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REGION I

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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, Maryland
Dates:	August 25, 1996 through October 19, 1996
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EXECUTIVE SUMMARY

Calvert Cliffs Nuclear Power Plant, Units 1 and 2
Inspection Report Nos. 50-317/96-07 and 50-318/96-07

This integrated inspection report includes aspects of BGE operations, maintenance, engineering, and plant support. The report covers an eight week period of resident inspection and includes the results of announced inspections by engineering, radiation controls, and spent fuel project specialists.

Plant Operations

- Operator response to transients caused by the after effects ropical Storm Josephine focused on reactor safety while corrective actions were taken to maintain the operability of plant cooling systems. The inspectors considered the operator response to the two transients to be very good, including an appropriate attentiveness to reactor control.

- BGE identified that some operations personnel had developed the work practice of initialing a locked valve control log for completion of a valve lineup change, prior to completing the action. The inspectors reviewed the BGE response to the issue and found the actions taken to be appropriate.

- The inspectors observed that BGE operations had implemented a reactivity management program following a number of reactivity control issues that occurred in 1995. The inspectors observed that the BGE activities were effective in raising operator awareness and monitoring the number of reactivity control issues.

Maintenance

- The inspectors observed BGE's effective use of risk-assessment to plan, schedule, and coordinate work for each week in the quarterly system schedule. BGE recently made enhancements to the process that included: consideration of switchyard and offsite power source maintenance; elimination of concurrent maintenance in two separate risk significant areas; and identification of the potential risk of maintenance to a plant trip.

- When 11 station battery was being replaced, it was determined by BGE electricians that an incorrect replacement battery had been purchased and staged for the job. The inspector concluded that no existing process or procedure was in place that would have identified the error during the purchase, receipt inspection, maintenance order planning, or material staging processes.

- The 11 auxiliary feedwater pump (AFW) turbine bearings were damaged during operations testing in July and August 1996. The inspectors found the BGE actions taken following the August bearing failure to be comprehensive. These included a review of 11 AFW pump turbine maintenance practices, a modification of the turbine bearings, and an independent assessment of failure root cause. The

overhaul and repair of the turbine were completed within the limiting condition for operability (LCO) time and included extensive evaluation and modification.

- The inspectors considered the evaluation and repair following the July failure of the 11 AFW pump turbine bearing to be weak. Many of the contributing factors identified following the August failure, including turbine rotor imbalance, and maintenance related degradation of the outboard bearing were not identified and the turbine was returned to service with compensatory action rather than repair.

- The inspectors concluded that BGE had been aggressive in reducing the backlog of Priority 1, 2, and 3 maintenance orders, and that the work had been performed in a high quality manner with very little rework.

- The inspectors considered BGE's implementation of an enhanced plant cleanliness program to be an excellent initiative in improving and maintaining overall plant cleanliness. The program also provided BGE with an objective method to assess the effectiveness of remedial actions.

Engineering

- As demonstrated by the protracted run-in of the 12 saltwater pump and the repeated cleanings of the 21 service water heat exchanger, the availability of the saltwater and service water systems continues to challenge BGE. BGE formed an independent assessment team to evaluate and improve performance of the saltwater and service water systems.

- The inspector reviewed portions of BGE documents involved in Independent Spent Fuel Storage Installation (ISFSI) activities and toured the ISFSI facility. The procedures were considered very good; however, the inspectors identified two issues for possible incorporation into the cask unloading procedure.

- BGE responded appropriately to the July 1996, low pressure safety injection pump circuit beaker failure. The corrective actions taken by BGE were extensive and timely. The operability determinations were thorough and technically sound.

- The new diesel generator control console was well designed. Human factors considerations were sufficiently included in the design process.

- The licensee had provided thorough calculations for the circuit protection and circuit breaker coordination for the new electric circuits connected to the new diesel generators.

- The protection and control features for the new safety related diesel generator (DG1A) were consistent with the design features specified in the Calvert Cliffs Safety Evaluation Report (SER).

Plant Support

- BGE implemented a generally effective radiation protection program. Overall, very good action was taken on previously identified ALARA concerns and High Radiation Area access control and posting issues. Some apparent residual weaknesses exist in key ALARA program areas and weaknesses were noted in air sample counting instrument quality assurance.

- Overall external and internal exposure controls were very good. The licensee completed the Unit 1 outage with no noteworthy internal or external exposures despite extensive emergent steam generator work, reactor coolant pump work, and emergent work associated with the fuel upender.

- The licensee implemented an effective in-house thermoluminescent detectors program and whole body counting program including quality assurance.

- The licensee took effective actions on previously identified ALARA concerns. ALARA goals were closely monitored and adhered to.

- The licensee took exceptional actions on four instances of problems involving access control to and posting of High Radiation Areas.

- The licensee readily identified traces of contamination in sewage sludge, controlled the sludge, and identified and corrected its causes.

- The licensee took aggressive action on self-identified radiation controls area access control concerns.

- The licensee shipped a package of radioactive material (reusable scaffolding) as a strong-tight package, and the package was found at its destination to have a hole in it. The issue was the subject of enforcement actions by the state of South Carolina and the licensee implemented corrective actions. The event was not symptomatic of weaknesses in the program. Rather, it was considered an isolated event. A Notice of Violation was issued.

- On September 19, 1996, BGE conducted a radiological emergency response drill. The inspector attended two post-drill critiques and observed that the BGE identified performance deficiencies were entered into the BGE corrective action system for tracking and resolution. Overall, the inspector concluded that the drill performance and evaluation were properly conducted.

- BGE security informed the inspectors that drug paraphernalia had been identified during the pre-access search of a vehicle. The inspectors considered the event as an example of security program effectiveness in preventing contraband items from entering the protected area.

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ATTACHMENTS

Report Details

Summary of Plant Status

Unit 1 started the period at full power, reduced power to 90 percent for waterbox cleaning on October 12, and returned to full power on October 13.

Unit 2 reduced power to 80 percent on September 7 for waterbox cleaning and returned to full power on September 9. Power was reduced on October 8 and again on October 9 due to fouling of the main condenser waterbox as the result of Tropical Storm Josephine. Reactor power was returned to 100 percent on October 10.

I. Operations

O1 Conduct of Operations [1]

O1.1 General Comments (71707)

Overall plant operations were conducted safely with a proper focus on nuclear safety. On September 25, 1996, BGE identified that some operations personnel had developed the work practice of initialing a locked valve control log for completion of a valve lineup change, prior to completing the action. A BGE management review ensured that valve lineup changes were being properly completed and informed operations personnel that initialing completion of an action should only be done after the action is complete. The inspectors reviewed the BGE response to the issue and found the actions taken to be appropriate.

On October 5, operators observed computer alarms indicating increased feedwater flow to 11 steam generator and rising steam generator level. Abnormal operating procedure AOP-3G, "Malfunction of the Main Feedwater System," was implemented and the backup feature of the feedwater control system responded. Steam generator levels returned to normal in a few minutes. Maintenance and engineering personnel were contacted, the failed component was replaced, and the system was returned to normal that day. The inspectors considered the activities of operations, engineering, and maintenance personnel to be very good in identifying and correcting the feedwater problem.

On October 8, tropical storm Josephine caused an influx of debris into the main condenser intake. The debris caused fouling of the main condenser waterboxes, travelling screens, and service water heat exchangers. A controlled power reduction of Unit 2 to 80 percent was completed to maintain main condenser differential temperature within Maryland State discharge permit specifications. Operators responded to the transient by properly monitoring the reactor and conducting the power reduction in a controlled manner.

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[1] Topical headings such as O1, M1, etc., are used in accordance with the NRC standardized reactor inspection report outline found in MC 0610. Individual reports are not expected to address all outline topics.

On October 9, the storm after-effects caused an influx of jellyfish, which also fouled Unit 2 intake travelling screens. Again, operator response focused on reactor safety while a minor power reduction was completed. The inspectors considered the operator response to both transients to be very good, including an appropriate attentiveness to reactor control.

Q7 Quality Assurance in Operations

The inspectors observed that BGE operations had implemented a reactivity management program following a number of reactivity control issues that occurred in 1995. Included in the program was a procedure that promulgated management expectations and designated responsibilities for reactivity management. Additionally, a tracking and evaluation system for reactivity events and excursions was initiated to continually evaluate program effectiveness. The inspectors reviewed the current reactivity controls trend and observed some reduction in the number of reactivity control occurrences. Events during the inspection period included the failure of a control element assembly to insert during a surveillance test and a spike on a reactor protection system channel which caused a power level high channel pretrip to occur. Each of these occurrences were assigned a point value and BGE had established a goal of less than 4 reactivity points per month. The inspectors observed that the BGE activities were effective in raising operator awareness and monitoring reactivity control issues.

II. Maintenance

M1 Conduct of Maintenance

M1.1 General Comments

The inspectors observed BGE's effective use of risk-assessment to plan, schedule, and coordinate work for each week in the quarterly system schedule. Maintenance, operations, and engineering personnel participated in the completion of the weekly assessment worksheets. Probabalistic risk assessments were conducted on both a weekly and a daily basis and the assessments evaluated cumulative risk, the risk of troubleshooting, and the risk associated with human error. BGE recently made enhancements to the process that included: consideration of switchyard and offsite power source maintenance; elimination of scheduling concurrent maintenance in two separate risk significant areas; and identification of potential risk of maintenance to a plant trip. Additionally, special work controls for trip sensitive work and special procedure reviews to identify trip risk steps have been implemented.

The inspectors reviewed maintenance practices using Inspection Procedure 62700. The inspectors reviewed selected maintenance activities to ensure that the work was performed safely and in accordance with proper procedures. The inspectors noted that an appropriate level of supervisory attention was given to the work depending on its priority and difficulty. The inspectors found that very good work practices were used in the auxiliary feedwater pump overhauls and repairs.

Emergency diesel generator maintenance was also conducted using very good work practices and the work was accomplished in an effective manner.

M1.2 Routine Maintenance Observations

Using Inspection Procedures 62707 and 61726, the inspectors observed the conduct of maintenance and surveillance testing on systems and components important to safety. The inspectors also reviewed selected maintenance activities to assure that the work was performed safely and in accordance with proper procedures. The inspectors noted that an appropriate level of supervisory attention was given to the work depending on its priority and difficulty. Maintenance activities reviewed included:

MO2199603297	22 SRW PMP Motor Breaker Trip Paddle Replacement
MO1199604110	CAL Check CH A RPS Loop Temp Transmitters Inspect Loop Slide Links
MO0199401579	Perform #11 ISFSI Fuel Movement
MO1199503624	Overhaul of 11 Auxiliary Feedwater Pump
MO1199603354	Repair of 11 Auxiliary Feedwater Pump Bearing
MO1199600499	11 Station Battery Replacement
MO1199604270	11 Station Battery Replacement (addendum)

M1.2 Number 11 Battery Activities

a. Inspection Scope (62707)

The inspectors reviewed activities associated with the 11 safety-related station battery.

b. Observations and Findings

On September 16, 1996, during preparations for the replacement of 11 station battery, the 11 station battery was disconnected and the reserve battery was connected to the DC bus using one cable per pole. An engineering evaluation for the lineup intended that two cables be used per pole. The 11 battery disassembly began in preparation for replacing all of the cells. On September 17, a plant electrician working in the area of the installed cables found and questioned the adequacy of the cables. An issue report was written and a second set of cables was installed. A preliminary operability determination determined that although degraded, the single cable configuration had been adequate for battery operability.

