

June 5, 2000

Mr. Charles H. Cruse
Vice President - Nuclear Energy
Baltimore Gas and Electric Company (BGE)
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702

SUBJECT: NRC's CALVERT CLIFFS INTEGRATED INSPECTION REPORT
05000317/2000-004, 05000318/2000-004

Dear Mr. Cruse:

On May 13, 2000, the NRC completed an inspection of your Calvert Cliffs facility. The enclosed report presents the results of that inspection. Preliminary results were discussed with Mr. Katz and other members of your staff on May 30, 2000.

NRC inspectors examined numerous activities as they related to reactor safety and compliance with the Commission's rules and regulations, and with the conditions of your operating license. The inspection consisted of selective reviews of procedures and records, observations of activities, and interviews with personnel. Specifically, the inspection involved six weeks of resident inspection, region-based inspections in the areas of safeguards/security and inservice inspection, and an in-office review of changes to your Security Plan.

The NRC inspected two issues that were evaluated under the risk significance determination process and were determined to be of very low safety significance (Green). These issues have been entered into your corrective action program and are discussed in the summary of findings and in the body of the attached inspection report.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be placed in the NRC Public Document Room and will be available on the NRC Public Electronic Reading Room (PERR) link at the NRC home page, <http://www.nrc.gov/NRC/ADAMS/index.html>.

Sincerely,

/RA/

Michele G. Evans, Chief
Projects Branch 1
Division of Reactor Projects

Charles H. Cruse

2

Docket Nos: 05000317 and 05000317

Renewed License Nos: DPR-53 and DPR-69

Enclosure: NRC's Calvert Cliffs Integrated Inspection Report 05000317/2000-004,
05000318/2000-004

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**U.S. NUCLEAR REGULATORY COMMISSION
Region 1**

License Nos: DPR-53; DPR-69 (Renewed)

Docket Nos: 05000317; 05000318

Report Nos: 05000317/2000-004; 05000318/2000-004

Licensee
Baltimore Gas and Electric Company
Post Office Box 1475
Baltimore, Maryland 21203

Facility: Calvert Cliffs Nuclear Power Plant
Units 1 and 2

Location: Lusby, MD

Dates: April 2 - May 13, 2000

Inspectors: Scott Stewart, Senior Resident Inspector
Fred Bower, Resident Inspector
Tim Hoeg, Resident Inspector
Michael Modes, Senior Reactor Inspector
Paul Frechette, Physical Security Inspector
Gregory Smith, Senior Physical Security Inspector
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TABLE OF CONTENTS

TABLE OF CONTENTS	ii
Summary of Findings	iii
Summary of Plant Status	1
REACTOR SAFETY	1
1R04 Equipment Alignment	1
1R05 Fire Protection Tours	2
1R08 Inservice Inspection	3
1R11 Licensed Operator Training Activity	3
1R12 Maintenance Rule Implementation	4
1R13 Maintenance Work Prioritization and Control	4
1R15 Operability Evaluations	4
1R19 Post-Maintenance Testing	5
1R20 Refueling and Outage Activities	6
1R22 Surveillance Testing	7
SAFEGUARDS	7
3PP1 Access Authorization Program	7
3PP2 Access Control	8
3PP4 Security Plan Changes	8
OTHER ACTIVITIES [OA]	8
4OA2 Performance Indicator Verification	8
4OA6 Management Meetings	9
PARTIAL LIST OF PERSONS CONTACTED	10
ITEMS OPENED, CLOSED AND DISCUSSED	10
LIST OF ACRONYMS USED	10
ATTACHMENT 1	11

Summary of Findings

Calvert Cliffs Nuclear Power Plant, Units 1 and 2 NRC Integrated Inspection Report 05000317/2000-004 and 05000318/2000-004

The report covers a six week period of resident inspection and announced inspections of safeguards, security program changes and inservice inspection by regional specialists. These inspections were conducted per the NRC's Revised Reactor Oversight Process (Attachment 1). The significance of issues is indicated by their color (green, white, yellow, red) and was determined by the Significance Determination Process in Inspection Manual Chapter 0609.

