

February 1, 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 REGION 1 INTEGRATED INSPECTION REPORT NOS.  
05000317/1999011 and 05000318/1999011**

Dear Mr. Cruse:

This report transmits the findings of the safety inspection conducted by NRC inspectors at the Calvert Cliffs Nuclear Power Plant from November 21, 1999, to January 8, 2000. At the conclusion of the inspection, these findings were discussed with Mr. Katz and others of your staff.

Overall, the NRC has concluded that your facility was operated in a safe manner. Your conduct of activities was generally characterized by safety-conscious operations, sound engineering and maintenance, and careful radiological controls. Specialist inspector review of selected aspects of your radiological controls program identified no significant problems.

Based on the results of this inspection, the NRC has determined that three Severity Level IV violations of NRC requirements occurred. These violations involved, a failure to follow procedures during troubleshooting, the lack of adequate surveys of sewage sludge prior to disposal, and the failure to report a change to the emergency plan within the required 30 days. These violations are being treated as Non-Cited Violations (NCVs), consistent with Section VII.B.1.a of the Enforcement Policy. These NCVs are described in the subject inspection report. If you contest these violations or their severity level, you should provide a response within

30 days of the date of this inspection report, with basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Regional Administrator, Region I, the Director, Office of Enforcement, and the NRC Resident Inspector at the Calvert Cliffs facility.

Charles H. Cruse

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We appreciate your cooperation.

Sincerely,

/RA by  
William A. Cook Acting For/

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

Docket/License Nos. 05000317/DPR-53  
05000318/DPR-69

Enclosure: NRC Region 1 Integrated Inspection Report Nos. 05000317/1999011  
and 05000318/1999011

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

License Nos.: DPR-53; DPR-69

Docket Nos.: 05000317; 05000318

Report Nos.: 05000317/1999011; 05000318/1999011

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: November 21, 1999 to January 8, 2000

Inspectors: Scott Stewart, Senior Resident Inspector  
Fred Bower, Resident Inspector  
Tim Hoeg, Resident Inspector  
Ron Nimitz, Senior Health Physicist

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

**Executive Summary**  
**Calvert Cliffs Nuclear Power Plant, Units 1 and 2**  
**Inspection Report Nos. 05000317/1999011 and 05000318/1999011**

This integrated inspection report summarizes aspects of BGE operations, maintenance, engineering and plant support. The report covers a seven-week period of resident inspection and the results of a specialist inspection in radiological controls.

**Operations/Maintenance**

Control room operators were slow to recognize and to enter Technical Specification action statement 3.3.10.A for an inoperable post-accident monitoring equipment indication channel. BGE did not control the scope of maintenance on RVLMS Channel "A" in accordance with station procedures. This violation of NRC requirements was non-cited. Ineffective inter-departmental communications and weak oversight by maintenance supervision and operations personnel contributed to these problems. (M1.3)

**Engineering**

Safety related temporary alterations were satisfactorily installed on Units 1 and 2 systems, in accordance with approved BGE procedures. BGE engineering properly reviewed and approved the temporary alterations prior to installation with adequate safety evaluation review screens performed. Several minor administrative deficiencies were identified by the inspectors indicating some inattention to detail by the responsible BGE staff. (E1.1)

**Plant Support**

BGE implemented effective radiological controls for high risk work activities reviewed. Appropriate personnel external and internal exposure controls were provided. There were no significant unplanned internal or external personnel exposures. Dosimetry anomalies were properly reviewed. (R1.1)

BGE was providing good planning and preparation for the upcoming Unit 1 refueling outage. Lessons learned were being appropriately evaluated for application and an outage Radiation Protection Plan was established. Outage work activities were classified relative to radiological risk and were being reviewed in accordance with approved radiological risk based work planning procedures. BGE initiated a comprehensive evaluation of its ALARA program to identify areas for further improvement. (R1.2)

BGE was implementing its Radiation Protection Improvement Plan and was making program changes to enhance performance in work planning and control. Of particular note was BGE's efforts to centralize risk assessment of work planning in one program document and establish a central routine and outage work planning organization. No changes that would adversely affect performance in radiation protection were noted. (R1.3)

BGE was implementing enhanced oversight of the station's performance in the area of radiological controls. BGE implemented initiatives to enhance the quality and consistency of self-assessments on a station-wide basis. (R7)