When BGE electricians began to remove the first of the existing cells, they determined that the replacement cells for battery 11 were not the correct cells. The inspectors noted that the incorrect cells were not identified during the purchase, receipt inspection, maintenance order planning, or material staging processes. Subsequently, the 11 battery was reassembled using the existing cells, and was charged, tested, and returned to service.

BGE promptly formed a team to perform a root cause analysis (RCA). At the end of the inspection period the root cause analysis report had not been issued. The inspectors interviewed selected personnel involved, reviewed documentation, and discussed the issue with the root cause analysis team leader. The cause of the improper cable installation appeared to have resulted from an unclear installation instruction provided in the engineering test procedure (ETP) developed by the plant engineering section (PES). Maintenance provided weak support of the development and independent review of the ETP.

From discussions with the RCA team leader and procurement personnel, the inspector concluded that once the wrong model number for the cells was entered on the initial order form, no existing process or procedure was in place that would have identified the error during the purchase, receipt inspection, maintenance order planning, or material staging processes. BGE personnel stated that management expectations and training on second checking "good practices" have been provided to procurement personnel to ensure that the material ordered matches the specified end use.

c. Conclusions

When 11 station battery was being replaced, it was determined by BGE electricians that an incorrect replacement battery had been purchased and staged for the job. The inspector concluded that once the wrong model number for the cells was entered on the initial order form, no existing process or procedure was in place that would have identified the error during the purchase, receipt inspection, maintenance order planning, or material staging processes. The inspectors considered the procurement process to be weak in providing assurance that design basis information is properly translated into procurement documents.

Unclear installation instructions provided by the plant engineering section (PES) appeared to have been the cause of improper cable installation during the number 11 safety-related battery maintenance. Maintenance provided weak support in the development and independent review of the associated engineering test procedure. BGE initiated a root cause evaluation of the occurrence.

M1.3 Auxiliary Feedwater Pump Turbine Maintenance

a. Inspection Scope

The inspectors reviewed the turbine bearing failures that occurred on the 11 auxiliary feedwater pump turbine in July and August 1996. For both cases, BGE identified the failures, completed corrective maintenance, and initiated a root cause investigation. The inspectors reviewed each of these activities.

The inspectors also conducted a general review of maintenance history and practices for the turbine driven auxiliary feedwater pumps.

b. Observations and Findings

During a monthly surveillance test of the 11 auxiliary feedwater (AFW) pump on July 29, 1996, a high temperature alarm was received for the turbine inboard journal bearing. In accordance with procedures, operators tripped the turbine and maintenance personnel begin troubleshooting and repair. An issue report was initiated and a root cause investigation was started. On investigation, the inboard turbine bearing was found destroyed (wiped) by direct contact that had occurred between the rotating assembly and the soft bearing material. Gross damage was observed on one side of the bearing with only minor damage found on the other side of the bearing.

As part of the troubleshooting and repair, the turbine pump alignment and shaft runout were inspected and no problems were identified. The wiped bearing was replaced and testing showed the AFW pump to be operable. A preliminary root cause determination was made prior to returning the turbine to service. The failure analysis indicated that the bearing slinger ring had somehow grabbed and did not rotate when the turbine started, starving the bearing of oil. Following bearing replacement, it was observed that the slinger ring on turbine start, always migrated to one side of the bearing housing, suggesting some imperfection with the rotating assembly. This migration was not resolved at that time, but rather, compensatory action was specified that included only manual starts for the machine and required that operations personnel ensure that the slinger ring was rotating on each turbine start. Additionally, because one of the test runs exhibited higher than normal temperature for the outboard bearing, monthly lubrication oil sampling was included as an added precaution.

On August 26, surveillance, STP-O-5-1, "Auxiliary Feedwater Monthly Test," was performed satisfactorily. Following the turbine run, the bearing lubrication samples were drawn and BGE found evidence of water intrusion and babbitt in the oil of the turbine outboard bearing. Since it was suspected that the bearing had degraded or possibly wiped, an issue report was written, a seven day technical specification action statement was entered, and troubleshooting was initiated. On inspection, the outboard bearing exhibited signs of contact between the shaft and the bearing, but had not wiped.

A formal root cause evaluation of the August bearing failure was initiated and the scope expanded to include commonalities from the July failure. The troubleshooting was extensive. Vendor and independent representatives were included in the planning, troubleshooting and repair. No definitive root cause was identified; however, a number of contributing causes were considered. Included in these were:

1. The turbine rotor was determined to be out of balance by approximately 25 grams on one edge of the rotor. Rubbing indications on the shaft-journal bearing interface confirmed the imbalance. A review of turbine vibration data revealed that the imbalance had existed probably since manufacture.

2. The marked oil level on the outboard bearing sight glass was incorrectly marked. Although the precise oil level at the time of the outboard failure was not known, it was possible to be in the marked band but have insufficient oil in the sump for all possible operating conditions.

3. Water (6 percent) was found in the lubrication oil sample, suggesting some gland steam or other leakage during rotor operation.

4. The lubrication slinger ring was determined to be insufficiently designed to provide lubrication for overspeed testing of the turbine. Representatives of the turbine manufacturer had informed BGE that the maximum operational speed for the slinger ring was about 4600 rpm. The overspeed testing was conducted at 5100 rpm and extensive testing was conducted following a May 1996 turbine overhaul. This testing could have initiated damage to both the inboard and outboard bearings. The technical manual for the machine stated that the overspeed trip setpoint would be established at 5250 rpm, well above the 4600 operational limit.

5. The outboard journal bearing may have been damaged during the July 29 failure. BGE informed the inspectors that the outboard bearing was not evaluated for damage during the corrective maintenance for the inboard bearing failure.

As corrective action, the entire rotating assembly was replaced. Also, a more efficient bearing was used in both inboard and outboard applications. Following testing and satisfactory completion of the surveillance test, the AFW pump was returned to service on September 1, 1996. The formal root cause evaluation including resolution of the remaining contributing causes was not complete at the end of the NRC inspection period.

In a review of maintenance practices during auxiliary feedwater pump and turbine overhauls, the inspectors identified that very good alignment checks were specified in the maintenance procedures, and that no problems with improper alignment had been identified. The inspectors found that maintenance practices were in concert with technical manual specifications, and that both the technical manuals and maintenance procedures had been sufficiently revised to include industry information.

c. Conclusions

The 11 AFW pump turbine bearings were damaged during surveillance testing in July and August 1996.

The inspectors found the BGE actions taken following the August bearing failure to be comprehensive, which included a review of 11 AFW pump turbine maintenance practices, a modification of the turbine bearings, and an independent assessment of failure root cause. The overhaul and repair of the turbine were completed within the

limiting condition for operability (LCO) time and included extensive evaluation and modification.

The inspectors considered the evaluation and repair following the July bearing failure to be weak. Many of the contributing factors identified following the August failure, including turbine rotor imbalance, and maintenance related degradation of the outboard bearing were not identified and the turbine was returned to service with compensatory action rather than repair. The BGE root cause evaluation of both failures continued at the end of the inspection period.

A review of auxiliary feedwater pump and turbine maintenance practices found that appropriate procedures and controls had been specified for work and that the technical information base for the work had been appropriately updated as industry information became available. Workmanship was considered excellent and no craft deficiencies were identified.

M1.4 Routine Surveillance Observations

The inspectors witnessed/reviewed selected surveillance tests to verify that approved procedures were used, details were adequate, test instrumentation was properly calibrated and used, technical specifications were satisfied, testing was performed by qualified personnel, and test results satisfied acceptance criteria or were properly dispositioned.

The surveillance testing was performed safely and in accordance with proper procedures. The inspectors noted that an appropriate level of supervisory attention was given to the testing depending on its sensitivity and difficulty. Surveillance testing activities that were reviewed are listed below:

STP-O-5-2	AFW Monthly Surveillance Test
STP-M-525AL-1	AFAS SG Level Loop Calibration
STP-O-8A-1	1A EDG on 4KV Bus 11
STP-O-8B-1	Test of 1B EDG and 4 KV LOCI Sequencer

M2 Maintenance and Material Condition of Facilities and Equipment

a. Inspection Scope (62707)

The inspectors reviewed the status of the outstanding backlog of maintenance items, focusing on Mode 1 corrective and priority work. BGE initiatives to reduce maintenance order cycle time and improve maintenance effectiveness (rework) were also reviewed.

b. Observations and Findings

The inspectors found that BGE had continued earlier efforts to reduce their maintenance backlog. Mode 1 corrective maintenance orders (MO) had decreased from about 900 (both units) in January, 1993, to slightly less than 500 in

September, 1996, well under the BGE goal of 600. Priority 1 and 2 MOs, the most significant in terms of urgency and effect on safe operation, were reduced from an average of about 100 per day to less than 10 (typically) over the same period. Priority 1 and 2 MOs include those that needed repairs to be completed to meet technical specification action statement requirements.

BGE's main focus for 1996 was to reduce the number of outstanding Priority 3 MOs and to improve the cycle time in correcting deficiencies. Priority 3 MOs were those that required priority planning and support, but were less significant in nature and did not involve technical specification action statements. The inspectors noted a number of enhancements to the work control process, including the use of probabilistic and operational risk assessment for on-line maintenance activities. BGE also revised the risk assessment worksheet to include equipment performance history and reactivity management questions. Starting with a backlog of about 350 Priority 3 MOs in January, 1996, BGE successfully reduced this number to about 175 by the end of August, 1996. The inspectors noted that the reduction was accomplished with an average error free work rate of 99.6% against a goal of 99.5% or better.

As part of the system maintenance improvement initiative, BGE formed a planning system performance improvement team to reduce MO planning cycle time by at least 20% by the end of 1996. Enhancements to the planning process included earlier pre-planning, parallel review of MOs, and streamlining the engineering delay process.

c. Conclusions

The inspectors concluded that BGE had been aggressive in reducing the backlog of Priority 1, 2, and 3 maintenance orders and that the work had been performed in a quality manner with very little rework. The numerous enhancements to the work control process appear to have been effective in reducing the backlog and decreasing time to complete Priority 3 MOs.