Cornerstone: Mitigating Systems

- **Green.** The inspectors identified degradation of the Protectowire fire detection system installed to detect overheated electrical cabling in the Unit 1 containment cable trays. The deficiencies included: the detection wire not being in the optimum serpentine design configuration; and, the protective covering for the Protectowire detection wires being damaged. The deficiencies were noted in both trains of electrical cable trays in the vicinity of the containment penetrations. The Protectowire fire detection system was degraded, but operable (Section 1R05).
- **Green.** During post-maintenance testing, the 1A emergency diesel generator (EDG) tripped on low oil sump level signal from the 1A2 engine (Section 1R19). An actual high level existed in the sump. Whipping of the oil by the crankshaft resulted in oil frothing in the sump and the sump level transmitter sensing lines. The oil frothing problem caused the sump level trip sensor to read lower than the actual level resulting in an EDG trip. The high oil sump level was caused by two problems: (1) incorrect guidance from the vendor (SACM) regarding the shutdown oil sump level band; and, (2) the 1A2 engine dipstick guidetube was aligned differently than the other engine's dipstick guidetube, resulting in actual sump level being higher than indicated. Since the low oil sump level is bypassed during a fast engine start, the 1A EDG would have started and ran given a safety injection actuation signal or an emergency bus undervoltage signal. However, if the engine was manually started to respond to a plant event, the low oil sump level trip would not have been bypassed and the EDG would have been expected to trip in the same manner experienced during the post-maintenance testing.

Cross-cutting Issues: Problem Identification and Resolution

No Color. The degraded condition of the Protectowire fire protection feature (Section 1R05) was identified by the inspectors and was apparently caused when the fire detection system was not restored after being removed for work in the cable trays. BGE personnel could not specifically identify how long the condition had existed. Although testing is periodically conducted to verify the alarm function of the Protectowire fire detection system, no procedure or instruction exists to periodically verify that the detection wire remains installed in its design configuration.

Report Details

Summary of Plant Status

Unit 1 was shutdown for a scheduled refueling outage at the beginning of the inspection period and was returned to full power on April 30, 2000. Except for a minor power reduction due to the No. 26 circulating water pump being out of service between April 4 and 5, Unit 2 operated at full power through the entire inspection period.

1. REACTOR SAFETY **Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity**

1R04 Equipment Alignment

a. Inspection Scope

The inspectors conducted equipment alignment partial walkdowns primarily to evaluate the operability of selected trains or backup systems, with the redundant train or system inoperable or out of service. Walkdowns were also conducted on equipment recently realigned due to refueling outage activities and surveillance testing. The walkdowns included reviews of system operating instructions and piping and instrumentation diagrams (P&IDs) to determine correct system lineups and verification of critical components to identify any discrepancies which could affect operability of the redundant train or backup system. The inspectors reviewed the following BGE documentation:

- OI-21A, "Operation of the 1B EDG"
- OI-21B, "Operation of the 2A EDG"
- OI-3A, "Operation of Emergency Core Cooling Systems (ECCS)"
- OI-32A, "Operation of the Auxiliary Feedwater (AFW) System"
- P&ID 60583, AFW System Drawing
- P&ID 62731, CS System Drawing
- P&ID 60731, SI System Drawing
- P&ID 62731, SI System Drawing

The inspectors performed partial system walkdowns on the following systems:

- 1B Emergency Diesel Generator (EDG) during planned maintenance on 1A EDG
- 2A EDG during planned maintenance on 2B EDG
- Unit 1 Containment Spray System following a refueling outage
- Unit 1 Auxiliary Feed Water System following a refueling outage
- Units 1 and 2 High Pressure Safety Injection System in Mode 1

b. Issues and Findings

No findings were identified.

1R05 Fire Protection Tours

a. Inspection Scope

The inspectors conducted tours of areas important to reactor safety to evaluate, as appropriate, conditions related to: (1) licensee control of transient combustibles and ignition sources; (2) the material condition, operational status, and operational lineup of fire protection systems, equipment and features; and, (3) the fire barriers used to prevent fire damage or fire propagation. The inspectors used BGE administrative procedure SA-1-100, Fire Prevention, during the conduct of this inspection.