## Executive Summary (cont'd)

BGE identified trace tritium contamination in sewage effluent samples in August 1999, but was slow to take actions to prevent subsequent contaminated or potentially contaminated shipments from leaving the facility. BGE corrective actions appropriately addressed the organizational and program performance deficiencies which contributed to this event. An Issue Report was initiated to determine the source of the tritium, and remains open. A non-cited violation was issued for the licensee's failure to properly survey effluent shipments and take more effective and aggressive action to suspend subsequent shipments until sample results could be confirmed. (R8.1)

The licensee self-identified on December 8, 1999, the failure to have submitted Revision 28 (effective August 30, 1999) to the BGE Emergency Response Plan to the NRC within 30 days of the effective date. This issue was treated as a non-cited violation. (P1.1)

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## ATTACHMENTS

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                           Inspection Procedures Used  
                           List of Acronyms Used  
                           Items Opened, Closed

## Report Details

### Summary of Plant Status

Both Unit 1 and Unit 2 operated at or near full power throughout the inspection period, except for a few minor power reductions for valve testing and routine maintenance, and for the period of December 31, 1999, to January 1, 2000, Unit 2 reduced power for load following because of the lower demand for electrical power over the New Year Holiday weekend.

### I. Operations

#### **O1 Conduct of Operations**

##### O1.1 General Comments (71707)

Plant operations were conducted safely with a proper focus on nuclear safety.

The inspectors were onsite to observe the plant (in particular, systems and components with digital computer controls) and the operating staff respond to the time change from December 31, 1999, to January 1, 2000 (Year 2000 or Y2K rollover). In the months prior to the Y2K rollover, BGE had expended significant engineering and maintenance resources evaluating potential adversities associated with the date change and its implications for plant systems and continued safe operations. No significant vulnerabilities to plant power production or plant safety were identified. However, a number of data processing systems were identified as vulnerable, remediated, and tested prior to the Y2K rollover. BGE provided a contingent of engineers, technical support personnel, and plant operators to assist the operating crew during the transition. As the rollover occurred, plant operations remained unaffected and no Year 2000 discrepancies were identified. At the end of the inspection period, BGE was continuing to evaluate emergent plant problems for potential Y2K rollover causes, but none had been identified, to date.

The inspectors accompanied the turbine building and auxiliary building plant operators on tours during deep backshift hours on November 26, December 5, and December 29, 1999. The plant operators conducted their rounds and logkeeping in accordance with BGE procedures. Observed operator actions and valve manipulations were conducted in accordance with station procedures. Use of error prevention methods, such as, three-way communications, self-checking, and peer-checking were observed. The operators walked down plant systems and entered deficiencies in the plant corrective actions system. No problems with the conduct of the tours were identified by the inspectors.



## II. Maintenance

### **M1 Conduct of Maintenance**

#### M1.1 General Comments

##### a. Inspection Scope (62707)

The inspectors reviewed maintenance activities and focused on the status of work that involved systems and components important to safety. Component failures or system problems that affected systems included in the BGE maintenance rule program were assessed to determine if the maintenance was effective. Also, the inspectors directly observed all or portions of the following work activities:

MO1199903469	11 B Service Water Heat Exchanger Cleaning
MO1199902400	13 AFW Pump Suction and Discharge Gage Calibration Checks
MO0199800350	Cask Handling Crane Main Hoist Lower Block Drain Hole Drilling
IR3-036-281	U1 Channel A RVLMS Rover Maintenance and Troubleshooting
MO2199905574	U2 Shutdown Margin Power Supply Replacement
MO2199905178	U2 RPS Channel B (T Cold Indication) Troubleshooting

##### b. Observations, Findings, and Conclusions

During the maintenance activities, the inspectors observed that technicians were experienced and knowledgeable of their assigned duties. Maintenance personnel practiced peer-checking and self-verification while performing work. The pre-job briefings included the important aspects of each maintenance task and were effective in ensuring the work was conducted in accordance with BGE requirements. Work was planned and scheduled on the Plan-of-the-Day and risk assessments were appropriately completed. No high risk configurations were observed.

#### M1.2 Unit 1 Reactor Vessel Level Monitoring System (RVLMS) Problem

##### a. Inspection Scope (71707, 62707)

The inspectors reviewed the activities of operations, maintenance, and system engineering personnel in response to Channel "A" RVLMS alarms received on December 22, 1999.