M8 Miscellaneous Maintenance Issues

M8.1 Plant Housekeeping

a. Inspection Scope (92902)

The inspectors reviewed BGE's implementation of an enhanced plant cleanliness program that used objective rating criteria to provide data for the tracking and trending of cleanliness issues.

b. Observations and Findings

In September 1996, BGE implemented an enhanced plant cleanliness tracking program to better assess general plant housekeeping. The program included all safety and non-safety related areas and structures within the protected area except

for radiologically controlled areas (such as the auxiliary building or containments). The radiologically controlled areas were covered in a separate program. Each area or structure was objectively rated on eleven criteria (each criterion was assigned a point value, with 100 points total). Among the more significant criteria were:

- preventive measures taken to limit the spread of debris from in-progress jobs;
- no dust on plant equipment,
- no leaks, or existing leaks contained/barricaded;
- trash cans and oil rag bins are routinely emptied; and,
- no uncontrolled or improperly placed debris found in the area.

The ratings ran from "excellent" (90-100 points), "good" (80-90 points), "fair" (70-80 points), to "poor" (less than 70 points). Management's expectations were to maintain at least 80 points for each area/structure evaluated. The site met the goal for the month of September, with an 84.5 average.

The point system also allowed BGE to track and trend the cleanliness data to assist in identifying problem areas or recurring issues indicating that actions taken to remedy deficient conditions had not been effective.

c. Conclusions

The inspectors considered BGE's implementation of an enhanced plant cleanliness program to be an excellent initiative in improving and maintaining overall plant cleanliness. The program also provided BGE with an objective method to assess the effectiveness of remedial actions.

M8.2 (Closed) Violation (50-317/94-28-02, 50-318/94-29-02): Unauthorized Modification

BGE responded to the violation in a letter to the NRC dated December 22, 1994. The inspector reviewed the corrective actions taken by BGE and documented in the response to the subject violation. An engineering analysis was competed which concluded that no seismic or cable separation concerns were created by the temporary cable. BGE also completed an engineering evaluation to determine the general bounding requirements for temporary services and established work controls to ensure that temporary services beyond those allowed by the evaluation would be separately evaluated. The violation is closed.

III. Engineering

E1 Conduct of Engineering (37550)

E1.1 General Electric (GE) Magne-Blast Circuit Breakers

a. Inspection Scope

The inspector reviewed the BGE corrective actions in response to the circuit breaker failures in June and July 1996, due to bent trip-paddles in the GE 4160V Magne-Blast circuit breakers.

b. Observation and Findings

On June 14, 1996, while performing a monthly test of the low-pressure safety injection (LPSI) pump using Station Procedure STPO-7A-2, "A Train Engineered Safety Features Logic Monthly Test," LPSI pump 21 failed to start. Investigation by BGE determined that the problem was due to a failure of the associated 4160V circuit breaker (152-2104) to close. BGE tested the breaker seven additional times and the breaker failed to close twice. BGE found that the breaker failure was due to excessive bending of the manual trip-paddle, which caused the trip-paddle to be in contact with the manual trip-rod, leaving no gap between the two. This "no gap" condition prevented the trip-shaft from rotating to the required position to allow subsequent closure of the breaker. BGE replaced (in June 1996) the defective trip-paddle with the trip paddle from a spare breaker and tested the breaker 20 times satisfactorily.

On July 26, 1996, while performing a monthly test for LPSI pump 22, the pump failed to start. BGE found the manual trip-paddle bent similar to the June 14, 1996, event, and the trip-paddle support bracket (L-bracket) cracked at the elbow. BGE replaced the breaker with a spare breaker and completed the test. BGE also removed the cracked L-bracket and sent it to their material laboratory for testing. The test results indicated that the crack was due to strain-aging embrittlement.

Following the second breaker failure due to a bent trip-paddle, the licensee formed an inspection team to inspect all safety-related 4160V breakers to verify that (1) a "no gap" condition did not exist; and (2) the L-brackets were not cracked. Eight circuit breakers (four in each unit) were not inspected because these breakers were normally closed during plant operation and were not required to cycle during a postulated design basis accident (DBA) plus loss of offsite power (LOOP).

Inspection by BGE conducted in August 1996, identified two more 4160 V breakers that had "no gap" and two more breakers that had small cracks in the L-brackets (152-1112,1412). The two breakers that had "no-gap" included a nonsafety-related breaker and the breaker for LPSI pump 21 (152-2104), which failed on June 14, 1996, and whose trip-paddle was replaced two months earlier.

Because of these findings, BGE took the following immediate corrective actions:

- Replaced breaker 152-2104 with a spare breaker and tested successfully.

- Nonsafety-related breaker 152-2301 was returned to its cubicle. This breaker was normally closed and was not required to change its position (except manually) both during plant operation and during an accident. Its short-term operation would not be affected by the no-gap condition because its trip shaft was not required to be rotated to achieve the breaker-closed position.

- The two cracked brackets were sent to the BGE material laboratory for analysis. The analysis result (confirmed by GE) identified that the cracks existed during material fabrication, and would not affect breaker operations. (The inspector's review of the laboratory analysis report indicated that the analysis was acceptable and the result was conclusive. Sufficient evidence was presented in the analysis report to support the conclusion).

- Completed an operability determination (96-020) for breakers 152-1112 and 1412 on August 24, 1996, and determined these breakers to be operable.

- Also completed another operability determination (96-021) to address the trip-paddle bending issue on August 26, 1996. This document concluded that with the exception of breakers 152-2104 and 2301, all 4160V breakers were operable.

- Conducted a 10 CFR 21 applicability evaluation on August 27, 1996, and determined this issue to be reportable per 10 CFR Part 21. Discussion with BGE indicated that a report or interim report would be issued within 60 days from August 27, 1996. A telephone discussion with BGE on November 5, 1996, indicated that an interim 10 CFR 21 report had been sent to the NRC on October 25, 1996. This report was not reviewed by the inspector.

BGE contacted GE for a new design of trip-paddle assembly (including trip paddle, L-bracket and other linkages) replacement parts and issued Engineering Service Package (ESP) No. 199601747 to evaluate the replacement of the trip-paddle assemblies with new designed parts. This package also included a short procedure for installing the new replacement parts and a 10 CFR 50.59 safety evaluation.

BGE started replacing manual trip-paddle assemblies with new GE design parts for safety-related 4160V breakers in September 1996. BGE stated that all safety-related 4160V breakers (about 60 total for both Units) would have the trip-paddle assemblies replaced before the end of October 1996, except eight breakers which could not be repaired without affecting plant operations. These eight breakers (152-1102, 1114, 1402 & 1413 for Unit 1 and 152-2102, 2114, 2402 & 2413 for Unit 2) did not have undervoltage trip features and would not change position during normal plant operation or during a postulated accident condition (with or without loss of offsite power). Therefore, these breakers would not be affected

functionally by the "no-gap" condition until they are manually tripped. BGE also stated that these eight breakers would have their trip-paddle assemblies replaced during the next opportunity (forced outage) or next refueling outage (February 1997 for Unit 2, and February 1998 for Unit 1), whichever is sooner. The inspector reviewed Calvert Cliffs single line diagram (Drawing 61001 sheet 1, Revision 30, dated September 16, 1996), and schematic diagrams (Drawings 63-071-D, sheets 14, 14A, and 14B) which confirmed the no-undervoltage-trip features.

Due to the age of the 4160V breakers (all greater than 20 years old), BGE was planning to replace all safety-related 4160V breakers with vacuum or SF6 type breakers. Although funding of the breaker replacement had not been approved by BGE management, BGE provided a preliminary replacement schedule for the inspectors review. This schedule indicated that breaker replacements could start in July 1997, with ten breakers to be replaced every year.

Root Cause Analysis

During this inspection, BGE was still working on the root cause analysis. BGE stated that additional information from GE was needed before the root cause analysis could be completed. If additional corrective actions are identified in the root cause analysis, a follow-up inspection would be included in Unresolved item 96-04-01 (see Section E8.4 of this report).

The inspector reviewed BGE's corrective actions and determined that BGE had responded appropriately to the circuit breaker failure event in a timely manner. Sufficient bases were presented in the operability determinations (96-020 and 96-021). The breaker conditions were thoroughly discussed and evaluated. Justification was based on sound engineering reasoning and laboratory test results. The safety evaluation for the trip-paddle modification was also reviewed and found acceptable.

The inspector also witnessed the trip-paddle replacement process using GE's new designed parts for breaker 152-1407 on September 25, 1996. No abnormalities were observed. The inspector also reviewed the lists for the 4160V breakers that had their trip-paddle assemblies replaced with the new designed parts, and found that as of September 26, 1996, 32 of the 60 safety-related breakers were completed.

During a telephone conversation on November 6, 1996, between BGE (system engineer) and the inspector, BGE stated that all safety-related 4160V circuit breakers (except the eight breakers identified in the previous paragraph) and about one half of the nonsafety-related 4160V circuit breakers had their trip-paddle assemblies replaced with the new designed parts.

c. Conclusion

The inspector concluded that BGE responded appropriately to the circuit beaker failure on July 26, 1996. The corrective actions taken by BGE were extensive and timely. The operability determinations were thorough and technically sound.

E1.2 Diesel Generator Control Console Design

a. Inspection Scope

The inspector reviewed the design of the new diesel generator control console (DGCC) in the main control room that provided the controls for all five diesel generators at Calvert Cliffs, and to determine whether human factors considerations prescribed in NUREG 0700 were included in the design process.

b. Observation and Findings

The addition of two new diesel generators (the safety-related DG1A and station blackout DG0C) necessitated BGE to modify the control panels in the main control room to provide operator controls for these two diesel generators. Controls of the original three diesel generators (DG11, 12, and 21) were originally located in control consoles 1C18, 1C19, and 1C20 of the main control board. Due to insufficient control panel space for all five diesel generators, BGE issued design change FCR No. 89-0079, Supplements 21 and 36, for the design and installation of a new DGCC for all five diesel generators, and the relocation of controls and instrumentation of the existing diesel generators to the new DGCC, that was to be located adjacent to control panels 1C18 through 1C20.

The inspector reviewed the design documents for the new DGCC, which included:

- Supplement No. 21 to FCR No. 89-0079, which included Attachment 48 for the design instructions, Attachment 17 for design input record, Attachment 20 for cross discipline impact screen, and Attachment 3 for the safety evaluation; and

- Control system design criteria for Calvert Cliffs Nuclear Power Plant, Revision 0, dated August 2, 1991.

The inspector found that the design input data and design criteria for the new control console were clearly defined. Human factors considerations, including those prescribed in NUREG-0700, "Guidelines for Control Room Design Review," dated September 1981, were also specified in the design documents. Two of the engineers involved in the control console design were designated as qualified Human Factors engineers before the design started. The qualification required the engineers to be knowledgeable of various human factors guidelines and criteria.