The areas inspected included:

- 45 Foot Elevation Switchgear Room - Unit 2
- 27 Foot Elevation Switchgear Room - Unit 2
- Cable Spreading Room - Unit 2
- Auxiliary Feed Pump Room - Unit 2
- Containment Purge Fan Room - Unit 2
- Containment - Unit 1

b. Issues and Findings

During the walkdown of the Unit 1 containment, the inspector identified deficiencies with the fire detection system (Protectowire) installed to detect overheated electrical cabling. The deficiencies included examples of the detection wire being out of its support hangers and not in close proximity to the electrical cable trays or not in the optimum serpentine design configuration, as specified in BGE Drawing No. 61343 and BGE Vendor Technical Manual No. 12922-003. The inspectors also found instances where it appeared that the protective covering of the Protectowire detection wire were damaged. The deficiencies were noted in both trains of electrical cable trays in the vicinity of the containment penetrations. The inspectors discussed these findings with BGE personnel.

The responsible fire protection engineer concluded that since the fire detection system was not in alarm, no short circuit existed, the heat sensitive coating on the twisted pair of conductor detection wire was not damaged, and that the Protectowire system was degraded, but operable. The inspectors found this fire detection system operability determination acceptable. This issue was evaluated using the significance determination process (SDP) and was determined to be Green (very low risk significance) because the fire protection feature remained operable. The deficiencies identified by the inspectors and additional deficiencies identified by BGE were documented in Issue Report (IR) No. 3-014-320. These deficiencies were corrected prior to containment closeout and unit restart.

This issue also had implications regarding BGE's identification, evaluation, and resolution of problems. The degradation of the Protectowire fire protection feature was identified by the inspectors and was apparently caused when the fire detection system was not restored after being removed for work in the cable trays. BGE personnel could not specifically identify how long the condition had existed. Discussion with BGE personnel identified that, although testing is periodically conducted to verify the alarm function of the Protectowire fire detection system, no procedure or instruction exists to periodically verify that the detection wire remains installed in its design configuration. BGE planned corrective actions include development of a periodic inspection during each outage and training of personnel.

1R08 Inservice Inspection

a. Inspection Scope

The inspector reviewed ASME Boiler and Pressure Vessel Code repair and replacement plans for the spent fuel heat exchanger inlet isolation valve, safety injection check valve, equipment hatch tongue edge, and blowdown system piping to the blowdown tank. The inspector reviewed radiographics of welds on the Nos. 21 and 22 low pressure safety injection system. The inspector reviewed a sample of eddy current data from the No. 22 steam generator and observed the base-line eddy current inspection of Alloy 800 sleeve repairs. The inspector reviewed various loose parts operability determinations for the No. 22 steam generator. The inspector reviewed a sample of ultrasonic inspection results of welded components on the shutdown cooling heat exchanger.

b. Issues and Findings

There were no findings identified.

1R11 Licensed Operator Training Activity

a. Inspection Scope

The inspectors observed licensed operator simulator training for the planned reactor plant start-up following the Unit 1 refueling outage. The observed training involved crews of reactor operators and senior reactor operators simulating reactivity control during low power operations. Following the simulator exercise, the inspector observed the training instructor's debrief and critique.

b. Issues and Findings

No findings were identified.

1R12 Maintenance Rule Implementation

a. Inspection Scope

The inspectors reviewed performance based problems involving selected in-scope structures, systems, or components (SSCs) to assess the effectiveness of the maintenance program. Reviews focused on: (1) proper maintenance rule scoping, in accordance with 10 CFR 50.65; (2) characterization of failed SSCs; (3) safety significance classifications; (4) 10 CFR 50.65 (a)(1) and (a)(2) classifications; and, (5) the appropriateness of performance criteria for SSCs classified as (a)(2), or goals and corrective actions for SSCs classified as (a)(1). The inspector reviewed BGE's system scoping documents and system report cards. The following SSCs were reviewed:

- Unit 2 Low Pressure Safety Injection System
- Unit 2 Primary Containment System
- Unit 1 Reactor Coolant System

b. Issues and Findings

No findings were identified.