##### b. Observations and Findings

On December 22, 1999, the Unit 1, "Reactor Vessel Water Level Low" alarm and the "Channel A Reactor Vessel Level Monitoring System (RVLMS)" alarm were received in the control room. Additionally, the 29-inch sensor light was lit on the RVLMS mimic panel and error codes were received at the local RVLMS panel. The RVLMS was designed to provide the plant operators with information needed to assess void formation in the reactor vessel head region and to trend liquid level in the reactor vessel plenum during a loss of coolant event. Because all other plant indications were normal

for full power operation, the sensor indication was determined to be spurious. In accordance with the operating instruction for the system, the operators reviewed the system error codes and concluded that the system remained operable. An Issue Report, IR3-036-281, was written and the maintenance staff promptly initiated an investigation into the spurious alarm.

During an inspector walkdown of the control room panels, the inspector noted that the 29-inch sensor light was no longer lit on the RVLMS mimic panel. The inspector communicated this observation to the control room operators and questioned the operability of the system with the mimic light extinguished. The operators responded that the system remained operable and that the error codes were under investigation by maintenance technicians.

The inspector went to the work site and found that the technicians had temporarily suspended their investigation. The inspector was informed that the initial scope of the minor (or rover) maintenance/investigation was to obtain voltage readings in order to identify any open thermocouple circuits. The scope of this maintenance was then expanded as the technicians identified and replaced a blown fuse after being informed by operators that some additional error codes had been received at the RVLMS panel. The inspector noted that this change in maintenance scope was not formally recognized or communicated to the appropriate work control staff or control room operators. The inspector determined that the control room operators did not promptly identify that the blown fuse rendered RVLMS Channel "A" inoperable. Only after discussions with the inspector did the operators enter Technical Specification (TS) action statement 3.3.10.A for an inoperable post-accident monitoring equipment indication channel. BGE concluded that ineffective communications between work units (operations, maintenance, and systems engineering) contributed to the two-hour delayed entry into the TS 3.3.10.A action statement.

Inspector follow-up identified that Section 5.13 of operations administrative procedure NO-1-200, Control of Shift Activities, states, in part, that when allowing maintenance on in-service safety-related components, the system to be worked on should be declared inoperable. The inspector noted that the operations staff did not follow procedure NO-1-200 and did not declare RVLMS Channel A inoperable prior to allowing maintenance. The inspector also reviewed maintenance administrative procedures MN-1-101, Control of Maintenance Activities, and MN-1-110, Troubleshooting and Procedure Controlled Activities. Procedure MN-1-101 defines troubleshooting as a short-term maintenance activity, not governed by a specific approved procedure, used to diagnose plant or equipment symptoms for the purpose of identifying/quantifying a degraded parameter/component or verifying the operability of a component. MN-1-101 also states that troubleshooting shall be performed in accordance with procedure MN-1-110. The inspector observed that expanding the maintenance beyond the initial scope (taking voltage measurements to identify open thermocouple circuits), diagnosing equipment symptoms, and identifying degraded components (the blown fuse) without a specific approved procedure and without declaring the system inoperable was troubleshooting per MN-1-101. Accordingly, the failure to perform maintenance and troubleshooting per the above stated station procedures was a Severity Level IV violation. However, due to the minor safety consequence of these procedural violations and the appropriate BGE response, the failure to properly control troubleshooting and maintenance on the Unit 1

reactor vessel level monitoring system is being treated as a Non-Cited Violation, consistent with Section VII.B.1.a of the NRC Enforcement Policy. These concerns are in the BGE corrective action system as Issue Report IR3-049-334.  
**(NCV 05000317/1999011-01)**

c. Conclusions

Control room operators were slow to recognize and to enter Technical Specification action statement 3.3.10.A for an inoperable post-accident monitoring equipment indication channel. BGE did not control the scope of maintenance on RVLMS Channel "A" in accordance with station procedures. This violation of NRC requirements was non-cited. Ineffective inter-departmental communications and weak oversight by maintenance supervision and operations personnel contributed to these problems.