The inspector interviewed two individuals involved in the DGCC design and found them to be very familiar with control console design criteria and human factors

guidelines. The inspector observed the installed DGCC in the main control room and found that the console was in a convenient location, and the controls and instrumentation, including control switches and gages, were logically arranged. While in the control room, the inspector had a discussion with two operators; both individuals stated that the control devices in the new console were much easier to operate than those in the original control arrangement.

c. Conclusion

The inspector concluded that the new diesel generator control console was well designed. Human factors considerations were sufficiently included in the design process.

E1.3 Coordination and Protection for the Diesel Generator Circuits

a. Inspection Scope

The inspector reviewed the coordination for the new circuit breakers and the protection of the electric circuits (4160 V buses) that were connected to the two new diesel generators (safety-related DG1A and station blackout DG0C).

b. Observation and Findings

Due to the addition of two new diesel generators, BGE rearranged all diesel-to-bus connections. The swing diesel was no longer needed. A new safety-related 4160 V bus (bus 17) was added to the circuits. This new bus was located in the new DG1A building, and was used to provide power to the operation of DG1A. During normal plant operation, when offsite power was available, bus 17 obtained its power from bus 11 in the switchgear room that was connected to the offsite power source. During a loss of offsite power, bus 17 obtained its power from DG1A and backfed the power to bus 11. A nonsafety-related 4160 V bus (bus 07), located in the station blackout (SBO) building, was also added to the electric circuits to serve DG0C.

The cable and bus projections and breaker coordination for the new buses were documented in BGE calculation No. D-E-94-001, "Relay Setting and Coordination," Revision 6, dated August 26, 1994. The inspector's review of these calculations indicated that the calculations were thorough and technically sound. The bases and assumptions in the calculations were clearly stated and the sources identified. Each protected circuit and the associated breaker coordination curves were clearly shown in this document.

c. Conclusion

The inspector concluded that BGE had provided thorough calculations for the circuit protection and breaker coordination for the new electric circuits connected to the new diesel generators.

E1.4 Protection and Control Features of the Safety-Related Diesel Generator

a. Inspection Scope

The inspector reviewed the protection and control features for the new safety-related diesel generator ((DG1A) to ascertain whether these design features were consistent with the Safety Evaluation Report (SER), "The Emergency Diesel Project, Diesel Generator and Mechanical Design Report for Calvert Cliffs Nuclear Power Plant, Units 1 and 2," issued by the NRC on March 4, 1994.

b. Observations and Findings

For the new safety-related diesel generator (DG1A), BGE committed to meet the recommendations of Regulatory Guide (RG) 1.9, "Selection, Design, Qualification, and Testing of Emergency Diesel Generator Units Used as Class 1E Onsite Electric Power Systems at Nuclear Power Plants," Draft Revision 3.

The inspector's review of the SER for DG1A indicated that the DG1A was designed to start and accelerate to rated voltage and speed by any one of the following:

1. Receipt of a safety injection actuation signal (SIAS)
2. Loss of the 4160V bus to which DG1A was connected
3. Manual switch operation in the diesel generator control console
4. Manual switch operation in DG1A control room
5. Emergency manual switch operation in DG1A control room

The SER also indicated that when DG1A was started by a SIAS, 4160V bus undervoltage signal, or the emergency manual switch in DG1A control room, the only protective trips that remained active were those that were used to prevent rapid destruction of the diesel generator with the proper trip signal logic to comply with RG 1.9, Draft Revision 3, as follows:

Trips	Logic
Engine Overspeed	1 of 2
Low lube oil pressure	2 of 3
Generator ground current	2 of 3
Generator differential current	1 of 1

The inspector reviewed the diesel generator logic diagrams (DLT-147-147) sheets, 03-01 through 03-08, and verified the correctness of the above control and protection design features.

c. Conclusion

The inspector concluded that the protection and control features for the new safety-related diesel generators (DG1A) were consistent with the design features specified in the Calvert Cliffs SER.

E2 Engineering Support of Facilities and Equipment

E2.1 Salt Water and Service Water System Operability and Initiatives

BGE has been repeatedly challenged in maintaining the operability and reducing the out-of-service times for the salt water (SW) and service water (SRW) systems. During this inspection period, the 12 saltwater pump was replaced and the inspectors observed the run-in of the 12 SW pump bearings to ensure that the thrust and radial bearing temperatures remained within the operability limits of 230 degrees Fahrenheit (°F) maximum or greater than 210°F for more than one hour. The 12 SW pump run-in involved 14 different technical specification action periods for a total of approximately 180 hours from September 3 until the pump was declared operable on September 17. After that date, the pump required monitoring and trending of erratic temperature excursions above the alarm setpoint of 175°F.

BGE operations personnel also repeatedly cleaned the head and tubesheet of the 21 SW/SRW heat exchanger. During the inspection period, sixteen cleanings were required to preclude the SW/SRW heat exchangers from exceeding their design-basis operating limits. Fourteen of the cleanings were for the 21 SW/SRW heat exchanger. Additionally, eight "bulleting" of the individual tubes of all four (two bulletings for the two heat exchangers for each unit) of the SW/SRW heat exchangers using brushes and scrapers were also completed. The 11 and 12 SW/SRW heat exchangers were cleaned once to preclude the heat exchangers from exceeding their operating flow, temperature, and differential pressure limits.

To address the ongoing issues with the saltwater and service water systems, BGE formed a saltwater system independent assessment team to review: (1) SW pump motor failures; (2) SW pump inservice testing trend data; (3) periodicity of SW pump overhauls; (4) SW pump discharge check valve failures and design adequacy; (5) impact of service water heat exchanger cleanings on control room operators; (6) control valve problems; (7) cost effectiveness of the containment air cooler flow control modification; and, (8) preventive maintenance and surveillance test adequacy and scheduling.

c. Conclusions

As demonstrated by the protracted run-in of the 12 saltwater pump and the repeated cleanings of the 21 service water heat exchanger, the availability of the saltwater and service water systems continues to challenge BGE. BGE formed an independent assessment team to evaluate and improve performance of the saltwater and service water systems.

E8 Miscellaneous Engineering Issues

E8.1 Independent Spent Fuel Storage Issues (60855)

a. Inspection Scope

The inspectors reviewed portions of BGE documents involved in Independent Spent Fuel Storage Installation (ISFSI) Activities and toured the ISFSI facility. The inspectors also discussed ISFSI activities with plant personnel including BGE fuel management personnel responsible for ISFSI project management.

b. Observations and Findings

The inspectors conducted a tour of the BGE spent fuel storage installation and related areas. At the horizontal storage module (HSM) storage area, the inspectors noted cracks in the concrete transfer pad and discussed them with the BGE engineering personnel. BGE verified that the transfer pad was not important to safety as defined in the ISFSI Safety Analysis report. They also judged that the cracks would not propagate to the important to safety concrete pads under the HSMs. BGE initiated an issue report to document the cracking and have it dispositioned.

The inspectors also reviewed the following procedures related to ISFSI activities: ISFSI-01, Revision 2, "ISFSI Loading," ISFSI-02, Revision 1, "ISFSI Unloading," and FH-350, Revision 2, "Fuel Handling Procedure 350, DSC Loading and Unloading." The inspectors found the procedures were consistent with the safety analysis report and technical specifications. The procedures contained very good detail and controls to ensure the performance of ISFSI fuel loading activities in a safe and controlled manner. BGE also integrated technical specification requirements, radiation protection warnings and cautions, and human factor attributes into the procedures. The procedures also incorporated hydrogen gas monitoring in response to NRC Bulletin 96-04.

The inspectors identified that the unload procedure, ISFSI-02, did not contain steps to take and analyze a dry storage canister (DSC) atmosphere sample before venting the DSC in procedure subsection 6.9. The safety basis for the atmosphere sample was to determine the DSC contents before venting to ensure that the appropriate precautions were taken to prevent an uncontrolled radiological release in the event of a postulated cladding failure. BGE management stated that procedure ISFSI-02 would be revised to incorporate sampling.

The inspectors also identified that unload procedure ISFSI-02, subsection 6.9, contained steps to flood the DSC with borated water from the spent fuel pool via a portable pump. The operator was to control reflood rate by maintaining pressure below 40 psig as indicated in the discharge line. This planned operation may not provide the operator with a good indication of internal DSC pressure and therefore potentially cause an inadvertent over pressurization of the DSC.

The temperatures of much of the fuel and DSC internals could exceed temperatures of 350° F in a DSC containing fuel at the design basis heat load and loaded in the transfer cask. With these conditions, the reflood transient would cause steam flashing and pressurization of the DSC. The vent path was a temporary hose attached to the DSC vent fitting (nominal diameter 0.5 in.) with a pressure gage attached to the vent line. The inspector expressed concern that this configuration could be providing the operator with only backpressure in the vent line rather than DSC internal pressure.

BGE initiated a thermo-hydraulic analysis of the reflood transient and the results were not complete at the end of the inspection period. BGE will evaluate further actions based on the analysis. Upgrade of BGE procedure ISFSI-02 to include sampling and an evaluation of internal pressurization were considered an inspector followup item. (IFI 50-317&318/96-07-01)

c. Conclusions

The inspector reviewed portions of BGE documents involved in Independent Spent Fuel Storage Installation (ISFSI) activities and toured the ISFSI facility. The procedures were considered very good; however, the inspectors identified two issues for possible incorporation into the cask unloading procedure ISFSI-02.

E8.2 Independent Safety Engineering Group

a. Scope

The scope of this inspection was to assess the effectiveness of BGE's Independent Safety Engineering Groups (ISEG) review and evaluation of the effectiveness of the corrective action process. Also the analysis and corrective action recommendations based on known industry problems was assessed.

b. Observation and Findings

At Calvert Cliffs, the ISEG is part of a larger organizational group called the "Operating Experience Review Group (OERG)." OERG consists of three distinct sub-groups with separate responsibilities, i.e., Plant Experience/Event Analysis Group, Industry Operating Experience Review (IOER) Group, and Independent Safety Evaluation Group. These sub-groups were staffed by experienced personnel with backgrounds in engineering, maintenance, and operations. There were no significant backlog in the areas of industry experience review and Institute of Nuclear Power Operations (INPO) significant event report reviews for OERG as a whole.

The inspector reviewed Calvert Cliffs' Administrative Procedures, NS-1-100, Rev 0; "Use of Operating Experience and the Nuclear Hotline," and NS-1-300, "Industry Operating Experience Information Processing."