1R13 Maintenance Work Prioritization and Control

a. Inspection Scope

For the selected maintenance orders listed below, the inspectors evaluated: (1) the effectiveness of the risk assessments performed before the maintenance activities were conducted; (2) risk management control activities; (3) the necessary steps taken to plan and control resultant emergent work tasks; and (4) the overall adequacy of identification and resolution of emergent work and the associated maintenance risk assessments.

- MO1200002390 Removal of the No. 11 service water (SW) system header from operation and repair of the No. 11 SW header automatic flush valve.
- MO1200002395 Troubleshooting and repair of the 1A EDG, due to a trip on low oil sump level.

b. Issues and Findings

No findings were identified.

1R15 Operability Evaluations

a. Inspection Scope

The inspectors reviewed selected operability evaluations affecting risk significant mitigating systems, to assess: (1) the technical adequacy of the evaluations; (2) whether continued system operability evaluation was warranted; (3) whether other existing degraded systems adversely impacted the affected system or compensatory

measures; (4) where compensatory measures were used, whether the measures were appropriate and properly controlled; and, (5) degraded system impact on Technical Specification (TS) limiting condition for operations and the risk significance in accordance with the significance determination process (SDP). The inspectors also verified that the issues were in the BGE corrective action program and, where appropriate, the inspectors verified that the associated performance indicators were in the green band.

- Operability Determination No. 2000-002: Fuel pins in low power core peripheral assemblies are exhibiting increased cladding wear (including through wall wear) after only one cycle of operation.
- Operability Determination No. 1997-001: In response to NRC Generic Letter 96-06, the licensee evaluated the operability of the containment air coolers for system voiding during a large break loss of coolant accidents.

b. Issues and Findings

No findings were identified.

1R19 Post-Maintenance Testing

a. Inspection Scope

The inspectors reviewed post-maintenance test (PMT) procedures and associated testing activities for selected risk significant mitigating systems to assess whether: (1) the effect of testing on the plant had been adequately addressed by control room and engineering personnel; (2) testing was adequate for the maintenance performed; (3) acceptance criteria were clear and adequately demonstrated operational readiness, consistent with design and licensing basis documents; (4) test instrumentation had current calibrations, range, and accuracy for the application; (5) tests were performed, as written, with applicable prerequisites satisfied; (6) jumpers installed or leads lifted were properly controlled; (7) test equipment was removed following testing; and, (8) equipment was returned to the status required to perform its safety function.

- Post-maintenance performance testing of control element assembly (CEA) 65 in accordance with Engineering Test Procedure (ETP) 99-15R, CEDM Performance Testing.
- Post-maintenance testing of the 1A emergency diesel generator (EDG) in accordance with surveillance test procedure (STP)-0-08A-1.

b. Issues and Findings

During observation of the post-maintenance testing of the 1A emergency diesel generator (EDG) in accordance with surveillance test procedure (STP)-0-08A-1, the EDG tripped on a 1A2 engine low oil sump level signal. Issue Report (IR3-041-882) was initiated to enter this item into the corrective action program. The inspectors monitored BGE's troubleshooting activities that determined that an actual high level existed in the

sump. Whipping of the oil by the crankshaft resulted in oil frothing in the sump and the sump level transmitter sensing lines. The oil frothing problem caused the sump level sensor to read lower than actual level resulting in an EDG trip. Engineering determined that the high oil sump level was caused by two problems: (1) incorrect guidance from the vendor (SACM) regarding the shutdown oil sump level band; and, (2) the 1A2 engine dipstick guidetube was aligned differently than the other engine's dipstick guidetube, resulting in actual sump level being higher than indicated. The crankcase sump oil level was returned to an appropriate level, as determined by BGE and SACM engineering. The inspectors verified that the 0C EDG oil sump level was also returned to the recommended level. At the end of the inspection period, BGE had not determined how long the oil level had been above the correct level.

The low oil sump level trip is bypassed during a fast engine start that would result from a safety injection actuation signal or an emergency bus undervoltage signal. BGE's discussions with the vendor determined that the engine would have safely operated with a high oil sump level as long as the frothing oil did not result in fluctuating engine oil pressure. No fluctuating engine oil pressure was observed prior to the engine trips. However, if the engine was manually started to respond to a plant event (slow speed start), the low oil sump level trip would not have been bypassed and the engine would be expected to trip in the same manner experienced during the post-maintenance testing.

