U.S.NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos.	50-317/95-08; 50-318/95-08
License Nos.	DPR-53/DPR-69
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
Inspection conducted:	August 6, 1995, through September 16, 1995
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Inspection Summary:

Core, regional initiative, and reactive inspections performed by the resident inspectors during plant activities are documented in the areas of plant operations, maintenance, engineering, and plant support. Additionally, inspections conducted by regional inspectors are documented in the areas of maintenance, engineering, and radiological environmental and meteorological monitoring programs.

Results:

See Executive Summary.

EXECUTIVE SUMMARY

Calvert Cliffs Nuclear Power Plant, Units 1 and 2

Inspection Report Nos. 50-317/95-08 and 50-318/95-08

Plant Operations: Both units were operated safely during the period. There were no significant operational events this period.

Maintenance: Maintenance activities observed were performed in a safe and professional manner. Pre-job briefings, communications, and the use of self-verification practices were generally good, except as noted below. BGE's maintenance backlog was satisfactorily managed and maintenance that impacted safety-related components was promptly performed.

An incorrect solenoid was used on a component cooling control valve due to using the wrong stock number and failure to verify the right part before installation. This was a Non-Cited Violation.

Engineering: Tests conducted for the new diesel generator were properly controlled and executed in accordance with established test procedures. The test procedures for this diesel generator were of good quality and contained appropriate acceptance criteria. The actions taken by BGE in response to loss of diesel engine cooling water were appropriate and thorough. BGE had provided good management oversight for the diesel generator project (DGP) activities. The quality assurance audits of project construction and the diesel generator vendors were thorough and comprehensive. The audit reports were of good quality.

Engineering reviews to resolve unresolved electrical system open items were thorough and well documented. Significant resources have been, and are continuing to be, expended to upgrade the electrical systems by installing 13.8 kV voltage regulators, upgrading the capacity of the existing emergency diesel generators, installing two additional emergency diesel generators, performance of system load flow studies, and planned modifications to replace the degraded grid and bus undervoltage protection relays.

The operability evaluation associated with the cork expansion joints that was performed as a result of the fire that occurred on April 14, 1995, did not contain adequate technical bases to support a conclusion that cork joints that had caulk or metal covers were operable fire barriers. The inspectors also concluded that the cork expansion joints were not designed to be rated fire barriers, nor had they been tested to prove their ability to perform as fire barriers. As such, a Notice of Violation was issued for the failure to comply with the requirements of 10 CFR 50.48, "Fire Protection."

Plant Support: Within the areas inspected, BGE continued to maintain an excellent Radiological Environmental Monitoring Program and Meteorological Monitoring Program. Responsible individuals were knowledgeable with respect to the implementation of the above programs.

(Executive Summary Cont'd)

A neutron radiation area boundary at the Unit 2 containment personnel air lock was inadvertently removed following routine decontamination activities. This was a Non-Cited Violation. In separate instances, a locked high radiation area door was found unlatched and a high radiation area boundary rope was found down. These events were an Unresolved Item pending further investigation by BGE and NRC evaluation.

BGE properly prepared the site in accordance with procedures for Hurricane Felix.

Safety Assessment/Quality Verification:

An example of lingering problems in maintenance self-verification occurred as noted during work on a component cooling water control valve.

The operability evaluation associated with the cork expansion joints that was performed as a result of the fire that occurred on April 14, 1995, did not contain adequate technical bases to support a conclusion that cork joints that had caulk or metal covers were operable fire barriers. In addition, the cork expansion joints were not designed to be rated fire barriers, nor had they been tested to prove their ability to perform as fire barriers.

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DETAILS

1.0 SUMMARY OF FACILITY ACTIVITIES

Unit 1 began the period at full power. On August 18, power was reduced to 70% to perform corrective maintenance on both steam generator feed pump (SGFP) speed control circuits. Repairs were made without significant incident and the unit returned to full power on August 20.

Unit 2 began the period at full power. On September 2, BGE reduced power to 70% to perform corrective maintenance on both SGFP speed control circuits. The unit returned to full power on September 5.

2.0 PLANT OPERATIONS (INSPECTION PROCEDURES (IPs) 71707, 92901)

The inspectors observed plant operation and verified that the facility was operated safely and in accordance with licensee procedures and regulatory requirements. This review included tours of the accessible areas of the facility, verification of engineered safeguards features (ESF) system operability, verification of proper control room and shift staffing, verification the units were operated in conformance with technical specifications and that appropriate action statements for out-of-service equipment were implemented, and verification that logs and records were accurate and identified equipment status or deficiencies. There were no significant operational events this period.

2.1 Plant Operations and Safety Review Committee

The inspectors attended several Plant Operations and Safety Review Committee (POSRC) meetings. Technical Specification (TS) 6.5.1 requirements for required member attendance were verified. The meeting agendas included safety significant issue reports, proposed tests that affected nuclear safety, 10 CFR 50.59 evaluations, reportable events, and proposed changes to plant equipment that affected nuclear safety. Overall, the level of review and member participation was satisfactory in fulfilling the POSRC responsibilities.

3.0 MAINTENANCE (IPs 62703, 61726, 92902)

3.1 Routine Surveillance Observations

The inspectors witnessed/reviewed selected surveillance tests to determine whether properly approved procedures were in use, 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. Inspectors noted that an appropriate level of supervisory attention was given to the testing depending on its sensitivity and difficulty. Surveillance testing activities reviewed are listed in Attachment 1.

3.2 Routine Maintenance Observations

The inspector reviewed selected maintenance activities to assure that the work was performed safely and in accordance with proper procedures. Inspectors noted that an appropriate level of supervisory attention was given to the work depending on its priority and difficulty. Maintenance activities reviewed are listed in Attachment 1.