M1.3 Routine Surveillance Observations

a. Inspection Scope (61726)

The inspectors observed all or portions of the following surveillance tests:

STP-O-9A-1 AFAS Equipment Response Time Testing [11/26]  
 STP-O-7B-2 "B" Train Engineered Safety Features Logic Monthly Test [12/5]  
 STP-M-213-1 Unit 1 Power Range NI Calibration [12/8]  
 OI-21C 0C Emergency Diesel Generator Operability Test

b. Observations, Findings, and Conclusions

The inspectors found that the selected surveillance activities were performed safely and in accordance with approved procedures. Test details were discussed at a pre-test briefing followed by a question and answer session. The briefings were attended by all test participants. The test participants were knowledgeable of their assigned responsibilities. Good supervisory and engineering personnel participation was observed during the surveillance tests. Minor test discrepancies were appropriately documented in the BGE corrective action program.

**M8 Miscellaneous Maintenance Issues**

M8.1 (Closed) Licensee Event Report (LER) 05000317/1999006: Inaccurate Electrical Current Determination Leads to Manual Reactor Trip

This LER documented the circumstances of a manual reactor shutdown (trip) on September 22, 1999, and provided a summary of corrective actions. The details of the shutdown were previously inspected and reported in NRC Inspection Report 05000317 & 05000318/1999007, Section O1.2. The inspector reviewed the results of the BGE Significant Issues Findings Team and discussed aspects of the report with BGE personnel. The need to manually trip the reactor was the result of performance errors when electrical technicians improperly alligned two station motor control centers to a single under-rated electrical power source in preparation for maintenance. The

inspector verified that the overcurrent trip of the affected circuit breaker was as designed and that actions were implemented to prevent recurrence, including improved training of electrical technicians in electrical theory and discussion of the event and lessons learned with electrical maintenance personnel. BGE was continuing to evaluate the need for permanently installed motor control center ammeters. This LER is closed.

### **III. Engineering**

#### **E1 Conduct of Engineering**

##### **E1.1 Review of Temporary Alterations.**

###### **a. Inspection Scope (37551)**

The inspectors reviewed and assessed the extent and effectiveness of reactor plant temporary alterations (TAs) at Calvert Cliffs per implementing procedure MD-1-100, "Temporary Alterations." The inspectors reviewed active temporary alterations for proper documentation and adequacy of post-installation testing.

###### **b. Observations and Findings**

On December 21, 1999, the inspectors reviewed the 21 active TAs installed on Unit 1 and 12 TAs installed on Unit 2. Ten of the 33 total TAs were safety-related. The oldest TA was installed on May 30, 1997, and the most recent was installed on August 20, 1999. The temporary alteration index maintained in the shift manager's office was up-to-date and properly reflected the current status of all active TAs. Engineering reviews and evaluations had been performed by cognizant BGE engineering personnel. The inspectors verified that the TAs received the required screening process to determine the need for a 10 CFR 50.59 safety evaluation. BGE concluded that safety evaluations were required to be performed on TA Nos. 1-99-48 and 2-99-43, which removed safety injection actuation signals (SIAS) and recirculation actuation signals from the Unit 1 and Unit 2 component cooling heat exchanger salt water isolation valves, respectively. The safety evaluations reviewed by the inspector were thorough and complete, with BGE concluding that no unreviewed safety questions existed.

Post-installation tests were documented as having been performed on all the TAs, with the exception of TA No. 9-99-044, which modified the Unit 2 turbine generator lube oil vapor extraction system. The inspector identified that the originally specified post-installation test consisted of a leak check of the vapor extraction piping. BGE determined that this specified test requirement was not practical after installation, due to the piping being vented (and therefore unable to leak check). The inspectors determined that BGE did not properly revise TA No. 9-99-044 documentation to reflect this change. BGE entered this deficiency into their corrective action system as IR3-34-437. The inspectors also noted that several TAs documented post-installation tests as not applicable, but these determinations were not verified, by signature of the responsible BGE installer, as required by procedure MD-1-100, Section 5.3. The inspectors discussed this observation with BGE management and concluded these oversights were administrative deficiencies with no risk consequence. BGE

documented the lack of post-installation test verification signatures in their corrective action program as IR3-034-438. The above stated documentation deficiencies were of minor safety consequence and were not subject to formal NRC enforcement action.

c. Conclusions

Safety related temporary alterations were satisfactorily installed on Units 1 and 2 systems, in accordance with approved BGE procedures. BGE engineering properly reviewed and approved the temporary alterations prior to installation with adequate safety evaluation review screens performed. Several minor administrative deficiencies were identified by the inspectors indicating some inattention to detail by the responsible BGE staff.