The inspectors observed the retest of the 1A EDG in accordance with STP-0-08A-1. The EDG tested satisfactorily and was returned to service approximately 63 hours after the start of the 72 hour action statement. This issue was evaluated using the significance determination process (SDP) and was determined to be Green (very low risk significance) because the actual loss of the 1A EDG did not occur for longer than the Technical Specifications allowed outage time. The BGE extent of condition evaluation concluded that the 0C EDG (station blackout diesel) was also affected by this issue. Cause analysis and corrective actions for the 1A2 dipstick guidetube alignment were being tracked by IR3-041-882.

1R20 Refueling and Outage Activities

a. Inspection Scope

The inspectors reviewed outage activities associated with maintaining decay heat removal capabilities, reduced inventory conditions, removal of outage equipment from containment, preliminary containment closeout inspections, and plant heat-up.

b. Issues and Findings

No findings were identified.

1R22 Surveillance Testing

a. Inspection Scope

The inspectors witnessed performance of surveillance test procedures (STPs) and reviewed test data of selected risk-significant SSCs to assess whether the SSCs satisfied Technical Specifications, Updated Final Safety Analysis Report, Technical Requirements Manual, and licensee procedure requirements; and to determine if the testing appropriately demonstrated that the SSCs were operationally ready and capable of performing their intended safety functions. The following tests were witnessed:

- STP-O-8A-1 1B Emergency Diesel Generator Operability Test
- STP-O-8A-2 2B Emergency Diesel Generator Operability Test
- STP-O-73I-2 Unit 2 High Pressure Safety Injection pump and valve quarterly Operability Test
- STP-M-498-2 Unit 2 Cable Spreading Room Halon System Fire Detection Instruments Functional Test

b. Issues and Findings

No findings were identified.

3. **SAFEGUARDS [PP]** **Cornerstones: Physical Protection**

3PP1 Access Authorization Program

a. Inspection Scope

The following activities were conducted to determine the effectiveness of the licensee's behavior observation portion of the personnel screening and fitness-for-duty programs:

Five supervisors representing the Maintenance, Radiation Protection, and Instrumentation & Control Departments were interviewed regarding their understanding of behavior observation responsibilities and their ability to recognize aberrant behavior traits. Two Access Authorization/Fitness-for-Duty self-assessments, three Event Reports, an audit, and three loggable events were reviewed. Five individuals who perform escort duties were interviewed. Behavior observation training procedures and records were reviewed.

b. Issues and Findings

No findings were identified.

3PP2 Access Control

a. Inspection Scope

The following activities were conducted to verify that the licensee had effective site access controls and equipment in use to detect and prevent the introduction of contraband (firearms, explosives, incendiary devices) into the protected area: (1) a random sample of personnel, granted unescorted access to the protected and vital areas, was checked to assure that they were properly screened, identified, and authorized; (2) site access controls were observed, including personnel processing through the search equipment during peak ingress periods, package searches, and vehicle searches; and, (3) testing of all access control equipment, including metal detectors, explosive material detectors, and X-ray examination equipment, was observed. The inspector also reviewed the Access Control Event Log, an audit, and three maintenance work requests.

b. Issues and Findings

No findings were identified.

3PP4 Security Plan Changes

a. Inspection Scope

An in-office review was conducted of Revision 38 to the Calvert Cliffs Security Plan and Revision 4 to the Independent Spent Fuel Storage Facility Security Plan. These plans were submitted to the NRC in January 2000, in accordance with the provisions of 10 CFR 50.54(p). Based on the licensee's determination that the changes did not decrease the overall effectiveness of the security plans, BGE concluded that NRC approval of these revisions was not required prior to their implementation.

b. Issues and Findings

No findings were identified.

4. **OTHER ACTIVITIES [OA]**

4OA2 Performance Indicator Verification

Physical Security Cornerstone

a. Inspection Scope

The inspector reviewed the licensee's programs for gathering and submitting data for the Fitness-for-Duty, Personnel Screening, and Protected Area Security Equipment Performance Indicators. The review included the licensee's tracking and trending reports, and security event reports for the Performance Indicator data submitted from the 2nd quarter of 1997 through the 1st quarter of 2000.

b. Issues and Findings

No findings were identified.

