

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

Region I

Report No. 317/81-14

Docket No. 50-317

License No. DPR-53 Priority - Category C

Licensee: Baltimore Gas and Electric Company

P.O. Box 1475

Baltimore, Maryland 21203

Facility Name: Calvert Cliff Unit 1

Inspection at: Lusby, Maryland

Inspection conducted: May 18-20, 1981

Inspectors: *John W. Chung*
John W. Chung, Reactor Inspector

8-17-81
date signed

date signed

date signed

Approved by: *D. L. Capton*
D. L. Capton, Chief, Test Program Section
Engineering Inspection Branch

8/18/81
date signed

Inspection Summary:

Inspection on May 18-20, 1981 (Report No. 50-317/81-14)

Areas Inspected: Routine, unannounced inspection of follow-up on previous inspector-identified items; Cycle 5 Refueling Startup Testing of Precritical Functional and Calibration Tests; Post-Critical Tests; Cycle 5 Startup Test Report Review. The inspection involved 16 inspector-hours onsite and 4 inspector-hours offsite by one region-based inspector.

Results: No items of noncompliance were identified.

DETAILS

1. Persons Contacted

Principal Licensee Employees

- J. T. Carrol, General Supervisor - Operations
- **W. S. Gibson, General Supervisor - Electrical and Control
- J. Lippe, Supervisor - Nuclear Fuel Management
- J. Mihalcik, Senior Engineer - Fuel Management
- N. Millis, General Supervisor - Radiation Safety
- L. B. Russell, **Plant Superintendent**
- *S. Somma, Engineer - Fuel Management
- J. Steelman, Engineer - Fuel Management

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- *R. Architzel, Senior Resident Inspector

The inspector also interviewed other licensee employees during the inspection, including Reactor Operators, Technical Support, and Performance Engineers.

**Acting Plant Superintendent at the Exit Interview

*Denotes those present at the Exit Interview

2. Licensee Actions on Previous Inspection Findings

(Closed) Deficiency (50-317/80-13-01; 50-318/80-12-01): Failures to maintain alarm procedures consistent with the indicated alarm status and to recognize the alarm setpoint change and procedure revision by the operators.

The inspector verified that the Secondary CEA deviation alarm window has been changed to indicate +4", and the Shift Supervisor's uncontrolled copy of the Alarm Manual has been removed. The inspector further

verified by interviews with the operators that the operators were reinstructed regarding the importance of removing outdated procedures and recognizing changes associated with the alarm setpoints and procedures. Based upon these findings, the item is closed.

(Closed) Deficiency (50-317/80-13-02; 50-318/80-12-02): Failures to update EOC-11 and IC-06 with current, correct alarm response procedure references and setpoints. The inspector verified by review of the alarm and the emergency procedures that the current and correct references and setpoints had been entered into the Alarm Manual. The procedures reviewed were:

- IC-06, Revision 15, March 18, 1981
- EOP-11, Revision 10, January 7, 1981

Based upon these findings, this item is closed.

(Open) Unresolved Item (50-317/80-13-03; 50-318/80-12-03): Maintenance procedure RCP-15 requires to adjust the torque with a tolerance of +5 ft-lbs. However, the torque wrench was calibrated to an accuracy of $\bar{+}$ 11 ft-lbs. A licensee representative stated that the tolerance specified in the procedure was unrealistic and would be revised. This item will be reviewed pending the procedure revision.

(Closed) Inspector Follow Item (50-317/78-22-02; 50-318/78-16-02): Calibration procedure REP-2-413 of the Eberline PIC-6A Survey Meter would be revised to include precautionary steps during the instrument adjustments.

The inspector verified by review of REP-2-413, Revision 3, August 11, 1980 that a revision to the procedure was issued and precautionary instructions were included in the revision to minimize extremity exposure. This item is closed.

3. Cycle 5 Startup Testing - Precritical Tests

- a. The inspector reviewed selected calibration and functional test programs to verify the following:
 - Procedures were provided with detailed stepwise instructions;
 - Instruments and calibration equipment used were traceable to the National Bureau of Standards;
 - "As Found" and "As Left" conditions were recorded;

- Acceptance and operability criteria were observed in accordance with the Technical Specifications;
- Technical content of procedures was sufficient to result in satisfactory component calibration and test;
- Work Order was issued and corrective actions were taken if the test was not acceptable.

b. The following tests were reviewed:

(1) CEA/CEDM Performance

CEA/CEDM performance tests were completed on December 21, 1980 and the procedures used were technically adequate.

CEDM Drop Times to 90% full insertion positions were less than 3 seconds, where Technical Specifications require equal or less than 3.1 seconds. Indicators and alarms associated with CEA withdrawal and position indication/deviation were also tested. Test reviewed was,

- Post Startup Test Procedure 2 (PSTP-2), Appendix B, Unit 1 Cycle 5 Initial Approach to Criticality and Low Power Physics Testing, Revision 1, December 11, 1980.