#### **IV. Plant Support**

### **R1 Radiological Protection and Chemistry (RP&C) Controls**

#### **R1.1 Applied Radiological Controls**

a. Inspection Scope (83750)

The inspector selectively reviewed the implementation and adequacy of applied radiological controls. Areas reviewed included external and internal exposure controls during 1999 and radioactive material and contamination controls. The inspector reviewed radiological controls for high risk diving activities conducted in October 1999, and observed BGE efforts to transfer a loaded high integrity container (HIC) to its Lake Davies onsite temporary storage area for later transfer to a permanent disposal facility. The inspector reviewed applicable documentation, interviewed cognizant personnel and attended the Management Oversight Board review of planning for the re-landing of a stuck high integrity container.

b. Observations and Findings

BGE implemented appropriate radiological controls for personnel involved with the spent fuel pool diving operations in October 1999. Very High Radiation Area controls were implemented and areas entered by divers were extensively surveyed and decontaminated, as appropriate. Redundant radiation surveys, using calibrated meters, were conducted and appropriate dosimetry was provided and used. Requirements specified in BGE high radiological risk control procedures were properly implemented, including controls for access to very high radiation areas. Divers were provided radiological controls training commensurate with their tasks, including training on use and limitations of underwater survey equipment. No significant radiation dose was received by divers or support personnel. Licensee identified areas for improvement were entered into the BGE corrective action program.

BGE implemented appropriate radiological controls for the transfer on December 7, 1999, of a loaded high integrity container (HIC) to its Lake Davies interim storage location. The activity was controlled with BGE's high radiological risk procedure. During

the transfer to a shielded vault on December 9, 1999, the HIC became stuck and partially exposed. BGE properly posted and controlled access to the area, conducted onsite and offsite radiation dose rate surveys to verify conformance with applicable dose criteria, and instrumented the area with integrating electronic dosimetry. A recovery plan was developed. A BGE Management Oversight Board for independent assessment purposes was held prior to performance of the recovery efforts. The HIC was freed from the storage vault on December 12, 1999, with no physical damage. No offsite dose consequences were noted. The HIC was returned to onsite facilities and no significant personnel radiation dose was received. BGE was continuing to review the cause of the stuck HIC at the end of the inspection.

BGE's overall external and internal dose control performance in 1999, specifically as it related to the early 1999 Unit 2 outage, was reviewed during NRC Region I Integrated Inspection Report Nos. 05000317/1999003 and 05000318/1999003, dated June 16, 1999. Since that review, there have been no significant personnel exposures and no significant shallow dose equivalent to the skin exposures have occurred.

BGE conducted evaluations of inconsistent/anomalous dosimetry results, including dose assessment for lost dosimetry and mismatch of electronic dosimetry versus thermoluminescent dosimetry results. Instances of discrepancies between electronic and thermoluminescent dosimetry were evaluated using established criteria. No significant dose results were identified.

c. Conclusions

BGE implemented effective radiological controls for high risk work activities reviewed. Appropriate personnel external and internal exposure controls were provided. There were no significant unplanned internal or external personnel exposures. Dosimetry anomalies were properly reviewed.

R1.2 Outage Planning and Preparation

a. Inspection Scope (83750)

The inspector reviewed BGE's planning and preparation for the March 2000 Unit 1 refueling outage including the status of outage work identification and completion of ALARA planning. The inspector reviewed planning efforts to reduce personnel radiation exposure during the outage to as low as is reasonably achievable (ALARA). The inspector interviewed station ALARA and outage planning personnel and selectively reviewed various ALARA packages for work activities that were defined as higher radiological risk and exhibited higher estimates of personnel dose for work activities. The inspector also reviewed the status of work planning efforts.

b. Observations and Findings

BGE was performing appropriate ALARA planning for the upcoming refueling outage. BGE's outage estimate (130 person-rem) was based on detailed analysis of planned work activities and estimated person-hours in radiological work areas. Work activities with higher estimated total radiation exposure had been identified and planned and high

radiological risk work was identified. Potential work, identified as contingency work, was also being planned from a radiological controls perspective. ALARA personnel were working with the maintenance groups to identify and plan the outage. Exposure goals for the 2000 Unit 1 outage and the entire year were approved by the BGE Radiation Protection Oversight Committee.