4OA6 Management Meetings

Exit Meeting Summary

The inspectors presented the inspection results to Mr. Katz and other members of licensee management at the conclusion of the inspection on May 30, 2000. The licensee acknowledged the findings presented.

The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was received.

PARTIAL LIST OF PERSONS CONTACTED

C. Cruse, Vice President, Nuclear Energy Division
 P. Katz, Plant General Manager
 T. Pritchett, Manager, Nuclear Engineering
 D. Holm, Superintendent, Nuclear Operations
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 A. Edwards, Director, Nuclear Security
 J. Alvey, General Supervisor, Security Operations and Maintenance
 M. Burrell, Supervisor, Security Screening, Training and Support

ITEMS OPENED, CLOSED AND DISCUSSED

None

LIST OF ACRONYMS USED

ASME	American Society of Mechanical Engineers
BGE	Baltimore Gas & Electric
CEA	Control Element Assembly
CEDM	Control Element Drive Mechanism
CFR	Code of Federal Regulations
EDG	Emergency Diesel Generator
IR	Issue Report
PMT	Post-Maintenance Test
SACM	Societe Alsacienne De Constructions Mecaniques De Mulhouse
SDP	Significance Determination Process
SSCs	Systems or Components
STP	Surveillance Test Procedure
SW	Service Water
TS	Technical Specification

ATTACHMENT 1

NRC's REVISED REACTOR OVERSIGHT PROCESS

The federal Nuclear Regulatory Commission (NRC) revamped its inspection, assessment, and enforcement programs for commercial nuclear power plants. The new process takes into account improvements in the performance of the nuclear industry over the past 25 years and improved approaches of inspecting safety performance at NRC licensed plants.

The new process monitors licensee performance in three broad areas (called strategic performance areas): reactor safety (avoiding accidents and reducing the consequences of accidents if they occur), radiation safety (protecting plant employees and the public during routine operations), and safeguards (protecting the plant against sabotage or other security threats). The process focuses on licensee performance within each of seven cornerstones of safety in the three areas:

Reactor Safety	Radiation Safety	Safeguards
<ul style="list-style-type: none"> ● Initiating Events ● Mitigating Systems ● Barrier Integrity ● Emergency Preparedness 	<ul style="list-style-type: none"> ● Occupational ● Public 	<ul style="list-style-type: none"> ● Physical Protection

To monitor these seven cornerstones of safety, the NRC uses two processes that generate information about the safety significance of plant operations: inspections and performance indicators. Inspection findings will be evaluated according to their potential significance for safety, using the Significance Determination Process, and assigned colors of GREEN, WHITE, YELLOW or RED. GREEN findings indicate issues that, while they may not be desirable, represent very low safety significance. WHITE findings represent issues with low to moderate safety significance, which may require additional NRC inspections. YELLOW findings represent issues with substantial safety significance, which would require the NRC to take additional actions. RED findings represent issues with high safety significance and an unacceptable loss of safety margin, which would result in the NRC taking significant actions that could include ordering the plant shut down.

Performance indicator data will be compared to established criteria for measuring licensee performance in terms of potential safety. Based on prescribed thresholds, the indicators will be classified by color representing incremental degradation in safety: GREEN, WHITE, YELLOW, and RED. The color for an indicator corresponds to levels of performance that may result in increased NRC oversight (WHITE), performance that results in definitive, required action by the NRC (YELLOW), and performance that is unacceptable but still provides adequate protection to public health and safety (RED). GREEN indicators represent performance at a level requiring no additional NRC oversight beyond the baseline inspections.

The assessment process integrates performance indicators and inspection so the agency can reach objective conclusions regarding overall plant performance. The agency will use an Action Matrix to determine in a systematic, predictable manner which regulatory actions should be taken based on a licensee's performance. As a licensee's safety performance degrades, the NRC will take more and increasingly significant action, as described in the matrix. The NRC's actions in response to the significance (as represented by the color) of issues will be the same for performance indicators as for inspection findings.

More information can be found at: <http://www.nrc.gov/NRR/OVERSIGHT/index.html>.