(2) Reactor Coolant System Flow

RCS flow test was conducted in accordance with PSTP-2, Appendix C, and was completed on December 16, 1980. The test results were satisfactory.

(3) Reactor Coolant RTD Calibration

Reactor Coolant RTD's were cross-calibrated against thermocouples on January 9, 1981, although calibration procedures were not established in writing.

The inspector determined that the calibration and correlation were satisfactory and the absence of written procedure obviously did not affect the safe conduct of the test.

c. Findings

- (1) The inspector reviewed the CEA operational check record, B-1, Appendix B of PSTP-2, December 19, 1980, and identified that the Metrascope Readings on CEA position indication were occasionally recorded in odd numbers. During a subsequent

discussion with a licensee representative the inspector raised a question, as to why the rod position indication on the Metrascope would not be displayed every 2 inches, i.e., even numbers, since the Reed Switches were positioned 2 inches apart.

The licensee representative acknowledged the inspector's finding and stated that this discrepancy would be investigated. This is an unresolved item pending clarification of the Metrascope readings and a subsequent review by an NRC:RI inspector (317/81-14-01).

- (2) The inspector identified that the following test procedures were either inadequate or not available in the Cycle 5 Sequencing documents:
- RCS Flow Test Procedure, Appendix C of PSTP-2. This procedure did not include stepwise details of calculations; and, methods to compare the RCS loop flows were not specified.
 - RTD calibration against thermocouple readings were satisfactory but the procedures to perform the correlation were not available.

A licensee representative agreed that the test procedures were inadequate or even not available, and data reduction and calculations had been generally performed by the engineers using their personal notes. The licensee representative further stated that the need for detailed procedures had been recognized and the detail procedures would be completed before the next refueling startup test. This is an unresolved item to be reviewed by an NRC:RI inspector (317/81-14-02).

4. Cycle 5 Startup Testing - Post-Critical Tests

- a. Initial criticality was achieved on December 21, 1980 at 1935 hours with boron concentration of 1267 ppm and CEA Group 5 withdrawn at 91.5 inches. The inspector reviewed selected test programs to verify that:
- The test programs were implemented in accordance with Cycle 5 Refueling Sequencing Procedures;
 - Step-wise instructions of test procedures were adequately provided, including Precautions, Limitations and Acceptance Criteria in conformance with the requirements of the Technical Specifications;

- Provisions of recovering from anomalous conditions were provided;
- Methods and calculations were clearly specified and the tests were performed accordingly;
- Review, approval, and documentation of the results were in accordance with the requirements of the Technical Specifications and the licensee's administrative controls.

b. The following programs were reviewed:

(1) Core Thermal Power Escalation

The core thermal power was calculated employing calorimetric method and Operating Instruction OI-30, Nuclear Instrumentation, Revision 4, June 21, 1978 was used. The inspector determined that the procedure was technically adequate; correct units and physical properties were used; and steam generator blowdown was adequately accounted for.

The inspector reviewed the plant calorimetric data of January 20, 1981. Work sheets were independently cross-checked by the inspector using manual calculations and found to be in agreement with the computer calculated thermal power with differences of less than 2.3%.

(2) Isothermal Temperature Coefficients

Isothermal Temperature Coefficients were determined using the procedure PSTP-2, Appendix D and the Reactivity Computer Tracings from primary (Westinghouse) and secondary (GA) Computers. The inspector verified by review of the tracings dated December 22, 1980 that both tracings were in good agreement as shown in the following table:

Reactivity Coefficient at 134" (ARO)

<u>Computer</u>	<u>Reactivity Coefficient, $\% \Delta \rho / ^\circ F$</u>
Primary (W)	0.2524
Secondary (GA)	0.2510

The ITC's were measured with All-Rods-Out (ARO) at 134", and were compared with the predicted values at 102" of the CEA Group 5 withdrawn position. A correction factor of differential group worths from 134" to 102" was applied to the measured ITC's at ARO. The following is the summary of the ITC's at zero power:

ITC, $10^{-4} \Delta P / ^\circ F$

Measured @ ARO (134")	0.2524
Differential Group Worth from 134" to 102"	0.013
Measured (Corrected) @ 102"	0.241
Predicted * @ 102"	0.257 \pm 0.3

* CC Unit 1, C5 SU Test Predictions and Core Data, BG&E-9676-513, December 15, 1980.

The inspector also verified by review of PSTP-2, Appendix A, Attachments, Review and Evaluation Records that ITC data had been properly reviewed and documented in conformance with Technical Specifications.

The inspector had no further questions.