The radiological controls group had established an Outage Radiation Protection Plan, had established an outage organization, and had identified supplemental staffing needs. Lessons learned from previous outages were being evaluated and a pre-outage report was in preparation. Outage ALARA planning personnel were incorporated into the work planning group for enhanced effectiveness.

BGE did not meet its 1999 Unit 2 Outage ALARA goal due to emergent work on steam generators and reactor coolant pumps. In addition, dose rates encountered during the outage were elevated. The inspector learned that BGE was evaluating the elevated dose rates and was conducting an in-depth review of its ALARA program to identify areas for improvement.

c. Conclusions

BGE was providing good planning and preparation for the upcoming Unit 1 refueling outage. Lessons learned were being appropriately evaluated for application and an outage Radiation Protection Plan was established. Outage work activities were classified relative to radiological risk and were being reviewed in accordance with approved radiological risk based work planning procedures. BGE initiated a comprehensive evaluation of its ALARA program to identify areas for further improvement.

R1.3 Radiation Protection Programmatic and Organization Changes

a. Inspection Scope (83750)

The inspector reviewed programmatic, organizational, and equipment changes since the previous inspection. The implementation of the Radiation Protection Improvement Plan was also reviewed. The inspector reviewed work in progress and applicable documentation, and interviewed cognizant personnel.

b. Observations and Findings

BGE continued to implement its Radiation Protection Improvement Plan. BGE initiated a transition to a new work planning organization to provide for centralized work planning for both routine and outage activities and was developing a "Fix-It-Now" (FIN) team. BGE was also developing an integrated risk management program to provide for enhanced oversight of risk significant activities at Calvert Cliffs. The program is targeted to provide for centralized review of operational, industrial, and radiological risks associated with planned work activities. The inspector determined that BGE was evaluating recent changes to regulations in the area of respirator protection to ensure appropriate implementation.

c. Conclusions

BGE was implementing its Radiation Protection Improvement Plan and was making program changes to enhance performance in work planning and control. Of particular note was BGE's efforts to centralize risk assessment of work planning in one program document and establish a central routine and outage work planning organization. No changes that would adversely affect performance in radiation protection were noted.

R1.4 Radiological Protection Postings

On December 5, 1999, during a tour of the auxiliary building, the resident inspectors noted that scaffolding erected on the minus 10 foot elevation did not have any radiological postings. The inspector discussed the need for postings with the onshift radiation safety technicians. A subsequent survey of the scaffolding determined that the scaffolding work area was a radiation area; however, the dose rates were low (5 mrem/hr general area and a 30 mrem/hr contact reading) and individuals working in the area would be equipped with personnel dosimetry. The radiation safety technicians took prompt action to post the scaffolding with radiation safety warnings. The technicians also took action to initiate an Issue Report (IR3-051-690) and enter this observation into the BGE corrective action system. The inspectors considered this radiological posting oversight of minor safety consequence and not subject to formal NRC enforcement action. BGE initiated a root cause analysis which was ongoing at the end of the inspection period.

**R7 Quality Assurance in RP&C Activities**

a. Inspection Scope (83750)

The inspector reviewed BGE's corrective action processes in the area of radiation protection. The evaluation included a review of issue reports, recent audits, surveillances, and self-assessments of the radiological controls program.

The inspector evaluated performance via observation of work activities during tours of the radiologically controlled area, discussions with cognizant personnel, review of applicable documentation, and review and evaluation of station procedures.



b. Observations and Findings

BGE developed a new procedure for self-assessment to document the expectations and to outline the methodology for conducting self-assessments. BGE also developed a specific radiation protection and chemistry self-assessment program procedure. A self-assessment and corrective action plan was also developed to provide for the site-wide trending and tracking of performance. Self-assessment coordinators were identified and a site self-assessment schedule was established for each functional area.