In addition to the above procedures, a sample of the groups' reports was also reviewed. The sample included Significant Operating Event Report 91-01. The inspector also reviewed ISEG-Evaluation 95-16, dated December 18, 1995, Root Cause Analysis 95-23, and the integrated second quarter 1996 evaluation of the safety performance.

SOER 91-01 addressed the conduct and control of infrequently performed tests and evolutions. The inspector noted the review was very detailed, evaluated the administration controls (procedures), and the training program of the test personnel. The review revealed that BGE procedure NO-1-102: "Conduct of Infrequent Test or Evolution (ITOE)" did not clearly describe how tests or evolutions not described in the Attachment 1 to ITOE are approved, controlled, staffed, and documented. An Issue Report was issued to document this ISEG observation and also to resolve the inadequacy.

In the area of personnel training, the ISEG observed that the Control Room Operator qualification manual did not reference or present the training materials on Procedure OP-7 from this SOER, or from Procedure NO-1-102, although the Procedure OP-7 required listing of infrequent evolutions in Attachment 1 to the NO-1-102. Overall, the review was thorough, and the recommendations were accepted and implemented by the Operations Department. Of the three "Applicability Review" reports, two reports dated March 13, 1996 and July 17, 1996, covered in INPO SEN-127, and INPO SER 1-96 respectively, and the third dated September 10, 1996, covered a review of the NRC Information Notice 96-34.

The IOER's review of Significant Event Notice-127 indicated that it was applicable to the Calvert Cliffs Nuclear Power Plant (CCNPP). The issue described in the SEN covered personnel and plant safety equipment safety during drilling/curing of concrete. The ISEG review disclosed there was no controlled process or program at CCNPP designed to prevent a personal injury or fatality from electric shock while drilling or boring into concrete structures with buried or attached electrical conduits. In addition to the potential for personal injury, damage to a safety-related conduit may disable individual equipment or a complete train of a safety system. The inspector found that review was very thorough and the seven recommendations pertinent. IR1-013-110 was issued to resolve the concern and implement the ISEG recommendations.

The second "Applicability Review" report covered Significant Event Report 1-96 which covered concerns regarding Transformer Explosions and Loss of Offsite Power. This review was also very detailed, and covered CCNPP's experience with similar events onsite; however, these events had not been reported to industry. One of the recommendations was that CCNPP management report CCNPP experiences to the Nuclear Network for information and use by others. The reviews were thorough and of good technical quality.

The third "Applicability Review" report covered the review of NRC Information Notice 96-34: Hydrogen Gas Ignition During Closure Welding of a VSC-24 Multi-Assembly Sealed Basket (MSB). The review of this Information Notice established

that the notice was not applicable to CCNPP because the Dry Shield Canisters (DSCs) at the site were not coated with Zinc. The inspector noted that this review was detailed and effective.

The "IOER-Evaluation Forms" are similar to the reviews for NRC notices, but are in a concise and abbreviated form. The four reviewed forms were identified as:

- OE-7751, dated May 17, 1996
- INFON 96-23, dated July 15, 1996
- OE-7749, dated April 3, 1996; and
- INFON 96-22, dated August 27, 1996.

The reviews covered:

- Diesel Generator Air Start System;
- Fires in Emergency Diesel Generator Exciters;
- Excessive Delay in Turbine Mechanical Trip Solenoid; and
- Improper Equipment Settings Due to the Use of Nontemperature-Compensated Test Equipment.

The inspector noted that the reviews and evaluations documented in the forms indicated a good understanding of the concerns, and technical reasoning behind the conclusions and/or recommendations.

The review of "ISEG Evaluation 95-16," dated December 18, 1995, Root Cause Analysis Report 95-23, and the integrated "Second-Quarter 1996 Safety Performance Evaluation" also indicated the ISEG/OERG was effectively performing its function. The documented evaluations were of high technical quality based on accepted engineering principles, and were appropriately distributed to plant management. The integrated report included sufficient statistical data and analysis to support trends and conclusions.

c. Conclusions

Based on the above reviews and discussions and interviews with cognizant personnel, the inspector concluded that at Calvert Cliffs Nuclear Power Plant, the Independent Safety Evaluation Group is effective in assuring that effectiveness of corrective actions are maintained, industry experience is evaluated for plant applicability, and industry and regulatory concerns are properly addressed.

E8.3 (Closed) Unresolved Item 50-317 and 318/95-01-01
Lack of seismic evaluation for onsite modification of prequalified safety-related control cubicle

During the January 1995 inspection, the inspector observed two current transformers being added to Diesel Generator Protection Cabinet No. 5 (ACC panels) using a field-fabricated mounting bracket. Seismic evaluations for the mounting bracket and for the protection cabinet were not discussed in the modification

package. BGE later stated that SACM (the diesel generator manufacturer) had a procedure for controlling field modifications and that this procedure required all field modifications be reviewed against all requirements invoked in the original purchase order.

The resolution of this item consisted of two parts. The first part involved the rigidity of the field fabricated 11 gauge mounting bracket and the seismic qualification of the current transformers. The second part involved the effect of the seismic qualification of the ACC panels as a results of the equipment being added to the cabinet.

The seismic qualification of the current transformers was demonstrated by analysis and was documented in seismic qualification report DL-CL-19-18-1322, "ACC Panel Component Seismic Qualification Report," Addendum 3, Revision C.

BGE performed an analysis for the field fabricated bracket. This analysis, dated September 25, 1996, indicated that the bracket, with mounted current transformers, had a natural frequency of 34.4 Hz, which is higher than the maximum vibration frequency (33 Hz) of all known earthquakes. The inspector reviewed this analysis and determined that the rigidity of the bracket was demonstrated.

The seismic qualification of the ACC panels was demonstrated using finite element analysis performed by National Technical Systems (NTS). The summary of this analysis was documented in NTS Report No. 60091-93F-5, "Seismic Structural Analysis of One ACC Panel for Jeumont Schneider Industries," Revision 2, dated March 28, 1994. Anchoring qualification of the protection cabinets was demonstrated by an analysis, also performed by NTS, and documented in Analysis Report DL-CL-19-18-1391, "Anchoring Design Qualification Report for AMT1, AMT2, AER and ACC Panels," Revision A, dated November 4, 1994. These analyses indicated that the total weight of the ACC panels was 8890 pounds and that 79.2% of the total weight was conservatively assumed to be distributed near the top of the cabinet. The inspector reviewed selected portions of NTS Report No. 60091-93F-5, and the anchoring calculation for the ACC panel in Report DL-CL-19-18-1391, and found these qualification documents acceptable.

The finite element analysis by NTS used computer model ANSYS and the validation and verification of this computer model was documented in NTS Procedure No. E5, "Finite Element Analysis Verification and Control," dated June 1, 1992.

BGE searched the modifications list and identified the items that had been added to the ACC panels in the field. These items included current transformers, relays, resistors, and thermostats. The total added weight was calculated to be 35.5 lbs. which was insignificant when compared with the total weight of 8890 lb for the ACC panels. BGE performed an analysis to evaluate the effect of the added weight to the seismic qualification of the ACC panels. This analysis was documented in the Seismic Qualification Review Summary (SQRS) No. 94D-SACM-19, Revision 4, dated March 26, 1996.

The inspector reviewed SQRS No. 94D-SACM-19 and NTS Procedure No. E5, and found them acceptable. The inspector determined BGE corrective actions to be adequate for resolving this item. Therefore, this item is closed.

E8.4 (Update) Unresolved Item 50-317 and 318/96-04-01
Inoperable LPSI pump circuit breaker due to bent trip-paddle problem.

This item was opened during a follow-up of the June 14, 1996, breaker failure, as discussed in Section E1.1, part b. of this report. There were two issues in this unresolved item. The first issue pertained to the bending of circuit breaker linkages by the technicians during the preventive maintenance inspection. The second issue dealt with licensee's root cause analysis for the breaker failure. Following the June 14, 1996, breaker failure, the resident inspector noticed that there were two conditions when the technicians could bend the breaker linkages to bring the measurements to within the designed values. Specifically, if there was "no-gap" between trip-paddle and the end of the trip rod, the technicians could bend the trip-paddle to obtain sufficient gap (about 1/4"), or if the distance (height) between the auxiliary switch operating arm and the floor was not within 14-3/8" - 14-7/16", Station Procedure FTE-15, "4 KV Circuit Breaker and Cubicle Inspection," required the technicians to bend the auxiliary switch operating arm to obtain the specified distance. Since both linkage bending methods were not specified in the manufacturer's (General Electric Company) technical manual, use of this method was unresolved pending receipt of information from General Electric (GE).

BGE obtained a response from GE dated July 16, 1996. The GE response indicated that bending the trip-paddle to obtain the specified "gap" was acceptable. Based on the second breaker failure on July 26, 1996, BGE determined to discontinue the trip-paddle bending method. Instead, BGE selected to replace the trip-paddle assemblies of all 4160V circuit breakers with new GE designed parts, as describe in Section E1.1.b of this report.

The July 16, 1996, GE response did not recommend bending of the auxiliary switch operating arm. Instead it recommended drilling new holes and enlarging existing holes to obtain the specified "height." Based on the result of a search of preventive and corrective maintenance orders (MO), the BGE system engineer stated that, even though "height adjustment by bending" was specified in Procedure FTE-15, bending of the auxiliary switch operating arm had not occurred at Calvert Cliffs during the past six years. There was one bending for breaker 152-1109 in 1990. This breaker had operated properly during the past six years. BGE promptly revised Procedure FTE-15 and changed the instruction from "bending the switch operating arm" to "notifying the system engineer for resolution." This failure to provide an appropriate instruction for activity affecting quality in accordance with 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," constitutes a violation of minor significance and is being treated as a non-cited violation, consistent with Section IV of the enforcement policy. The first issue of this unresolved item was closed.

At the time of this inspection, BGE had not yet completed the root cause analysis for the "trip-paddle bent" issue, as discussed Section E1.1, part b. of this inspection report. BGE stated that they needed more information from GE before they could complete the root cause analysis. The inspector was not sure whether any addition long-term corrective actions were needed as the result of the root cause analysis. This issue remains open pending licensee's completion of the root cause analysis.

IV. Plant Support

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Radiological Controls (External and Internal Exposure Controls)

a. Inspection Scope (83750)

The inspector selectively reviewed personnel dose assessments, and licensee occupational exposure summaries for 1996 up to the time of the inspection. The inspector also reviewed radiological controls provided for welding of fuel casks (loaded with fuel) for transfer to the ISFSI. The casks were loaded with fuel in the spent fuel pool then transferred to the cask wash pit for welding.

b. Observations and Findings

The inspector's review indicated no individual sustained any significant internal or external occupation radiation exposure of note during 1996, including exposures of the skin attributable to radioactive contamination.