3.3 Other Maintenance Observations

The inspectors also performed a detailed review of maintenance activities involving the overhaul of the 22 auxiliary feed water (AFW) pump under maintenance order (MO) 2199503237, the replacement of a secondary disconnect on the 11 low pressure safety injection (LPSI) pump breaker cabinet under MO 1199500731, and the performance of surveillance test procedure (STP) STP-M-520C-1, "ESFAS Containment Pressure Channel ZF Calibration."

Preparations for performing the various maintenance activities were good. The inspectors observed that the first line supervisors (FLS) conducted pre-job briefings conducted for each activity. The briefings were thorough, addressed appropriate safety precautions, and were documented on a pre-job briefing checklist. Prior to commencing any work, workers reviewed the scope of their respective MOs including all instructions and prints, properly verified the adequacy of tagout boundaries, and verified that equipment was properly de-energized. Personnel performing the activities were qualified in those job tasks, and the qualification matrix for maintenance personnel was up to date.

Communications during the performance of maintenance activities were formal, especially when an operator interface was required. Repeat backs of action steps by both operators in the control room and maintenance personnel were excellent. Operators and instrumentation and control (I&C) personnel also demonstrated excellent use of STAR (stop, think, act, review) practices. For example, during the performance of STP-M-520C-1, the operation of reactor protection system (RPS) and engineered safety features actuation system (ESFAS) bypasses switches were carefully performed. Calibrated instruments used during the activities were all within their required due dates.

During the replacement of a secondary contractor insulator board on the No. 11 LPSI breaker cabinet at Unit 1, the MO did not reference a vendor drawing which provided detailed instructions for installing the board, including torquing requirements for the bolts. The electricians and the FLS determined it was not essential to stop the job and incorporate the drawing into the MO, as the instructions were within the skill of the craft, and they did not alter the scope of the job. A feedback sheet was completed to ensure the planners incorporated the vendor drawing in future MOs. However, the vendor drawing should have been referenced by the MO, as the additional instructions and torque requirements contained in the vendor drawing were not reviewed by appropriate groups. For example, a quality engineering (QE) review of this safety-related MO may have resulted in a quality verification of the torque requirements. This was indicative of insufficient review of the job scope by

planners. BGE documented the problem on an issue report to address why the job was not stopped to incorporate the vendor drawing.

The use of probabilistic risk assessment (PRA) for the planning and scheduling of maintenance activities was effective. For example, the No. 13 AFW pump maintenance scheduled for August 23 was rescheduled after considering the increased risk caused by the unexpected failure of the No. 22 AFW pump on August 21.

The IR system was the single method for documenting abnormal plant conditions and initiating maintenance. BGE had a relatively low threshold for generating IRs, and trends the causes of IRs to identify and evaluate adverse trends. Maintenance performance trends were being tracked in 17 areas. The most significant trend was weak foreign material exclusion (FME) practices. This trend was first identified in 1989, and BGE management instituted action plans to correct this trend. Notwithstanding heightened management attention and corrective actions to address this longstanding problem area, FME problems have persisted.

Overall, the maintenance activities observed were performed in a safe and professional manner. Pre-job briefings, communications, and the use of STAR practices were good.

3.4 Maintenance Backlog

As of August 24, 1995, there were 487 maintenance orders (MOs) for safety-related equipment deficiencies in the maintenance backlog, while the overall backlog for all systems was approximately 2000 MOs. The MOs were prioritized from 1 to 5, with 1 being the highest priority due to the problem's potential impact on the plant. Of the 487 backlogged MOs, only 21 were priority level 3, two were priority level 2, and two were priority level 1. The assigned priorities for selected safety-related system MOs were reviewed and found to be acceptable. Priority 1 and 2 MOs were actively being worked, and the priority 3 MOs were scheduled for completion in the near future.

The backlog of MOs was tracked and trended by responsible department, age (greater than 6 months), priority, work type, and operational mode. System engineers also periodically reviewed the equipment maintenance history to identify significant trends. Maintenance backlog trend reports were published weekly and reviewed by BGE management, with backlog reduction goals established for the various trend reports. With the exception of priority 1 and 2 MOs, BGE had not consistently met established goals. In addition, the maintenance backlog has remained relatively constant since January 1995.

The inspectors conducted a detailed review of the maintenance backlog for several safety-related systems. The backlog was appropriately prioritized based on the safety impact of the maintenance item. Overall, the inspectors concluded that BGE's maintenance backlog was satisfactorily managed and maintenance that impacted safety-related components was promptly performed.

3.5 Solenoid Valve Misapplication

On August 20, while troubleshooting the cause of a ground on the control circuit for component cooling water valves 2-CV-5160 and 2-CV-5206, BGE electricians found one of two solenoids for 2-CV-5206 had burned up. BGE determined that the solenoid was not appropriate for its application. Its control power was 125vDC; however, the solenoid was configured for 120vAC. BGE replaced the solenoid with a correct one.

The inspectors reviewed the issues surrounding the installation of the wrong solenoid, noting that BGE has not had a problem of this sort in the recent past. While BGE's root cause evaluation was not formally completed when the inspection period ended, the inspector discussed the preliminary findings with BGE engineering and procurement personnel. The safety-related solenoid was scheduled to be changed out on August 9 due to expiration of its environmental qualification. The maintenance order (MO 2199405234) specified a like-for-like changeout and included a quality verification of the solenoid's characteristics per the qualification maintenance requirement sheet (QMRS) prior to installation. Once the new solenoid was installed, operators stroked the valve satisfactorily and the valve was declared operable. BGE's on-going investigation determined the following:

- The part number for both AC and DC solenoids, as provided by the manufacturer, was the same. The purchaser was responsible for specifying the particular application.

- The QMRS stock number for 2-SV-5206 incorrectly specified an AC solenoid in section 5 (Replacement Parts). However, in both sections 1 (Equipment Description) and 5, the solenoid was described as requiring a 125vDC coil.

- The type of coil supplied was identified on the nameplate attached to the top of the solenoid housing.

