviewed calibration curves for fluoride and chloride analyses and found them to be adequate. There are no reference samples analyzed for gross alpha, gross beta or fluoride analyses. The inspector suggested the development of reference samples as a quantitative check of laboratory technique. The licensee stated that this area would be reviewed. The inspector stated that this item would be reviewed in a future inspection (317/84-09-02; 318/84-09-02).

C. Audits

The licensee has instituted a departmental review of procedures. Staff members review each procedure for accuracy of numbers and correctness of technique. The audit includes observation of tech-

nicians and review of analytical data. These reviews have resulted in many minor procedure corrections, clarifications and technician training. The licensee appears to have good control of laboratory practices.

4. Confirmatory Measurements

During the inspection, actual liquid, charcoal, and gaseous effluent samples were split between the licensee and NRC:I for the purpose of intercomparison. The effluent samples were analyzed by the licensee using the licensee's normal methods and equipment, and by the NRC using the NRC:I Mobile Radiological Measurements Laboratory. Joint analyses of actual effluent samples are used to determine the licensee's capability to measure radioactivity in effluent samples.

In addition, a liquid effluent sample was sent to the NRC reference laboratory, Department of Energy, Radiological and Environmental Sciences Laboratory (RESL), for analyses requiring wet chemistry. The analyses to be performed on the sample are: Sr-89, Sr-90, gross alpha, and tritium. These results will be compared with the licensee's results when received at a later date, and will be documented in a subsequent inspection report.

The results of an effluent sample split between the licensee and NRC:I during a previous inspection on April 4-8, 1983 (Inspection Report Numbers: 50-317/83-08; 50-318/83-08) were also compared during this inspection.

The results of the gamma isotopic measurement comparisons indicated that all of the measurements were in agreement under the criteria used for comparing results (see Attachment 1) with the exception of the I-131 analysis of the reactor coolant sample. The disagreement may be the result of incorrect calibration input or incorrect efficiency curve smoothing by the computer. The licensee agreed to review his calibration data including the gamma isotope library against current references to determine the cause for the discrepancy. The licensee's I-131 result was higher than the NRC:I Mobile Laboratory. The higher value would result in a more conservative number in the calculation of the iodine dose equivalent. The inspector stated that until the documentation was received and reviewed this would be considered an unresolved item (317/84-09-03; 318/84-09-03).

5. Testing of Air Cleaning Systems

The inspector reviewed the licensee's air filtration system testing with regard to the Technical Specifications requirements. The testing of air filtration systems is conducted by the Electrical and Controls Department, with the exception of laboratory testing of carbon adsorber filters, which is performed by a contractor. The latter test results are filed with the in-place filter tests conducted by the licensee upon receipt from the contractor. The inspector noted that the licensee has an adequate method for scheduling air filtration system tests, and for logging actual dates on which tests were performed, thus ensuring that the Technical Specifications requirement for frequency of these tests will be met. The inspector reviewed

the Surveillance Test Procedures (STPs) appropriate to Unit 1, Unit 2, and Common air filtration systems that are required by Technical Specifications (Penetration Room Exhaust, ECCS Pump Room Exhaust, Containment Iodine Removal, Control Room Post-LOCI, and Spent Fuel Pool). Both the in-place and laboratory tests met the Technical Specifications requirements. However, the inspector noted that the STPs for the in-place tests lacked clarity in some respects, and in one instance, had no procedural instruction corresponding to a section of the form for results. Specifically, the inspector noted a lack of a procedural instruction while reviewing STP Number M-541-0, "Control Room Post-LOCI Filter Test (Charcoal)," performed on December 8, 1983. An "Individual/Bank Filter Penetration Test" had been performed, but nothing in the procedure described or required this test. The inspector stated that the procedures should contain a description of this test. The licensee stated that the STPs for air-filtration system tests were written in a generic fashion to cover tests of all such systems, with minor modifications to adapt each procedure to its particular system. The licensee stated that procedures would be reviewed and modified as necessary to assure that details for individual tests are included.

The inspector discussed with the licensee some of the areas in which the air-filtration system STPs lacked clarity:

- ° There is no method for systematically indicating the reason for performing the test. Space is provided for indicating whether the test was performed for a reason other than satisfying the Technical Specifications requirements; however, the inspector noted that in several instances, this information was not supplied. The inspector stated that each air-filtration system test should indicate why the test was performed. Additionally, the inspector recommended that the log of STPs for air-filtration systems should indicate which tests were performed to meet Technical Specifications requirements. These measures would provide the licensee with a method for prompt verification that Technical Specifications requirements are fulfilled with regard to frequency of tests, and facilitate the licensee's review of the appropriate tests to ensure that such tests are properly done.
- ° The STPs specify that a visual inspection of the filters be made, and that any problems be noted in the appropriate place on the procedure cover sheet. However, no provision is made for verification that this portion of the STP has been performed. The inspector recommended that such provision be added.
- ° Most of the air filtration systems have two fans that are individually able to draw sufficient flow through the same filter train. The licensee stated that each fan is operated at the beginning of a test, and the one providing the greatest flow (cfm) is used to perform the remainder of the test. The inspector noted that the STPs do not provide instructions pertaining to this method. Data sheets are provided for both fans, but according to the method described by the licensee, only one of them need be completed; the other is marked "N/A". The inspection stated that the procedures should contain instructions detailing fan operation during testing.