(3) Shutdown Margin

The measured value for CEA Group 5, 4, 3, 2, and 1 was 1008.3 ppm, and was well within the predicted value of 1028 \pm 100 ppm, as specified in the Test Sequencing Procedure. The following procedures and data were reviewed:

- NEOG-7, Technical Data Book, Revision 8, December 31, 1980
- PSTP-2, Section 3.1.8, Attachment 8, Critical Boron Concentration Measurements
- PSTP-2, Section 3.1.4, Appendix E, CEA Worth Measurements.

c. Findings

The inspector noted that the calorimetric calculation of core thermal power was not specified in the Startup Sequencing document. The test had been performed by an operations engineer using the Operational Instruction OI-30. The inspector determined that the test results had not been reviewed as a part of the Startup Test package but rather in accordance with the OI review procedure.

The inspector also identified that OI-30 had not been reviewed as required by the Station Operating Instruction CCI-101G, "Review and Approval procedure for proposed Calvert Cliff procedure."

The procedure was last reviewed on May 31, 1978 and overdue for review. The inspector determined that calculations performed January 20, 1981 per procedure OI-30, were correct.

The inspector also verified that the critical boron concentration calculation was performed based on personal notes and information, rather than following the procedure.

The licensee representative acknowledged the inadequacy of the procedures and stated that OI-30 and stepwise details for the calculation would be incorporated into Cycle 6 Startup Test procedures. This is an unresolved item pending review of the revised procedures during a subsequent NRC:RI inspection (317/81-14-03).

5. Power Distribution and Limits

- a. The inspector reviewed selected test data to verify that:
- The test programs were implemented in accordance with Cycle 5 Refueling Sequencing Procedures;
 - Step-wise instructions of test procedures were adequately provided including Precautions, Limitations and Acceptance Criteria in conformance with the requirements of the Technical Specifications;
 - Provisions of recovering from anomalous conditions were provided;
 - Methods and calculations were clearly specified and the tests were performed accordingly;
 - Review, approval, and documentation of the results were in accordance with the requirements of the Technical Specifications and the licensee's administrative controls.
- b. The following procedures were reviewed:
- PSTP-3 Unit 1, Cycle 5 Escalation to Power Test Procedure, Revision 1, December 16, 1980.
 - PSTP-3, Appendix D, INCA Library Qualification and Power Distribution, Revision 1, December 16, 1980.
 - NEP-5, INCA Library Qualification (Unit 1 and 2), Original, January 11, 1979.

The inspector further verified by review of test data and computer output/input listings that the inputs to computer calculations did include and accounted for:

- CEA positions,
- Flux information from detectors,
- and previous burnup data.

The inspector reviewed the test data performed January 11-14, 1981.

(1) Axial Shape Index

Power tilts were measured at 50% and 96.4% power levels, and were within the Technical Specifications limits, as summarized in the following table:

<u>Power</u>	<u>ASI</u>
1359.3 MW (50%)	-0.00362
2603.3 MW (96.4%)	0.01835

The inspector had no further questions.

(2) Power Distribution

The INCA analysis data for core power distribution showed that:

- Peaking factors were within the thermal limits and acceptance criteria, and
- Peak LHR's were within the acceptance limits of 15.5 KW/ft specified in Technical Specifications.

The results are summarized in the following table

	<u>Measured</u>	<u>50% Power</u> <u>Acceptance</u>	<u>Measured</u>	<u>100% Power</u> <u>Acceptance</u>
<u>Peaking Factor</u>				
F _{xy} ^T	1.5679	≤1.70	1.5436	≤1.62
F _y ^T	1.5063	≤1.695	1.4989	≤1.62
<u>Azimuthal Power Tilt</u>				
T _q	0.0199	≤0.030	0.0165	≤0.030
<u>Linear Heat Generation Rate</u>				
Highest Peak, KW/ft (6.2 ft from bottom)	5.89 @ W04	-	10.86 @ W11	-
Highest Peak with penalty uncertainty	6.92	≤ 15.5	12.81	≤ 15.5

The inspector had no further questions.

6. CC Unit 1, Cycle 5 Startup Test Report

The inspector reviewed Cycle 5 Startup Testing Summary Report of BG&E Calvert Cliffs Unit 1, which was transmitted to NRC from A. E. Lundvall, Jr. dated April 8, 1981.

The inspector determined that the test results and conclusions were consistent with the predicted values, as observed by the inspector, and were within the limits specified in Technical Specifications.

The inspector found that the CEA withdrawn position was listed as 105" in Table 2 of the Summary Report, instead of 102" in the test data/work sheets. A licensee representative stated that 102" was correct and that this discrepancy was due to a typographical error. The licensee representative further stated that NRR would be notified promptly regarding this error. This item is an Inspector Follow Item. (317/81-14-04)

7. Unresolved Items

Unresolved items are those items for which further information is required to determine whether they are acceptable or items of noncompliance. Three unresolved items are identified and detailed in Paragraphs 3.c and 4.c.

8. Exit Interview

Licensee management was informed of the purpose and scope of the inspection at the entrance interview, and the findings of the inspection were periodically discussed and were summarized at the conclusion of the inspection on May 19, 1981. Attendees at the exit interview are denoted in paragraph 1.