- The quality verification (QV) inspector did not verify all the critical characteristics of the solenoid as described in section 1 of the QMRS and as required by the MO. When later interviewed by BGE concerning his role in this issue, the QV inspector stated that he had allowed himself to be distracted during his inspection and forgot to verify the solenoid coil type.

- Post-installation testing was not adequate to detect whether the correct solenoid was used.

- The solenoid valve associated with the safety function of the isolation valve was operable and capable of throttling flow from the component cooling water heat exchanger in the event of an accident. The safety significance of this event was therefore minimal.

BGE's immediate corrective actions included replacing the solenoid with one with a DC coil, taking appropriate disciplinary action, and reviewing the

incident with the electrical and controls technicians. BGE also verified that the proper solenoids were installed on three other similar valves and initiated a review of similar QMRSs to verify their accuracy.

The inspector assessed that BGE's installation of an incorrect solenoid was due to several causes, including a failure to follow procedure, an incorrect stock number, and a lack of questioning attitude during installation of the solenoid. However, BGE's corrective actions were prompt and thorough and this event appeared to be an isolated occurrence. BGE's failure to follow procedures (the MO and QMRS) and the use of inaccurate data (the stock number) were violations of Criterion V of 10 CFR 50, Appendix B, which requires that activities affecting quality be accomplished in accordance with procedures or instructions, including appropriate acceptance criteria for determining that the activities were completed satisfactorily. However, these licensee-identified and corrected violations are being treated as Non-Cited Violations, consistent with Section VII of the NRC Enforcement Policy.

3.6 22 Auxiliary Feedwater Pump Failures

On August 21, following the performance of a routine surveillance test, 22 auxiliary feedwater (AFW) pump seized during coastdown. BGE declared the pump inoperable and disassembled the pump end for inspection. BGE found that the balance bushing was galled. The bushing was replaced and the pump was inspected for foreign material. None was found and the pump was reassembled. Following the post-maintenance test the pump again seized during coastdown. The pump was rebuilt, reassembled, and successfully test run.

The inspectors reviewed the work package for pump reassembly and found it detailed and providing clear work direction. Appropriate foreign material protection controls were provided and properly adhered to during the job.

The inspectors discussed this event with operations and system engineering personnel and observed portions of the two pump reassemblies. BGE indicated that their initial investigations revealed several contributing causes for the pump seizures, including:

- The pump was reassembled during the May, 1995, overhaul with the same rotating element instead of a refurbished one. This element was found to be slightly eccentric, which with an out-of-round balance sleeve resulted in significantly reduced clearances.

- The rotating element was aligned improperly.

- The pump bearing housing was not properly doweled to the casing.

The inspectors also reviewed the functional evaluation detailing the results of BGE's preliminary investigation, root cause analysis, and generic implication, and assessed that BGE's investigations were, in general, thorough and well-conducted. BGE's reasoning why the other three AFW pumps were not affected with similar problems was sound and demonstrated good engineering judgement. The other three AFW pumps had received refurbished rotating elements during their overhauls in past refueling outages and had operated

satisfactorily since then. The procedure for aligning the pump rotating element had been changed in 1989 and was slightly different depending on whether or not a new rotating element was used. BGE was evaluating the adequacy of the procedure used when using the same rotating element instead of a refurbished one, but had not completed the investigation at the end of the period. Inspectors will continue routine followup after BGE's investigation is complete.

4.0 ENGINEERING (IPs 37828, 92903, 37551, 2515/111)

4.1 Review of Service Water System Boundary Isolation Valve Issues

In NRC Inspection Report 50-317 and 318/93-31, inspectors noted that BGE had partially based their determination and implementation of leakrate criteria and their operability assessments of the service water (SRW) and component cooling (CC) water systems on the fact that the systems historically had low leakrates. However, BGE did not include leakage through the boundary isolation valves between the safety-related and non-safety-related portions of the systems in their evaluations. This was an unresolved item pending further NRC review (URI 93-31-02).

The inspectors reviewed the BGE Design Engineering Section (DES) analysis of the SRW and CC systems and the contribution of system leakage to core damage frequency (CDF), as documented in RAN 94-008, "Evaluation of SRW and CC Makeup," and discussed the issue with BGE operations, licensing, and engineering staff, and NRR staff. The analysis was done to address the adequacy of SRW/CC inventory makeup, the effect of boundary valve leakage on overall system leakage, the requirement for saltwater to SRW system makeup, and the actions necessary to respond to increased leakrates. RAN 94-008 addressed each of the issues using a probabilistic risk assessment (PRA) approach.

The evaluation concluded that reliance on existing SRW/CC makeup sources did not significantly increase the CDF. The loss of offsite power (LOOP) event without a seismic event was determined to be the bounding event for the evaluation. For the LOOP, pre-existing SRW leakage contribution to CDF was 4.0 E-06, while that of the CC system was 1.0 E-06 annually. The values were based on historically low system leakrates. The Calvert Cliffs Individual Plant Examination (IPE) Summary Report indicated that any system's contribution to CDF which exceeded 1.0 E-06 annually was considered risk significant. Values above 1.0 E-06 were subsequently classified as medium or high dependent on the level of contribution. The SRW and CC values were considered within the moderate risk range. Using industry guidelines, moderate risk issues did not justify plant modifications, but could be suitably addressed by an accident management program.

DES concluded that the existing makeup systems were sufficient to ensure plant safety. They also concluded that the saltwater to SRW cross-connection was not required for SRW system operability; however, they noted that it was a desirable enhancement to safety since it reduced the probability of failure of the SRW system during a LOOP by a factor of 46.