BGE's Nuclear Performance Assessment Department was issuing Safety Performance Assessment Reports (SPARs) which provided detailed assessment of important performance attributes, challenges, and recommendations for improvement. BGE also wrote Issue Reports (IRs) for items requiring corrective action or performance improvement. The IRs were initiated at low thresholds. Assessments reviewed the effectiveness of corrective actions. For example, BGE performed effectiveness reviews of its Radiation Protection Improvement Plan. A report was prepared outlining strengths and areas for improvement.

c. Conclusions

BGE was implementing enhanced oversight of the station's performance in the area of radiological controls. BGE implemented initiatives to enhance the quality and consistency of self-assessments on a station-wide basis.

## **R8 Miscellaneous RP&C Issues**

### **R8.1 Trace Tritium Contamination Detected in Sewage Sludge**

a. Inspection Scope (83750)

The inspector reviewed the circumstances, evaluations, and corrective actions associated with the identification of trace tritium contamination in processed sewage sludge.

b. Observations and Findings

BGE maintains an onsite sewage treatment facility. Processed effluent from the facility is discharged to the circulating water system release point, which is identified as a release point in the Offsite Dose Calculation Manual (ODCM). Processed (aerobically digested) sewage sludge from the system is periodically shipped offsite for disposal.

BGE identified trace tritium contamination above its environmental lower limit of detection (about 1.0 E-6 uCi/ml) in an un-distilled sample of sewage effluent released on August 5, 1999, and analyzed on August 10, 1999. This effluent sample was analyzed for gamma emitters just prior to its release with no indication. The sewage sludge from the sewage treatment system was expected to exhibit similar tritium concentrations and was shipped offsite the same day as the effluent release. Since tritium was not routinely seen in this effluent stream, actions were initiated to re-analyze the August 5 sample

using a distillation process to remove potential contaminants that would provide a false indication of activity. Previous instances were noted where a false result had occurred and distillation of the sample verified the absence of radioactivity (tritium).

The inspector learned that while these confirmatory analyses were being performed, no action was taken by BGE to suspend further shipments of sewage sludge to offsite processors. A second shipment of sewage sludge was released on August 12, 1999, and this sludge was likewise analyzed for gamma emitters prior to its release and found not to contain any indications above environmental lower limits of detection. However, neither a sample of sewage effluent nor sludge was collected and analyzed for tritium, despite the positive indication of tritium in the August 10, 1999 sample analysis.

The August 5, 1999, sample was distilled and re-analyzed on August 16, 1999, and indicated tritium contamination at about  $3.1 \text{ E-6 uCi/ml}$ . The inspector determined that BGE supervision and chemistry personnel were informed of this confirmation of tritium, however, a third sewage sludge shipment was released on August 19, 1999. Similar to the August 5 and 12 releases, the August 19 sludge shipment was analyzed for gamma emitters, with none detected, but not for tritium.

The inspector determined that the un-distilled and distilled samples of sewage effluent collected on August 19, 1999, were analyzed on August 22, 1999, and found to contain tritium contamination at about  $1.6 \text{ E-6 uCi/ml}$ . As a result, BGE suspended further offsite shipments of sewage sludge, pending further evaluation of this issue. An Issue Report (IR3-035-034) was written to identify that samples of sewage effluent, expected to be clean, were indicating tritium. The sludge was treated as contaminated material.

10 CFR Part 20.1501 requires, in part, that surveys be performed, as necessary and reasonable, to comply with 10 CFR Part 20, and to evaluate concentrations or quantities of radioactive material to evaluate for potential radiological hazards. 10 CFR Part 20, Subpart K, provides specific requirements for the disposal of licensed material. Based on the above, BGE did not adequately evaluate the sewage sludge to identify licensed material (i.e., tritium) prior to its disposal, to ensure conformance with 10 CFR Part 20, Subpart K. Specifically, sewage sludge shipments were released on August 12 and 19, 1999, despite indications of tritium in the sewage system effluent identified in the August 10, 1999, analysis of the sample taken on August 5, 1999. The failure to conduct adequate surveys of processed sewage is a violation of 10 CFR Part 20.1501. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1.a of the NRC Enforcement Policy. This violation is recorded in the BGE corrective action program as Issue Report No. IR3-035-056. **(NCV 05000317&05000318/1999011-02)**

BGE conducted training on August 25 and December 9, 1999, to review this event and the program changes made to prevent recurrence. A pathway analysis was also conducted and no significant offsite dose impact was identified. Projected doses were well within applicable offsite dose limits. BGE also plans to treat sewage sludge as contaminated material if activities (tritium or gamma emitters) are detected above specified environmental lower limits of detection.

c. Conclusions

BGE identified trace tritium contamination in sewage effluent samples in August 1999, but was slow to take actions to prevent subsequent contaminated or potentially contaminated shipments from leaving the facility. BGE corrective actions appropriately addressed the organizational and program performance deficiencies which contributed to this event. An Issue Report was initiated to determine the source of the tritium, and remains open. A non-cited violation was issued for the licensee's failure to properly survey effluent shipments and take more effective and aggressive action to suspend subsequent shipments until sample results could be confirmed.