° The licensee stated that flow distribution tests are performed only after maintenance to an air filtration system that would affect the distribution, and that such maintenance has not occurred since the systems were installed. The inspector noted that the STPs contain provisions for performing this test, and recommended that they more explicitly state the circumstances under which it would be required.

The licensee indicated that its STPs for air filtration system testing are currently being reviewed and revised where necessary, and that this review would be completed within six months. The inspector stated that these procedures will be reviewed in a future inspection (50-317/84-09-04; 50-318/84-09-04).

The inspector reviewed charcoal laboratory test results of ECCS Pump Room for Units 1 and 2 for methyl iodide removal. This review was necessary because, according to Licensee Event Reports 83-41 (Unit 1) and 83-37 (Unit 2), a problem with the ECCS Pump Room Exhaust charcoal filter inlet dampers allowed flow through the filters when the bypass dampers were open. The consequence of this abnormal operating condition was that the duration of flow through the charcoal filters may have exceeded the Technical Specification 4.7.7.1.c limit of 720 hours. A laboratory test for methyl iodide removal efficiency is required after every 720 hours of charcoal adsorbent operation.

Laboratory tests were performed on January 14, 1984 for Unit 1 and on March 26, 1984 for Unit 2. Methyl iodide removal efficiencies for Units 1 and 2 were 92.80% and 93.05%, respectively, and these test results were in accordance with Section 4.7.7.1.c of the Technical Specifications (>90%). However, the licensee stated that the charcoal beds would be replaced in the future.

6. Radioactive Effluent Release Records

The inspector reviewed selected liquid and gaseous waste release permits and noted that the licensee recorded required parameters, including the laboratory analytical results, on the release permits.

In reviewing the liquid release permits, the inspector noted that the background readings for the liquid radwaste monitor were high, in the range of 5,000 - 18,000 counts per minute (cpm), in January 1984. The licensee calculated the minimum sensitivity based on the 5,000 cpm background reading, and the result was $1.47E-3$ uCi/cc. The licensee stated that 18,000 cpm on January 21, 1984 was in error but the licensee had not made any correction on the release permit (No. R-012-84) as of April 24, 1984. The licensee stated that the high background reading was due to internal plate out around the monitor. The inspector stated that the accuracy of the monitor was questionable due to high background reading. Furthermore, the inspector noted that the licensee had no background count limits for the effluent monitors. A similar problem was identified for a gaseous discharge monitor (O-RI-2191). The inspector stated that this item would be reviewed during a subsequent inspection (50-317/84-09-05, 50-318/84-09-05).

The inspector also reviewed the licensee's Semiannual Radioactive Effluent Release Reports for the first and second halves of 1983 and found them to be satisfactory. These provided information on gaseous and liquid effluents, with comparisons to Technical Specification limits, and on solid waste shipments. A discussion is provided of methodology for determining the quantities of radionuclides released, including estimation of total error.

7. Effluent Control Instrumentation Calibrations

The inspector examined the liquid and gaseous effluent monitors with respect to the Technical Specification requirements for calibration and functional testing. The inspector noted that the frequency of calibration was not specified in the Technical Specifications, therefore, the licensee determined the frequency in the Preventive Maintenance Schedules. The inspector reviewed the calibration data for the liquid radwaste monitor (C-RI-2201), gaseous waste discharge monitor (O-RI-2191), and gaseous main vent monitor (O-RI-5415). The licensee stated that the effluent monitors were calibrated by the vendor laboratory (Westinghouse). The vendor laboratory supplied calibration results to the licensee and the licensee verified these calibration results using Procedure FT-I-114, "Radiation Monitoring Drawer Calibration Check Procedure", dated August 31, 1979. The inspector noted that the calibrations were performed as required for the liquid and gaseous effluent monitors.

The inspector discussed the calibration check source with the Chemistry Group, which has responsibility for the radioactive effluent releases. The Chemistry Group informed the inspector that the E&C Group used two radionuclide sources for the calibration. In reviewing the effluent monitor calibration results, the inspector noted that the E&C Group used two calibration sources as required by Procedure FT-I-114, but the calibration sources were the same radionuclide with different activities. Therefore, the inspector reviewed the monitor calibration curve and determined that there was no bias. The inspector stated that good communication between the Chemistry and E&C Groups was necessary in exercising good practice.

No violations were identified in this area.

8. Audits

The inspector reviewed the licensee's program for audit of the liquid and gaseous radwaste programs. Procedure OQASP7, "Quality Assurance Audits" (Rev. 15), states the purpose of, responsibilities for, and method of conducting required audits. It contains provisions for a status log that provides confirmation that audits have been performed according to schedule. The licensee conducts annual audits in those areas concerned with, or related to, the handling of liquid and gaseous radwaste. The inspector reviewed the audits in these areas for 1983 and 1984, including:

- QAP #3 Radioactive Waste (Liquid & Gas)
- QAP #18 Chemistry
- QAP #20 Training (Rad. Safety, Chemistry)

The inspector noted that these audits were conducted in sufficient breadth and depth to reveal inadequacies in the licensee's programs. Findings were clearly presented, and in most cases the licensee responded promptly to effect corrective actions.