With regard to boundary valve leakage, DES concluded that it was unnecessary to measure seat leakage past the isolation valves from a PRA perspective. The main considerations were historically low leakage past the valves, the insignificance of intra-unit (between subsystems of the same unit) leakage, and the relatively short duration of inter-unit (between subsystems of different units) leakage any significant (until completion of modifications to the EDG SRW subsystem cross-connect valves during the 1996 refueling outage). BGE has evaluated all components associated with the non-safety-related portions of the SRW and CC systems using the guidelines established by the Seismic Qualification Utility Group (SQUG) and concluded that they were adequately rugged to withstand a design basis seismic event. NRR staff were reviewing BGE's SQUG evaluation as part of their followup of Licensee Event Report 89-23, "Postulated Pipe Rupture in the Turbine Building SRW System Renders Both Auxiliary Building SRW Subsystems Inoperable." The inspectors concluded that if the non-safety-related portions of the systems would withstand a seismic event, then the question of leakage through the boundary isolation valves was moot. BGE and NRR were still working to resolve questions with BGE's SQUG evaluation at the end of the period. Based on discussions with NRR staff, BGE intends to address the issue as part of their Individual Plant Examination of External Events (IPEEE) submittal, currently scheduled for 1996. Based on the apparent low safety significance of boundary isolation valve leakage from a risk assessment perspective and the continuing BGE/NRR discussions of BGE's SQUG evaluation, Unresolved Item 93-31-02 is closed.

Although risk increases as a function of leakrate, DES did not recommend using leakrate limits as criteria for system operability. As an alternative, DES recommended a process using system performance indicators based on historical system leakrates that would trigger increasingly rigorous compensatory actions as a function of actual SRW/CC system leakage. The performance indicators would be a measure of cumulative risk to core damage as a result of system leakage. The goal for each performance indicator was to maintain the indicator below 1.0 E-05, that is, below the high risk criteria of the IPE. At the end of the period, Operations staff were still evaluating whether to implement the performance indicators recommended by DES or retain the strict leakrate operability criteria currently in place.

4.2 Review of Excessive Corrosion of ICI Flange Components

NRC Inspection Reports 50-317 and 318/94-09 and 94-10 documented BGE's discovery and response to unexpected excessive corrosion of incore instrument (ICI) flange bolts on Unit 1. The issue was an unresolved item (URI 94-09-01) pending completion of BGE's investigation and further NRC evaluation.

The inspectors reviewed BGE's root cause analysis reports 9319 (ICI Flange Leakage) and 9409 (Higher Than Anticipated Corrosion of Carbon Steel Studs and Nuts on ICI Flanges) and Licensee Event Report 94-004, Revision 1 (Excessive Corrosion of ICI Flange Components). The reports provided a thorough and forthright discussion of the contributing causes of the event and recommended reasonable corrective actions to prevent recurrence. BGE concluded that the unexpected corrosion rate was due to wet boric acid contacting the studs and nuts. Dry boric acid had been assumed when the operability evaluation was

prepared. BGE determined that the root cause was that the reasonableness of the assumed ICI flange surface temperature used in the operability evaluation was not validated because the process did not specifically require it.

The inspectors reviewed BGE's corrective actions, which included site training on the lessons learned, changes to strengthen the Boric Acid Corrosion Inspection Program and Functional Evaluation/ Operability Determination procedures, and modifications to the ICI flanges. BGE had completed all corrective actions except replacing the ICI flange bolts with corrosion resistant studs and nuts. Unit 2 flanges were done, and BGE intended to complete the modification on Unit 1 during the 1996 refueling outage. The modification was included in the site action item tracking system. Based on the thoroughness of BGE's evaluation and corrective actions, Unresolved Item 94-09-01 is closed.

4.3 Testing of New Safety-related Emergency Diesel Generator

4.3.1 Trip Logic Testing

BGE conducted three tests of the safety-related EDG. The first test was conducted from May 25 to June 7 to test the functionality of the EDG trip logic. Test Procedure SAT-1A024F-01, "DGP Startup Acceptance Testing," dated May 23, 1995, was used for the test. The test covered three parts: trip functions during normal EDG operation; trip functions during emergency operation (most normal trip functions were automatically bypassed); and slow and fast starts of the EDG. Because the EDG unit consisted of two diesel engines, each part of the test included three distinctive tests, involving engine No. 1, engine No. 2, and both engines together. The inspectors reviewed the test procedure and the test report. The procedure provided clear instructions and logical steps for the tests. Review of the test records indicated no test deficiencies, except certain test sequences were changed (due to specific test conditions) resulting in procedural changes. These changes did not affect the test results.

4.3.2 Endurance Test

The second test was conducted on June 29 using Procedure SAT-1A024F-02 entitled, "1A Diesel Genset Endurance Run," dated June 22, 1995. This was a 24-hour endurance test of the EDG to verify the operational capability of the EDG and its support systems, such as the cooling water systems and lubrication oil systems. The EDG was loaded at 100%-rated kW with 0.8 power factor for 22 hours followed by 110%-rated load with 0.8 power factor for two hours. The inspectors' review of the test procedure and the test results indicated that the procedure contained appropriate acceptance criteria, detailed steps for the test, and was of good quality. The EDG passed the test successfully. However, during the final stage of the test, BGE observed that the high temperature (HT) cooling system was losing water at about two gallons per hour. BGE initiated extensive effort to locate the source of the coolant leak. On July 20 BGE identified a hairline crack in cylinder head 1A2-3B between the exhaust valves (two intake and two exhaust valves per cylinder). The cracked cylinder head was subsequently removed and replaced with a new cylinder head. BGE's preliminary evaluation was that the crack was due to

imperfect casting. BGE stated that the cracked cylinder head would be shipped to SACM (the EDG manufacturer) for further analysis. Because this EDG was procured with 10 CFR Part 21 requirements invoked, BGE stated that SACM would follow the reporting steps required by 10 CFR Part 21 after SACM identified the root cause of the cylinder head crack.