**P1 Conduct of Emergency Preparedness Activities**

P1.1 Review of Licensee Identified Non-compliance (71750)

10 CFR Part 50, Appendix E, Section V, "Implementing Procedures" requires licensees who are authorized to operate a nuclear facility to submit any changes to their emergency plan or procedures to the NRC, as specified in 10 CFR 50.4(b)(5), within 30 days of such changes. Contrary to Part 50, Appendix E, on December 8, 1999, BGE identified and submitted Revision 28 to their Emergency Response Plan, which had become effective August 30, 1999. The failure to have submitted these changes to the NRC within 30 days is a violation. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Section VII.B.1.a of the NRC Enforcement Policy.. This violation is in the BGE corrective action program as Issue Report Nos. IR3-029-196 and IR3-025-514. **(NCV 05000317&05000318/1999011-03)**.

**V. Management Meetings**

**X1 Exit Meeting Summary**

Following the conclusion of the inspection, on January 28, 2000, the inspectors presented the inspection results to Mr. Katz and others of BGE management. BGE acknowledged the findings presented.

## ATTACHMENT 1

### Partial List of Persons Contacted

#### BGE

C. Cruse, Vice President, Nuclear Energy Division  
P. Katz, Plant General Manager  
K. Cellars, Manager, Nuclear Engineering  
L. Wechbaugh, Superintendent, Nuclear Maintenance  
M. Navin, Superintendent, Nuclear Operations  
B. Montgomery, Director, Nuclear Regulatory Matters  
S. Sanders, General Supervisor, Plant Engineering  
T. Sydnor, General Supervisor, Plant Engineering  
D. Holm, General Supervisor, Plant Operations  
T. Pritchett, Superintendent, Technical Support  
L. Smialek, Radiation Protection Manager  
C. Earls, General Supervisor, Radiological/Chemistry  
T. Forgette, Director, Emergency Planning  
R. Branch, Component Engineering

### INSPECTION PROCEDURES USED

IP 71707	Plant Operations
IP 62707	Maintenance Observation
IP 61726	Surveillance Observation
IP 37551	Onsite Engineering
IP 71750	Plant Support Activities
IP 83750	Occupational Radiation Exposure

### LIST OF ACRONYMS USED

AFAS	Auxiliary Feedwater Actuating System
AFW	Auxiliary Feedwater
ALARA	As Low As Reasonably Achievable
BGE	Baltimore Gas & Electric
HIC	High Integrity Container
IR	Issue Report
LER	Licensee Event Report
NCV	Non-cited Violation
NI	Nuclear Instrumentation
ODCM	Offsite Dose Calculation Manual
OI	Operating Instruction
PDR	Public Document Room
RP&C	Radiological Protection and Chemistry
RPS	Reactor Protection System
RVLMS	Reactor Vessel Level Monitoring System
SIAS	Safety Injection Actuation Signal
SPAR	Safety Performance Assessment Report

STP            Surveillance Test Procedure  
TS            Technical Specifications  
TA            Temporary Alteration

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened/Closed

05000317/1999011-01	NCV	Failure to follow procedures for the control of work on the Unit 1 reactor vessel level monitoring system
05000317/1999011-02	NCV	BGE did not perform adequate surveys prior to release of slightly contaminated sewage.
05000318/1999011-02	NCV	BGE did not perform adequate surveys prior to release of slightly contaminated sewage.
05000317/1999011-03	NCV	An emergency plan revision was not reported to the NRC within 30 days
05000318/1999011-03	NCV	An emergency plan revision was not reported to the NRC within 30 days

Closed

05000317/1999006	LER	Inaccurate Electrical Current Determination Leads to Manual Reactor Trip
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