BGE provided generally effective radiological controls for fuel cask welding. BGE evaluated the neutron radiation energy spectrum emanating from the filled casks and concluded that its neutron monitoring device could properly monitor neutron dose. The inspector also evaluated the calibration and source checking of the neutron radiation dose rate survey meters used. The calibration and checking were traceable to the National Institute of Standards Technology (NIST). BGE repositioned personnel monitoring devices, as appropriate, to monitor highest radiation dose locations, and used remote reading dosimeters to perform real time radiation monitoring of gamma radiation dose rates and accumulated radiation exposure. BGE implemented effective ALARA controls for the fuel cask welding. The inspector made the following observations:

- For purposes of qualitative monitoring of ambient airborne radioactivity levels during welding, radiation protection technicians had rigged tubing from the work location (cask wash pit) to an airborne radioactivity monitoring instrument at the fuel pool elevation. The tubing used was non-standard and had apparently not been evaluated relative to its capability to collect airborne radioactivity samples. Further, the tubing was attached to the monitor via a hole punched in the hose. Also, one free end of the hose was taped shut. The inspector questioned the use of such in-field non-standard air-sampling arrangements. BGE initiated a review of this matter. The inspector

concluded that notwithstanding the questionable air sampling arrangements, the surface contamination levels on the cask (new casks) were very low and not prone to result in significant airborne radioactivity levels.

- The fuel casks being welded exhibited numerous top located bolt holes. Although the bolt holes were self-draining, BGE could not provide documentation regarding radiation surveys of the bolt holes. Since the cask had been removed from the fuel storage pool, the inspector questioned the lack of survey documentation and the potential for hot particles to collect in the holes. BGE initiated surveys of the bolt holes, did not locate any significant radiation dose rates (e.g., associated with hot particles), documented the surveys, and initiated action to ensure that surveys were documented, as necessary, for future casks.

- The inspector questioned the industrial safety implications of welding in the cask wash pit. Although the pit was not a defined "Confined Space," the inspector noted that BGE could not readily provide air sample (for industrial contaminants) data. BGE initiated a review of this matter. BGE's representative indicated extensive air sampling had been performed and that there were no industrial safety concerns. However, the individual who collected the samples was not available.

c. Conclusion

BGE implemented generally effective external and internal exposure controls. No violations or safety concerns were identified.

R1.2 Radiological Controls (External and Internal Dosimetry Program)

a. Inspection Scope (83750)

The inspector selectively reviewed the capabilities of BGE's personnel monitoring devices and its use of dosimetry accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). The inspector also reviewed the capabilities and testing of BGE's whole body counting equipment.

b. Observations and Findings

The inspector noted that BGE implemented its own in-house personnel monitoring program including processing of the personnel monitoring devices. The inspector reviewed the most recent dosimetry testing data and noted that the test results fell well within test criteria outlined in applicable national standards (ANSI HPS N13.11. 1993, American National Standard for Dosimetry-Personnel Dosimetry Performance-Criteria for Testing). BGE held a valid NVLAP accreditation for all applicable testing categories. The inspector verified that BGE implemented an aggressive program to evaluate and resolve NVLAP auditor comments/concerns, provided appropriate quality assurance for the dosimetry, and evaluated dosimetry test results. In anticipation of an upcoming NVLAP audit, BGE was performing a NVLAP like self-

assessment of its in-house program. The inspector also noted that BGE had subjected its electronic dosimetry to similar testing and concluded that the electronic dosimeter performed well relative to expected radiation energies to be encountered at the station.

BGE operates two whole body counters -- a standup counter and a moveable bed-type counter. The inspector reviewed the quality assurance testing of the standup whole body counter and noted that BGE implemented a variety of tests to verify proper operation of the counter including use of control charts. Although BGE performed generally comprehensive testing, the following observations were made.

- BGE was not able to readily provide traceability of its whole body counter calibrations/testing standards to the National Institute of Standards Technology (NIST). BGE subsequently obtained the traceability data for sources used.

- BGE recently revised its method to compute acceptable operation when performing quality assurance checks for the standup counter. Instead of comparing expected radioactivity to percentage of investigation levels, BGE was comparing expected radioactivity to percentage of annual limits of intake. Although this was a minor calculation change, it was inconsistent with procedure guidance and reflected lack of sensitivity to procedure details. BGE initiated a review of this matter.

c. Conclusion

BGE implemented a generally effective external and internal dosimetry program. No violations or safety concerns were identified.

R1.3 Radiological Controls (Air Sample Analysis Program)

a. Inspection Scope (83750)

The inspector selectively reviewed BGE's air sample analysis program with a specific emphasis on quality controls for air sample analysis.

b. Observations and Findings

The inspector noted that BGE performs air sample counting using gas flow proportional counters. If elevated airborne radioactivity was detected, the air samples were subsequently counted on a gamma spectroscopy system. BGE performed daily and weekly checks of the gas flow proportional counters to detect operational concerns. The inspector selectively verified that the procedurally-described program for the gas flow proportional counters was implemented. The following additional observations were made.

- There were no control charts of any kind for use in evaluating adverse trends associated with the daily or weekly checks of the proportional counters.

- One of BGE's checks for operability for the proportional counters was determination of the sample counter's alpha radioactivity minimum detectable activity (MDA) on a daily basis and comparison of that MDA to a predetermined value. The inspector noted that the MDA was generally low (below the pre-determined value), but fluctuated. However, the MDA selected (3E-12 uCi/ml) was the derived air concentration value (DAC) for a significant alpha emitter (i.e, Pu-239). The inspector questioned the logic of setting the acceptance criteria for an air sample analysis instrument at the DAC of a significant potential alpha emitter.

- The inspector reviewed the procedurally-described formulae used by radiation protection technicians to calculate airborne activity. The inspector concluded that the formulae were basic formulae and did not include all applicable factors for potential air sample analysis concerns (e.g., filter loading).

- The inspector noted that BGE did not have a clearly defined program to inter-compare the station's radiation environment (e.g., radiation energies) with analysis instrument calibration and check source characteristics to ensure calculation to appropriate instrument efficiencies.

The inspector discussed the above observations with cognizant licensee personnel and noted that BGE had initiated a procedure review and revision process for the air sample analysis program.

c. Conclusion

Although no violations or safety concerns were identified, the quality assurance program for the gas flow proportional counters was considered weak. Also, the procedurally-described sample analysis methodology appeared to need improvement. No violations or safety concerns were identified.

R1.4 ALARA Program Performance

a. Inspection Scope(83750)

The inspector selectively reviewed BGE's program to maintain occupational radiation exposure to as-low-as-is-reasonably-achievable (ALARA) and evaluated recent program performance.

b. Observations and Findings

The inspector reviewed BGE's 1996 Radiation Safety Section ALARA Report and BGE's 1996 Unit 1 refuel outage self assessment. BGE had established an overall exposure goal for the 1996 Unit 1 refueling outage of 185 person-rem, but sustained an actual exposure of 205.8 person rem. The principal cause for exceeding the goal was expanded steam generator work. BGE sustained an additional 18.1 person-rem for steam generator work over that originally planned and exceeded goals for radiation safety and minor maintenance by 6.2 and 7.8

person-rem respectively. BGE also experienced a number of successes where the actual aggregate exposure received was less than the goal (e.g., valve and reactor coolant pump maintenance). BGE sustained 34.8 person-rem for refueling path work which, according to BGE was the lowest in the plant's history and within the planned goal.

BGE used a number of actions to reduce exposure including use of early boration to remove primary system radioactive contamination, implementation of remote radiological monitoring, use of infield ALARA assessment personnel, continuation of the site ALARA awareness program, and implementation of area-based planning program for scaffold construction and use. In addition, BGE implemented use of man-hours in planning as compared to tracking maintenance orders. BGE published informative post-outage ALARA reports for the outage.

The inspector noted that BGE has taken action to reduce ambient radiation levels in the station. BGE hydrolazed "hot spots" in piping and, as of the time of the inspection, the station exhibited only four hot spots (e.g., areas with local elevated radiation levels on piping or components). Further, efforts continue at maintaining the station "radiologically clean." BGE indicated about 2% of the station [i.e., about 3,000 square feet was considered contaminated (excluding containment)].

The inspector noted that BGE continued with its radwaste reduction efforts reducing the amount of material generated by 26% as compared to the previous outage.

The following additional observations were made.

- Although overall outage ALARA performance was very good and significantly improved from previous outages, several residual weaknesses in key ALARA program areas were noted (e.g., scope control, communications, and contingency planning). For example, planning weaknesses (e.g., missed milestones) created uncertainty on job paths resulting in difficulty in developing dose estimates. BGE was aware of these issues, documented them in its outage report, and was planning actions to reduce or eliminate their impact on future outage ALARA performance.

- The inspector noted that it was not clear that BGE was effectively benchmarking itself against similar facilities to identify areas for improved ALARA performance.

c. Conclusion

BGE implemented an overall effective ALARA program, but apparent residual weaknesses exist in key program areas. In addition, opportunities for improved benchmarking exist. No violations or safety concerns were noted.

R2 Status of Radiation Protection and Chemistry Facilities

a. Inspection Scope (83750)

During a previous inspection (Reference NRC Combined Inspection No. 50-317 & 318/95-09, dated December 4, 1995) the inspector walked down all accessible portions of the station's radioactive liquid and radioactive solid waste collection, processing, and storage systems/locations. The inspector noted, among other observations, that the systems/storage locations were well maintained. However, the inspector noted apparent insulation to be coming off piping in the spent resin metering tank room. Also, an unexplained deficiency tag was noted on a valve in the room. BGE initiated a review of these matters.

During this inspection, the inspector attempted to ascertain the status of the room (particularly floor and tank conditions) and also to determine if any other isolated areas were unknown relative to system and area conditions.

b. Observations and Findings

Regarding the spent resin metering tank room, the inspector's review during this inspection indicated that BGE had generated an issue report for this matter and had lowered cameras into the relatively narrow space between the tank and its concrete shield. The inspector reviewed the pictures and noted that the floor areas exhibited miscellaneous debris and apparently a small quantity of resin (i.e., less than about 1/4 inch deep in several small spots). BGE personnel indicated that the resin was old, that the tank was sound and there were no indications of a leaking tank. The resin was apparently from a previous overflow of resin. BGE was attempting to plan and identify, as appropriate, a means of cleaning the room. However, current elevated radiation levels precluded such activity.

The inspector noted that BGE had also identified two other areas that were typically not entered and indicated that these areas were to be evaluated. These areas were the ion exchange pits (45 foot elevation Auxiliary Building - 3 pits per unit) and the spent fuel ion exchange pits (27' Auxiliary Building - one pit for both units). BGE also was evaluating other locations.

c. Conclusion

BGE's facility exhibited a generally clean and well maintained appearance. However, BGE was not able to provide a report on conditions in selected isolated areas as discussed above. Also, the spent resin metering tank room exhibited debris and spilled resin as discussed above. These matters should be reviewed and resolved by BGE, as appropriate.