4.3.3 Post-Maintenance Testing

The third test was conducted on August 9. This was an 8-hour post-maintenance test to determine whether the high temperature (HT) cooling system leakage problem had been corrected after replacement of the cracked cylinder head. BGE used Procedure SAT-1A024F-03 entitled, "1A Diesel Genset Endurance Run," dated August 4, 1995, for this test. The EDG was loaded with 5000 kW resistive load (no reactance load) for the 8-hour test. BGE explained that this test was not a functional test, therefore reactance load was not required. The inspectors observed part of this testing on August 9. BGE used tygon tubes to compare the water level at the HT cooling system expansion tanks before and after the test at the same temperature. BGE observed a decrease of about 1.5" water level at the expansion tanks. BGE could not determine whether this decrease in the water level was due to degassing of the new coolant (the coolant was refilled after replacement of the cracked cylinder head) or due to other leakages. Therefore, BGE retested the EDG on August 14, using the same test procedure. During a telephone conversation on August 15, BGE told the regional inspectors that they completed the retest successfully without further reduction of the HT cooling system water level. BGE also concluded that the water leaking problem was resolved. This was later verified by the resident inspector. The inspectors had no further questions regarding this issue.

4.3.4 Conclusion

The EDG test procedures were of good quality. These procedures contained appropriate acceptance criteria and provided clear instructions and logical steps for the tests. The tests were properly controlled and executed in accordance with the test procedures. The actions taken by BGE in response to the cooling water leak were appropriate and thorough. BGE stated that the steps required by 10 CFR Part 21 for the cylinder head crack problem would be followed by the EDG vendor after the root cause of the crack was identified.

4.4 Management Oversight of the Diesel Generator Project

4.4.1 Management Oversight

BGE management provided a project team to oversee the progress of the diesel generator project (DGP). This project team was headed by a project manager who had the overall responsibility of budgeting and scheduling of the project. The current project manager was previously the integration task manager, who was promoted recently when the previous project manager was reassigned. The inspectors interviewed the current project manager and found him to be very knowledgeable and familiar with the status and issues of the DGP activities.

The DGP startup manager conducted a "Plan of the Day" (POD) meeting each morning to discuss scheduled activities and problems of the day and of the week. This meeting was attended by various task managers and project engineers, such as maintenance, operations, mechanical, electrical, and instrumentation and control. The inspectors attended the POD meeting on August 8 and observed active discussion among the attendees. The startup manager was very knowledgeable of the details of the planned activities and current issues.

The DGP quality assurance (QA) group issued a monthly quality indicator report to inform project management of the status of activities conducted by the contractor, Bechtel, and BGE, including Bechtel nonconformance reports (NCR), problem reports (PR), construction change requests (CCR), engineering change notices (ECN), field engineering changes (FEC), and startup problem reports (SPR). The inspectors reviewed the May report (issued on June 5, 1995) and noted that this report provided very good trending in graphic form for each of the above items. The inspectors determined that this quality indicator report was a good tool for the management to monitor and track the progress of resolving the above items.

4.4.2 Quality Assurance (QA) Audits

BGE conducted two QA audits on the DGP constructor and vendor in 1995, one on Bechtel Power Corporation, and the other on SACM (diesel generator manufacturer) and its part suppliers.

QA Audit QAG60-Bechtel 95-Program 01 was conducted from May 24-25, 1995, by three auditors to evaluate the quality of the as-built DGP design documents. This audit identified several discrepancies in Bechtel's incorporation of design change documents, including construction change requests (CCR) and engineering change requests (ECR), into the as-built drawings. This audit also identified that Bechtel did not consistently adhere to the directions provided by BGE diesel project engineering. There were numerous examples where Bechtel did not properly reference unincorporated CCRs on the as-built drawings. In a letter dated July 10, 1995, Bechtel responded to the above findings and stated that corrective actions to resolve these findings would be completed by July 31, 1995. At the time of this inspection, the audit findings had not yet been closed.

QA Audit QAG60-SACM 95-Program 01 was conducted from January 23 to February 3, 1995, to evaluate the ability of SACM and its vendors (Jeumont Industries, Rötschi, and Spie Batiguolles) to supply qualified safety-related equipment to Calvert Cliffs. The audit team consisted of a team leader and four team members. This was a very extensive audit, covering broad areas in the vendor's QA program and 10 CFR Part 21. This audit identified six deficiencies, including previous audit findings not being resolved in a timely manner, lack of prompt corrective actions for nonconformances, lack of training for certain personnel, and storage areas not meeting the criteria of ANSI N45.2.2.

The inspectors' review of these QA audit reports indicated that these audits were thorough and comprehensive; audit findings were based on direct

documentation reviews, and were clearly discussed in the audit reports. The audit findings had been addressed by SACM and its vendors and the corrective actions taken to resolve the issues were being reviewed by the QA group.

4.4.3 Conclusions

The inspectors concluded that BGE had provided good management oversight of the DGP activities. The Bechtel quality indicator report was a useful tool for management to monitor and track the progress of resolving installation and engineering problems. The QA audits on the Bechtel and the EDG vendors were thorough and comprehensive. The audit reports were of good quality. The corrective actions taken to resolve the audit findings were under review by the QA group. Audit findings involved with QA programmatic issues did not affect the operability of the new diesel generators.

4.5 Review of Lack of Protection of Safety-Related Equipment During Construction

During the October 1994 NRC inspection of the Diesel Generator Project (DGP), the inspectors observed several instances where installed safety-related equipment and in-process equipment installation were not protected from the construction environment as required by BGE's quality assurance program. BGE responded that the following corrective actions had been taken to resolve the problems: 1) immediately established cleanliness guidelines and housekeeping requirements for the construction areas to provide protection of safety-related equipment; 2) a prompt and thorough inspection was conducted by BGE operations and DGP personnel during the week of October 24, 1994, using the newly-established cleanliness guidelines and housekeeping requirements to ensure that safety-related equipment was prctected against potential degradation; and 3) conducted training of construction personnel on cleanliness requirements. The failure to provide adequate foreign material control for the equipment was a Violation of NRC requirements (VIO 94-25-01).