This review indicated that the licensee is meeting its Technical Specification requirements for audits in this area.

9. Unresolved Item

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, items of noncompliance, or deviations. An unresolved item disclosed during this inspection is discussed in Paragraph 4.

10. Exit Interview

The inspector met with the licensee representatives (identified in Paragraph 1) at the conclusion of the inspection on April 27, 1984. The inspector summarized the purpose and scope of the inspection and the inspection findings.

The licensee agreed to perform the analyses listed in Paragraph 4 and report the results to the NRC.

TABLE 1

Calvert Cliffs Nuclear Power Plant Verification Test Results

SAMPLE	ISOTOPE	NRC VALUE	LICENSEE VALUE	COMPARISON
		Results in Microcuries per Milliliter		
12 RCWMT 04/05/83 1006 hrs	gross alpha	(6±1)E-9	*	No Comparison
	gross beta	(1.18±0.05)E-5	(1.4±0.2)E-5	Agreement
	H-3	(2.88±0.02)E-2	(3.23±?)E-2	Agreement
	Sr-89	(2.6±0.7)E-8	<5E-8	No Comparison
	Sr-90	(9±3)E-9	<5E-9	No Comparison
12 RCWMT 04/24/84 1507 hrs	Xe-133	(3.15±0.07)E-5	(3.56±0.12)E-5	Agreement
	Co-58	(2.4±0.2)E-6	(2.7±0.4)E-6	Agreement
	Co-60	(2.1±0.3)E-6	(1.2±0.3)E-6	Agreement
	Sb-122	(2.4±0.3)E-6	(1.5±0.4)E-6	Agreement
	I-131	(9.4±0.4)E-6	(7.8±0.6)E-6	Agreement
	Cs-134	(8.3±0.4)E-6	(9.4±0.7)E-6	Agreement
	Cs-137	(1.78±0.05)E-5	(1.83±0.09)E-5	Agreement
WGDT 04/24/84 1537 hrs	Xe-133m	(1.0±0.1)E-3	(7.8±0.4)E-4	Agreement
	Xe-133	(6.20±0.01)E-1	(5.79±0.01)E-1	Agreement
Unit I RCS 04/24/84 1333 hrs	I-131	(5.30±0.05)E-2	(7.65±0.07)E-2	Disagreement
	I-132	(6.83±0.07)E-2	(7.06±0.08)E-2	Agreement
	I-133	(9.38±0.07)E-2	(1.12±0.01)E-1	Agreement
	I-134	(9.3±0.2)E-2	(7.52±0.16)E-2	Agreement
	I-135	(1.01±0.02)E-1	(8.12±0.18)E-2	Agreement
Unit I M/V Gas 04/24/84 1600 hrs	Xe-133	(3.84±0.09)E-6	(5.00±0.10)E-6	Agreement
Unit I M/V Charcoal 04/19/84 1900 hrs	I-131	(8.90±0.09)E-5	(9.35±0.14)E-5	Agreement
	I-133	(9.8±0.9)E-5	(1.1±0.2)E-4	Agreement
Unit I M/V Charcoal 04/23/84 1900 hrs	I-131	(6.06±0.17)E-5	(6.1±0.3)E-5	Agreement
	I-133	(1.3±0.2)E-5	(1.31±0.05)E-5	Agreement
Unit 2 M/V Gas 04/25/84 1542 hrs	Xe-133	(7.36±0.10)E-6	(7.18±0.11)E-6	Agreement
	Xe-133m	(1.6±0.6)E-7	(8.5±2.3)E-8	Agreement

TABLE 1 (cont.)

Calvert Cliffs Nuclear Power Plant Verification Test Results

<u>SAMPLE</u>	<u>ISOTOPE</u>	<u>NRC VALUE</u> <u>Results in Microcuries per Milliliter</u>	<u>LICENSEE VALUE</u> <u>Results in Microcuries per Milliliter</u>	<u>COMPARISON</u>
Unit 2 M/V Charcoal 04/22/84 0708 hrs	I-131	(1.96±0.06)E-5	(2.18±0.10)E-5	Agreement
Unit 2 M/V Charcoal 04/23/84 1908 hrs	I-131 I-133	(7.48±0.19)E-5 (1.0±0.1)E-5	(8.3±0.3)E-5 (1.1±0.3)E-5	Agreement Agreement

* Analysis was not performed

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 judgement limits are variable in relation to the comparison of the NRC Reference Laboratory's value to its associated 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 must be considered acceptable as the resolution decreases.

$$\text{RATIO} = \frac{\text{LICENSEE VALUE}}{\text{NRC REFERENCE VALUE}}$$

Resolution

< 4
4 - 7
8 - 15
16 - 50
51 - 200
> 200

Agreement

0.4 - 2.5
0.5 - 2.0
0.6 - 1.66
0.75 - 1.33
0.80 - 1.25
0.85 - 1.18