R8 Miscellaneous RP&C Issues

R8.1 (Closed) Violation (50-318/96-04-02): Storage of Radioactive Materials

On June 21, 1996, the inspector identified several radioactive material packages that exhibited faded labels or tags and that were not protected from the environment. In addition, a package of radioactive material (steel box) was breached. These observations were considered a violation. (Reference NRC Combined Inspection Report No. 50-317/96-04; 50-318/96-04, dated July 26, 1996.)

Subsequent to the identification, BGE immediately initiated actions to evaluate and correct the above observations and implement a Radioactive Material Storage Action Plan, dated June 21, 1996. BGE also implemented the corrective actions outlined in its August 23, 1996, letter to the NRC. The corrective actions included revisions of procedures to clearly identify storage area inspection criteria and to clearly identify ownership responsibilities and controls governing the maintenance and inspection of radiological material storage areas. Training was also provided, as appropriate. This item is closed.

R8.2 (Closed) Violation (50-317/96-03-01): High Radiation Area Access Control

The inspector reviewed three licensee-identified violations in the area of High Radiation Area posting or access control. The inspector concluded that it was appropriate to cite these licensee-identified violations and a violation was issued (see NRC Combined Inspection No. 50-317/96-03; 50-318/96-03, dated June 12, 1996).

The inspector's review indicated BGE implemented the corrective and preventive actions described in its July 19, 1996, response to the violation. BGE took, among other corrective actions, the following corrective actions:

- Station management issued a memorandum to site supervisors regarding the events and discussed the need to adhere to radiation protection procedures.
- BGE instituted use of special step-off pads (at entrances to High Radiation Areas) as an additional alerting mechanism of personnel.
- The events were reviewed by the station's operating review committee.
- A work stoppage was initiated for appropriate contractor employees and remedial instruction was provided for all contractor employees.
- BGE initiated 24-hour manning of steam generator checkpoints.

Following a subsequent instance on June 27, 1996, (see Section R8.3 of this report) BGE initiated a number of additional actions.

- BGE conducted face-to-face meetings with all applicable station workers.
- On July 3, 1996, a site-wide safety break was held to discuss the recent High Radiation Area events.
- A High Impact Team was established to evaluate human performance issues associated with the High Radiation Area issues.
- BGE's Plant General Manager initiated a policy that he will review all High Radiation Area violations.
- BGE reduced the number of areas required to be controlled as High Radiation Area (i.e., reduced from 21 to 14).
- BGE developed and implemented a procedure for sponsorship and ownership of contractor personnel.
- BGE required all personnel who access the RCA to be trained in a special mock-up.
- BGE modified High Radiation Area key controls in that each High Radiation Area could only be accessed by one designated key.
- BGE set up a High Radiation Area access point display seen by all personnel entering the station.

These corrective actions were considered acceptable. This item is closed.

R8.3 (Closed) Unresolved Item (50-317,318/96-04-04): High Radiation Area Access Control

On June 27, 1996, a BGE temporary employee entered a posted High Radiation Area located in the Materials Processing Facility, Dry Active Waste Storage building. The individual's access was not monitored as required for High Radiation Area work, the individual had not received training for unescorted entry into High Radiation Areas, and the individual was not permitted to enter the area by the Special Work Permit under which the individual was working. A materials processor employee in the area observed the individual in the roped area, questioned the individual on access controls, and escorted the individual out of the Materials Processing Facility.

A Notice of Violation was previously issued (reference NRC Combined Inspection Report No. 50-317,318/96-03, dated June 12, 1996) for three instances of failure comply with procedures associated with High Radiation Areas (see Section R8.2 of this report). BGE informed the inspector that among other corrective actions, a radiological assessment of the event had been performed and that the individual had not received any significant exposure, that the June 27, 1996, event would be discussed as part of the response to the Notice of Violation included with

aforementioned report, and corrective actions for the recent occurrence would be specified. BGE initiated an extensive root cause evaluation and took actions to raise the awareness of Calvert Cliffs radiation workers to radiation control requirements (see Section R8.2 of this report).

The inspector noted that Technical Specification (TS) 6.11 requires, in part, that procedures for personnel radiation protection be adhered to for all operations involving personnel radiation exposure. Further, Calvert Cliffs' Radiation Safety Manual requires in Section 6.2.I that workers comply with special work permit (SWP) requirements. The inspector noted that the temporary employee did not comply with his SWP in that it prohibited entry into a High Radiation Area. This is a violation of TS 6.11 and Radiation Safety Manual Section 6.2.1. Consequently, Unresolved Item No. 96-04-04 (discussed above) is closed and the issue is considered a violation.

The inspector noted that this fourth example of failure to adhere to High Radiation access control requirements occurred subsequent to the issuance of NRC Combined Inspection Report No. 50-317,318/96-03 and prior to BGE's response, dated July 19, 1996, to the Notice of Violation. As a result, BGE detailed its corrective actions for this additional example in its response to the Notice of Violation transmitted with the aforementioned report. Consequently, the inspector considered it appropriate to consider the June 27, 1996, violation as an additional example of the violation outlined in the aforementioned report.

The inspector noted that information regarding the reason for the violation, the corrective actions taken and planned to correct the violation and prevent recurrence, and the date of compliance was previously addressed on the docket in BGE's July 19, 1996, response. Consequently, no additional response is required.

R8.4 (Closed) Unresolved Item (50-317&318/96-04-05): Improper Entry to Radiological Controlled Areas

During a previous inspection (reference NRC Combined Inspection No. 50-317&318/96-04) the inspector noted that BGE had experienced a number of instances of personnel apparently improperly entering the radiological controlled area (RCA). Forty-four individuals did not properly access the RCA in 1995 and twenty-seven had not in 1996, up to the time of the referenced inspection. BGE attributed the majority of improper entries to start-up difficulties with the new real-time electronic dosimetry system and had taken a number of actions to address this issue. These actions included training of all appropriate site personnel on the access control system, provision of alarms for improper sign-in on the access control system, and enhancement of oversight of RCA sign-in/out process. In addition, BGE provided observers at RCA access points to question personnel entering the RCA as to their level of knowledge of their respective RWPs.

During the inspection, the inspector reviewed the apparent reasons for the improper entries and the effectiveness of BGE's corrective actions. The inspector concluded that BGE was closely monitoring access controls and that any apparent improper

entries were aggressively pursued relative to cause and implementation of corrective actions. The inspector noted that personnel RCA access errors at the computer assisted sign-in station were immediately brought to the attention of the individual committing the error by local alarms. Further, radiation protection personnel were made aware of the problem via alarms and a separate computer screen at the radiation protection office. The inspector noted that use of the access control computer was also discussed during recently presented High Radiation Area access control training. BGE also placed instructional aides at each station.

The inspector reviewed all RCA entry errors for 1996 and concluded that the majority of errors were personnel interface errors with the computer system, which has since been corrected and that the few isolated errors subsequent to June 1996 were being aggressively evaluated and corrected by BGE. This item is closed.

R8.5 (Update) Unresolved Item (UNR 50-317&318/96-04-03): Verification of Updated Final Safety Analysis (UFSAR) Commitments

A recent discovery of a licensee operating their facility in a manner contrary to the UFSAR description highlighted the need for a special focused review that compares plant practices, procedures and/or parameters to the UFSAR description. While performing the inspections discussed in this report, the inspectors reviewed the applicable portions of the UFSAR that related to the areas inspected. In particular, the inspector evaluated waste storage matters.

During a previous inspection, several inconsistencies associated with processing and storage of radioactive waste and material at the Calvert Cliffs Nuclear Power Plant relative to descriptions and commitments provided in Chapters 1, 11, and 12 of BGE's UFSAR were identified. During the previous inspection, the inspector identified that the UFSAR did not identify all onsite radioactive material storage areas. Only two of the apparent twelve onsite areas were identified and discussed. Also, only two of the twelve areas had a supporting 10 CFR 50.59 evaluation.

BGE subsequently reviewed the inspector's observations and indicated that all areas need not necessarily be defined in the UFSAR. Specifically, BGE indicated UFSAR Chapter 11.4 provides for storage and control of licensed material in accordance with program procedures. Further, BGE indicated that a safety evaluation was to be performed for the Temporary Hazardous Waste Storage area. However, BGE was reviewing the need for 10 CFR 50.59 evaluations for the other areas. The inspector did note that BGE was also reviewing the documentation of the safety evaluation for onsite concrete storage containers located at the West Road.

R8.6 Receipt of Contaminated Equipment

BGE's Unit 1 operating license contained a requirement that limits storage of contaminated equipment to a maximum total radioactivity of 500 millicuries of contamination. BGE had apparently never evaluated the requirement to determine if the limit was met. The Unit 2 license did not have such a limit. BGE initiated an evaluation of this matter. Further, BGE initiated actions to evaluate and revise the

license, as appropriate (reference NRC Combined Inspection No. 50-317 & 318/96-04).

The inspector's review indicated that BGE did not have a program to ensure conformance with the limit. BGE subsequently inventoried all radioactive material onsite and concluded that the limit was not exceeded. BGE subsequently submitted a license amendment request on October 3, 1996, to eliminate the restriction on receipt of byproduct material. BGE continues to maintain the inventory pending approval of the amendment request.

R8.7 Use of Environmental Lower Limits of Detection

The inspector noted that BGE detected slightly contaminated sewage sludge at its sewage treatment station through use of environmental lower limits of detection for release of material from the station. BGE stored the sludge and subsequently obtained an innovative system to dewater the sewage sludge. The sewage was dewatered and was awaiting shipment for disposal. BGE subsequently determined that the slight contamination of the sewage was attributable to the presence of extremely low levels of contamination (on floors outside of the radiological controlled area access) being mopped up and the mop water subsequently being dumped into clean floor drains. BGE has directed that the mop water be processed as a radioactive liquid. The inspector did not have any further questions on this matter.

R8.8 Radiation Dose Rates on Refueling Water Storage Tanks

During a previous inspection (Reference NRC Inspection No. 50-317/96-04; 50-318/96-04) the inspector noted elevated radiation levels on the outdoor Refueling Water Storage Tanks. The inspector was informed that the tanks exhibited radiation dose rates due to water being transferred between the tanks and plant systems. The dose rates increased during outages. The inspector questioned what if any activity limits were placed on the tanks (for offsite worst case dose consequence analysis purposes in the event of a tank rupture) and what, if any, impact the elevated radiation dose rates on the tanks had on conformance with 40 CFR 190 offsite dose limits.