Following the inspection finding, BGE initiated a cleanliness and inspection program. BGE implemented new diesel generator project procedure DGPI-50, "Cleanliness and Work Area Housekeeping Requirements." This procedure established the responsibilities of the DGP project manager and various task mangers to implement the cleanliness and inspection program. The program required a 100% inspection of all areas in the safety-related and station blackout diesel buildings, using 23 inspection criteria listed in Attachment 2 to DGPI-50. The inspection responsibilities were divided among operations, mechanical maintenance, instrumentation and control, and electrical maintenance. Each group was responsible for specific areas in both buildings and also responsible to document their inspection results, including deficiencies observed, corrective actions initiated, and status of the resolutions. If further corrective actions were required to resolve the observed deficiencies, these actions would be tracked and discussed in the daily meetings. The first inspection was conducted the week of October 24, 1994. Subsequent inspections were conducted on a weekly basis. The inspectors reviewed Procedure DGPI-50, Revision 2, dated June 27, 1995, and noted that the procedure appropriately addressed the cleanliness and housekeeping issues, and that the 23 inspection criteria listed in

Attachment 2 were clear and explicit. The inspectors also reviewed the documented inspection results of the November 18, 1994, and November 21, 1994, inspections, and found them appropriate.

The inspectors reviewed a Bechtel nonconformance report (NCR 211C), dated October 20, 1994, involving cleanliness issues. The resolution of this NCR involved four training sessions of Bechtel construction personnel on construction site cleanliness and housekeeping topics.

The inspectors verified BGE corrective actions against their committed actions in their response letter as described above, and determined that BGE corrective actions taken to resolve this issue and to prevent recurrence were appropriate and thorough. This item is closed.

4.6 Review of Lack of Seismic Evaluation for On-Site Modification of Prequalified Safety-Related Control Cubicle

During the January 1995 NRC inspection of the Diesel Generator Project (DGP), the inspectors observed two current transformers being added to Diesel Generator Protection Cabinet No. 5 using a field-fabricated mounting bracket. Seismic evaluations for the mounting bracket and the protection cabinet were not included or referenced in the modification package. BGE stated that SACM had a procedure for controlling field modifications which required that all field modifications be reviewed against all requirements of the original purchase order. BGE also stated that this issue had been forwarded to SACM and that SACM would resolve the issue by analysis or retesting. The issue was an Unresolved Item (URI 95-01-01) pending resolution and NRC review. During this period, the inspectors reviewed several letters that BGE QA staff had sent to SACM requesting resolution of this issue, and concluded that BGE had responded promptly to this finding. According to BGE, the diesel generator protection cabinets were not provided by SACM, but by a subtier vendor. This could be the cause of additional delay of the corrective actions. This item remains open pending BGE's resolution of the seismic issue. This issue must be resolved before the diesel generator is declared operable.

4.7 Improvements in Project Controls

In January 1994, Unit 2 tripped and off-site power was partially lost after a protective relay for a 13 kV voltage regulator that was being installed actuated on a spurious signal. The NRC documented this event in NRC Special Inspection Report 50-317 and 318/94-05. The NRC found that a breakdown in communications, inattention to detail and inadequate design instructions resulted in portions of the voltage regulator protective circuits being installed that were incomplete, not fully tested and inadequately evaluated. The NRC issued a Notice of Violation (VIO 94-05-01) due to inadequate design controls. As a result of the event, BGE implemented several corrective actions. The inspectors reviewed BGE's corrective actions regarding design controls and assessed the effectiveness of those actions to prevent recurrence.

BGE implemented both short and long term corrective actions. The short term actions were taken to ensure that the remaining work and testing on the

voltage regulator project could be completed without adverse impact to either unit. Before reinitiating work, BGE developed a voltage regulator work scope plan that was reviewed by the Plant Operations and Safety Review Committee (POSRC) and approved by the Plant General Manager. The plan stated that the modification was isolated from the plant systems. The inspectors found that the plan was adequate. BGE revised the associated 10 CFR 50.59 safety evaluation, the design instructions and the construction implementing procedures to ensure that these documents were consistent with the test plan. BGE successfully completed the modification without further similar problems.

BGE implemented several long term corrective actions. These actions included the following.

- BGE enhanced their modification process to require that testing be performed prior to returning a system to service to ensure that the system would not respond in a manner adverse to plant safety. BGE revised several site administrative procedures to include guidance for work/testing requirements for modifications. Calvert Cliffs Instruction (CCI)-703, "Initiation of Design Change Modifications," and CCI-705, "Design Change and Modification Implementation," were changed assigning individuals to function as Test Performance Coordinators (TPCs). The procedures required the assigned TPC to review proposed plant modifications in order to develop test matrixes for those modifications. BGE's Plant Test Unit developed guidance on the requirements for the development of these test matrixes. Plant Testing Unit Guideline (PTUG)-200, "Control of Post Modification Tests," and PTUG-201, "Post Modification Test Development," contained these requirements.

  The inspectors reviewed the procedure changes and the PTUGs. The inspectors found that the procedures contained detailed guidance on test matrix development as well as a review process to verify the quality of the matrixes. PTUG-201 contained the minimum acceptable test requirements for plant modifications. PTUG-200 required that all test matrixes be reviewed and approved by the responsible system engineer. Once approved, the matrixes were required to be incorporated into the modification process. The inspectors reviewed the test matrixes used for several recent plant modifications. All of the reviewed matrixes had been prepared according to the guidelines and contained the appropriate modification tests to demonstrate that the modifications would not adversely impact on plant safety.

- BGE further revised CCI-703 and CCI-705 adding requirements to determine and then minimize risks to plant safety resulting from the implementation of a plant modification. The inspectors found that the procedures contained guidance for determining if the implementation process for a proposed modification represented a potential risk to plant safety. If the implementation of proposed modification constituted a potential high risk, the procedures required that a formal implementation plan be developed that delineated actions to minimize risks to plant safety. In addition, the procedures required that Design Engineering personnel review the implementation plans for all proposed potential high risk modifications to ensure that all 10 CFR 50.59 and

design instruction requirements were incorporated in the plans. Also, the procedures required that the implementation plan be reviewed by the POSRC and approved by the plant general manager.

Since the January 1994 event, BGE has only implemented one plant modification that was designated as a potential high risk to plant safely, the installation of new vital inverters in Unit 2. The inspectors observed major portions of this modification (see NRC Inspection Report 50-317 and 318/95-03). The implementation plan for this modification was detailed and thorough. The plan contained testing requirements, personnel training requirements, implementation controls, contingency plans and an implementation schedule. There were no noteworthy problems associated with the implementation of this modification.

- BGE performed a review of procedural requirements regarding the control of protective circuits during the modification process. BGE concluded that adequate controls existed for the control of these circuits. The inspectors concurred with this conclusion.

In conclusion, the inspectors found that BGE had implemented adequate design control measures to ensure that the process of installing plant modifications would not adversely impact plant safety. The use of test matrixes and detailed modification implementation plans were providing satisfactory barriers to prevent recurrence. Therefore, Violation 94-05-01 is closed.

4.8 Followup of Electrical/Fire Protection Open Items

4.8.1 Inadequate Cable Separation (Violation 89-27-05)

Issue

Violations of the plant cable separation criteria were identified in 1989 by the NRC resident inspector. Examples of the violations included the lack of design horizontal separation distances for cable trays, damaged or missing cable tray separation barriers, and cables that were allowed to cross into cable trays from different separation groups.

BGE Actions

BGE performed walkdown inspections of all safety-related cable trays located outside of the control room to identify separation criteria problems. A report was written by BGE personnel to document the results of each walkdown. In cases where deficiencies were identified, there were additional inspections performed to verify that the rework had properly corrected the problems.

The problems identified were primarily those associated with broken or missing separation barriers. The barriers are required to be installed when the specified three feet horizontal or five feet vertical cable tray separation was not maintained. Other deficiencies included cables that violated the separation criteria due to excess cabling that was allowed to cross into a cable tray of another separation group.

BGE completed all of the cable tray walkdowns and corrected all identified deficiencies. In addition to the normal work completion verification performed under the maintenance work order system, all deficiencies received an independent documented inspection to ensure that the installations were correct. These actions restored the cable tray installations to the original design configuration as stated in the Updated Final Safety Analysis Report (UFSAR).

NRC Review/Conclusions

The NRC reviewed BGE's program for resolving the electrical cable separation issue during Inspection 50-317 and 318/92-05 and found the program to be acceptable. Plant walkdowns were also performed by the NRC inspectors during that inspection and did not identify any additional separation problems. Work was not complete in all plant areas, and the violation remained open pending the completion of final corrective actions by BGE.

During the current inspection, the inspector reviewed the status of the corrective actions with BGE staff, reviewed walkdown inspection results, and toured various areas of the plant to inspect a sample of cable tray installations. The inspector also reviewed a sample of work orders requiring removal of cable tray covers to verify that appropriate directions were contained in the work package to ensure proper restoration of cable tray covers. Several raceway drawings were also reviewed to determine if the location of separation barriers were depicted on the drawings.

The inspector found that the cable tray installations and separation barriers were properly installed and that work orders and drawings contained the appropriate information to ensure that separation was maintained during future work in the cable trays. The completion of work to restore the cable trays to the configuration described in the UFSAR completes the corrective actions contained in BGE's letter to the NRC, dated March 9, 1990. Based on BGE's actions and the results of the NRC inspections documented in Report 50-317 and 318/92-05 and this inspection, this item is closed.

4.8.2 Emergency Diesel Generator Adequacy to Support Worst-Case Loads(Unresolved Item 92-80-05)

Issue

During the electrical distribution system functional inspection (EDSFI) conducted in 1992, the inspection team identified concerns regarding the capability of the emergency diesel generators (EDGs) to supply accident loads during a design basis event.

Specific areas of concern included:

1. The simplified predictions of the EDG dynamic performance did not account for the reduced effectiveness of the turbocharger during initial loading sequence. Also, the predictions did not specifically address that a loss of coolant accident coincident with a loss of offsite power

results in greater than 3150 kW load while the fuel rack stop was set to limit the steady state output to a maximum of 3250 kW.

2. The voltage drop at step four of the safety injection simulation surveillance test was marginal under test conditions and could be worse under accident conditions.

3. Resetting the EDG voltage regulator stability adjustment could result in the EDG becoming unstable. Also, the licensee needed to further review impact on machine stability at 100 percent load and analyze and/or test to demonstrate EDG ability to supply the accident loads without excessive voltage dip with all sources of instrument drift and error.

BGE Actions

BGE revised EDG Loading Calculation E-88-15 and concluded that, under worst-case accident conditions and assuming the failure of an EDG, the EDG loads would remain within the ratings of the engines.

BGE is also modifying the existing EDGs to upgrade their ratings to provide additional margin and permit future load additions. At the time of this inspection, the upgrade to the 21 EDG had been completed. The 11 EDG upgrade had been completed, with the exception of replacing the current transformers and adding a generator shroud plate to improve the flow of cooling air. As a result, additional margin is now available, but not the full upgrade rating. The 12 EDG upgrade is currently planned for the 1998 refueling outage.

In addition to upgrading the existing EDGs, two additional EDGs have been installed and are being tested and connected to the plant electrical buses. This will result in each of the 4 kV buses being supplied by an independent safety-grade EDG. The second added EDG will be able to power any of the four safety buses in the event of a station blackout (SBO) condition. During the 1996 Unit 1 refueling outage, BGE plans to put the new safety-related EDG in operation and have the SBO EDG available to supply three of the four buses. The SBO EDG connections to the fourth bus are expected to be performed during the Unit 2 1997 refueling outage. The safety-related EDG is rated at 5000 kW and will be connected to bus 11, currently the most heavily loaded bus.