During the inspection, BGE informed the inspector that the tanks were seismic qualified and consequently no offsite pathway analysis was needed. BGE provided the safety evaluation for NRC Licensee Amendment Nos. 100 and 82 (dated February 22, 1985) which indicated that no requirements for tank inventory (in terms of radioactivity) was needed. Further, BGE indicated radiation dosimeters monitor ambient radiation levels at selected protected area perimeter locations. BGE's Senior Chemist and Supervisor, Chemistry Technical Services indicated the radiation levels identified at the perimeter locations were essentially at background and comparable to offsite (controlled locations) readings. The inspector did not have any further questions on this matter.

R8.9 Rodents

During a previous inspection (NRC Inspection No. 50-317/96-04; 50-318/96-04) the inspector observed rodents (groundhogs) entering various storm drain piping around the station. The rodents also entered and exited areas posted as Radiological Controlled Areas. BGE initiated a review of this matter.

BGE informed the inspector that at least 12 groundhogs had been captured in the protected area and released at remote locations outside the protected area.

R8.10 Composite Resin Sampler

During a previous inspection (reference NRC Combined Inspection No. 50-317/95-09; 50-318/95-09), the inspector noted that there was no defined preventive maintenance program for the composite resin sampler. The sampler was used for collecting composite samples of spent resin sluiced from the spent resin metering tank to high integrity containers. The composite samples collected are analyzed and used for purposes of qualification of total resin curie content for shipping purposes. BGE indicated that these matters would be reviewed.

During this inspection, the inspector noted that BGE evaluated the composite resin sampler capabilities and developed a surveillance to monitor the fill head and sampler. BGE will periodically test the equipment.

R8.11 Loss of Integrity of Radioactive Materials Shipment

On May 24, 1996, a shipment of contaminated scaffolding on a flatbed trailer was shipped to the Chem-Nuclear Systems, Barnwell, South Carolina facility for processing. Upon arrival at the facility, the container, a 20-foot long sea-land type container was found to have a 5-6 inch hole in the floor of the container. The hole was apparently made, according to BGE, by the concentrated force from the scaffold rack on the floor when the scaffold shifted. No contamination was found on the exterior of the package. The state of South Carolina subsequently issued an infraction to BGE by letter dated July 9, 1996. BGE subsequently responded to the infraction in a letter dated August 8, 1996.

BGE implemented the corrective actions including revising procedures to require the use of weight distributing plates to prevent concentrated forces from punching holes in shipping containers, revised the driver instructions to notify the shipper of emergency stops which could damage packages, informed the owner of the container to alert other users of the concern, and issued a memorandum to the Materials Processing Supervisor on August 8, 1996, directing inspection of containers. In addition, BGE provided training on this matter to radiation safety personnel and included the issue in continuing training.

The inspector noted that 10 CFR 71.5 requires, in part, that licensees who transport licensed material outside the confines of its plant or other place of use comply with the applicable requirements of 49 CFR 170 through 189. 49 CFR 173.421 (a)(1)

requires that packages used to ship excepted limited quantities of Class 7 (radioactive) material comply with the general package design requirements of 49 CFR 173.410. The inspector noted that 49 CFR 173.410 requires, in part, that each package used to ship Class 7 (radioactive) material be designed such that the package will be capable of withstanding the effects of any vibration or acceleration that may arise under normal conditions of transport, without deterioration in the effectiveness of the package.

The inspector noted that on May 24, 1996, BGE shipped a package containing Class 7 (radioactive) materials (described as Excepted Package-Limited Quantity of Material, UN2910) which subsequently arrived at its destination on May 28, 1996, and was found on May 29, 1996, to have a 5 to 6 inch hole on the underside of the package. This is a violation of 49 CFR 173.410 and 10 CFR 71.5. **(VIO 50-317&318/96-07-02)**

R8.12 Housekeeping

The inspector noted that overall housekeeping was very good. However, the inspector noted that an individual had apparently thrown chewing tobacco in the overhead of the elevator in the Auxiliary Building, which is located in a radiological controlled area. The inspector noted the observation did not reflect good radiological controls practice since BGE prohibits chewing in the RCA.

P1 Conduct of Emergency Preparedness (EP) Activities (71750)

P1.1 Emergency Response Drill

On September 19, 1996, BGE conducted a radiological emergency response drill. The inspectors observed portions of the drill in the simulator and the emergency operations facility. Afterwards, BGE stated that the drill met the primary objective of providing a supervised instruction period for testing, developing, and maintaining emergency response skills. The inspector noted good control and evaluation of the drill by BGE emergency response organization personnel. The inspector attended two post-drill critiques and observed that BGE identified performance deficiencies were entered into the BGE corrective action system for tracking and resolution. Overall, the inspector concluded that the drill performance and evaluation was properly conducted.

S1 Conduct of Security and Safeguards Activities

S1.1 Access Controls

On September 27, 1996, BGE security informed the inspectors that drug paraphernalia had been identified during the pre-access search of a vehicle. The vehicle was operated by a contracted individual who sought access to the protected area to remove material used during Unit 1 outage activities. The vehicle and driver were denied site access and Maryland State authorities were informed. The

inspectors considered the event as an example of security program effectiveness in preventing contraband items from entering the protected area.

F8 Miscellaneous Fire Protection Issues

F8.1 (Closed) Violations 50-317/94-34-01, 50-318/94-33-01, and 50-317 and 318/96-04-06: Missed Fire Watch Activities

NRC Violation 50-317/94-34-01 and 50-318/94-33-01 described examples where dedicated fire watch personnel were assigned concurrent duties, contrary to the responsibilities stated in the BGE fire protection program procedure. NRC Violation 50-317&318/96-04-06; described three examples of inadequate fire protection activities at Calvert Cliffs Nuclear Power Plant. Each of the examples were also described in Licensee Event Reports 50-317/96-02; 50-318/96-02; and 50-318/96-03. The inspectors reviewed the corrective actions stated in the BGE response to the violation and found that actions had been implemented to correct the causes of the fire protection events. Specifically, a revision to the fire protection procedure had been implemented which established responsibility for fire watch activities. The fire and safety group chain of command was realigned to include a general supervisor. Also, a radiopager process was implemented which allowed the fire and safety group to positively verify that hourly fire watch activities were being conducted. BGE completed a comprehensive review using the independent safety engineering group with milestones established for addressing identified issues. The inspectors considered the actions by BGE to be appropriate and found that fire watch activities were effectively conducted by knowledgeable individuals. The violations and related licensee event reports are closed.

V. Management Meetings

X1 Exit Meeting Summary

During this inspection, periodic meetings were held with station management to discuss inspection observations and findings. On October 23, 1996, an exit meeting was held to summarize the conclusions of the inspection. BGE management in attendance acknowledged the findings presented.

L1 Review of UFSAR Commitments

A recent discovery of a licensee operating its facility in a manner contrary to the Updated Final Safety Analysis Report (UFSAR) description highlighted the need for a special focused review that compares plant practices, procedures and/or parameters to the UFSAR description. While performing the inspections discussed in this report, the inspectors reviewed the applicable portions of the UFSAR that related to the areas inspected to verify that the UFSAR wording was consistent with the observed plant practices, procedures and/or parameters. No discrepancies were identified.

ATTACHMENT 1

PARTIAL LIST OF PERSONS CONTACTED

BGE
P. Katz, Plant General Manager
K. Cellers, Superintendent, Nuclear Maintenance
K. Neitmann, Superintendent, Nuclear Operations
P. Chabot, Manager, Nuclear Engineering
T. Camilleri, Director, Nuclear Regulatory Matters
B. Watson, General Supervisor, Radiation Safety
C. Earls, General Supervisor, Chemistry
L. Gibbs, Director, Nuclear Security
T. Sydnor, General Supervisor, Plant Engineering
T. Forgette, Director - Emergency Preparedness

NRC
S. Bajwa, Director (Acting), Project Directorate I-3, NRR
A. Dromerick, Project Manager, NRR
J. Wiggins, Director, Division of Reactor Safety, Region I

INSPECTION PROCEDURES USED

IP 62707: Maintenance Observation
IP 71707: Plant Operations
IP 93702: Prompt Onsite Response to Events at Operating Power Reactors
IP 61726: Surveillance Observations
IP 37550: Engineering
IP 37551: Onsite Engineering
IP 71750: Plant Support Activities
IP 83750: Occupational Exposure
IP 92700: Onsite Followup of Written Reports of Nonroutine Events at Power Reactor

FACILITIES

IP 92902: Followup - Engineering
IP 82701: Operational Status of the Emergency Preparedness Program

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-317&318/96-07-01	IFI	Upgrade of procedure; ISFSI-02, Cask Unloading
50-317&318/96-07-02	VIO	Breached Shipping Container

Closed

50-317/94-28-02	VIO	Unauthorized Modification
50-318/94-29-02	VIO	Unauthorized Modification
50-317/94-34-01	VIO	Compensatory Fire Watch Activities
50-318/94-33-01	VIO	Compensatory Fire Watch Activities
50-317&318/96-04-02	VIO	Failure to follow radiation protection procedures
50-317/96-03-01	VIO	Failure to follow radiation protection procedures
50-317&318/96-04-04	UNR	RCA access control concern
50-317&318/96-04-06	VIO	Missed Fire Watch Patrols
50-317/96-02	LER	Missed Fire Watch
50-318/96-02	LER	Missed Fire Watch Due to Personnel Error
50-318/96-03	LER	Missed Fire Watch Due to Personnel Error
50-318/95-01-01	UNR	Seismic Evaluation for modification of prequalified safety related control cubicle

Discussed

50-317&318/96-04-03	UNR	Verification of Updated Final Safety Analysis (UFSAR) Commitments
50-317&318/96-04-01	UNR	Inoperable LPSI pump circuit breaker due to bent trip paddle

LIST OF ACRONYMS USED

ALARA	As Low As Reasonably Achievable
RCA	Root Cause Analysis
SWP	Special Work Permit
kV	Kilovolts (1000 volts)
UFSAR	Updated Safety Analysis Report
TLD	Thermoluminescent Dosimeter
RCAR	Root Cause Analysis Report
RCA	Radiological Controlled Area
NIST	National Institute of Standards Technology
NVLAP	National Voluntary Laboratory Accreditation Program
AFW	Auxiliary Feedwater
LCO	Limiting Condition for Operability
MOs	Maintenance orders
SW/SRW	Salt Water/Service Water System
ISFSI	Independent Spent Fuel Storage Installation
ETP	Engineering Test Procedure
PES	Plant Engineering Section
MDA	Minimum Detectable Activity
DSC	Dry Storage Canister
ISEG	Independent Safety Engineering Group
RP&C	Radiological Protection & Chemistry
EP	Emergency Preparedness
RCA	Radio Controlled Area
DAC	Derived Air Concentration
NTS	National Technical Standards
CFR	Code of Federal Regulations