To assess the effectiveness of the turbochargers, BGE reviewed the results of testing that had been performed to demonstrate the ability of the EDGs to start and accelerate an auxiliary feedwater pump. This procedure loaded an EDG to the point where the turbocharger begins to provide the engine combustion air and the blower begins to operate unloaded and then simultaneously started a component cooling and saltwater pump. This testing demonstrated that the EDGs could start and accelerate the largest emergency load under conditions where combustion air supply to the engine was most limiting.

BGE reviewed the settings for the rack stops to ensure that they were set in accordance with the vendor recommendations. BGE also contracted the vendor to perform a transient loading analysis for the EDGs to assess the effects on generator voltage and frequency during an accident loading scenario. This

analysis assumed that the rack stops were set for a 30% overload capability, as was the case in the plant EDGs. The result of this analysis showed that the EDGs would adequately start and accelerate all loads without any excessive voltage or frequency dips.

NRC Review/Conclusions

The adequacy of the EDG loading calculation was reviewed by the NRC during Inspection 50-317 and 318/93-21 and found to be acceptable.

During the current inspection, the inspector discussed the actions taken to resolve the issues with members of the BGE engineering staff and reviewed portions of the calculations, analyses, testing, and correspondence associated with the issue.

The inspector concluded that the modifications to upgrade the existing EDG and to add the two additional EDGs resolves the questions regarding EDG capacity. The results of the load testing that was performed and the dynamic loading study performed by the EDG vendor showed that the EDGs are capable of starting all loads throughout the load sequence without experiencing any significant voltage or frequency dips. The inspector found the actions taken by BGE to resolve this issue to be comprehensive and have resulted in significant improvements to an important safety system. This item is closed.

4.8.3 Degraded Bus Relay Setpoints and Load Flow Study (Unresolved Item 92-80-06)

Issue

The EDSFI team identified several unresolved items associated with degraded voltage conditions and load flow studies. Inspection Report 50-317 and 318/92-80-06 identified the following actions that were necessary to resolve the questions:

1) Perform a voltage regulation study for the voltage range between the nominal reset and minimum dropout of the degraded voltage relays and determination of the adequacy of the degraded bus relay setpoints;

2) Revise calculations to reflect higher conductor operating temperatures;

3) Establish the adequacy of the starting and running voltages for charging pump 13 under worst-case conditions;

4) Provide technical justification for 460 volt loads powered from bus 11 A and B;

5) Establish adequate starting and running voltages for panel 1P14 loads;

6) Establish motor control center (MCC) 114R contactor thermal capability during degraded voltage conditions; and,

7) Analyze motor starting and running capabilities based on motor purchase specifications and testing.

BGE Actions

BGE has performed evaluations of voltages available to the safety-related components with the existing degraded grid voltage relay setpoints. Specific operability reviews were performed for any components where the starting voltage was not at least 75% of the nominal supply voltage or where the available running voltage was not at least 90% of the nominal supply voltage.

BGE also has taken the following actions to resolve the above issues:

1) A load flow study was performed (Calculation E-94-017) and new degraded grid relay setpoints have been established (Calculation E-94-018). New degraded grid and bus undervoltage relays will have to be installed to implement the new setpoints. BGE plans to install the new relays during the 1997 and 1998 refueling outages on Units 2 and 1 respectively. The actual setpoint change will be implemented after all of the new relays are installed. The new setpoints ensure that all loads have adequate starting and running voltages under all grid conditions and eliminates the need to maintain specific analyses for loads that may not have at least 75% nominal voltage available during starting and 90% voltage during running conditions.

2) The load flow calculation utilized cable resistance values for 90°C to ensure a conservative cable impedance was included in the calculation.

3) Calculation E-94-017 demonstrated that the voltage available to charging pump 13 would be greater that 75% during starting and greater than 90% during running, assuming worst-case voltage conditions.

4) The load flow calculation demonstrated that all motors powered from load centers 11A and 11B would have adequate operating voltages.

5) The results of the load flow study and a specific load study performed for panel 1P14 demonstrated that adequate voltage will be available to components during transient and steady state conditions.

6) The load flow study demonstrated that the voltage at the MCCs will be maintained above the minimum required pickup voltage for the contactors at 85% of nominal bus voltage.

7) The load flow calculation demonstrated that the starting voltage to all safety-related motors will be at least 75% of the nominal bus voltage.

NRC Review/Conclusions

The inspector discussed the resolution of these issues with the BGE design engineers and reviewed portions of the associated analyses and calculations, including the assumptions and conclusions. The inspector also verified that

Modifications 93-004-001 and 93-004-004 had been initiated to replace the degraded grid and bus undervoltage relays.

Based on these reviews, the inspector concluded that BGE had thoroughly addressed the issues identified by the EDSFI team. This item is closed.

4.8.4 HVAC for Electrical Distribution System Equipment (Unresolved Item 92-80-09)

Issue

The EDSFI team identified several concerns associated with the switchgear room ventilation design, analyses and operation. These concerns included potential common mode failures of both ventilation trains due to effects of fires, tornados or missiles generated by a motor generator set. The team also identified that the fire protection analysis and switchgear room temperature calculations did not appear to address the potential common mode failure effects or the total loss of ventilation. Weaknesses in operating instructions were identified in that they did not assure the initial conditions of the temperature analyses are satisfied nor did they provide instructions for long-term cooling under various postulated conditions.

BGE Actions

In response to the EDSFI team findings, BGE revised operating procedures and purchased and staged equipment that could provide switchgear room ventilation in the event of an emergency that resulted in the loss of all normal ventilation. The equipment consists of portable fans and a gas generator to provide power for the fan motors. The fans, generator, and fuel for the generator are staged in the turbine building and are operated once per month to ensure continued availability of the emergency ventilation. Calculations were performed that showed that the emergency ventilation fans could reduce the switchgear room temperatures to less that 150°F and thereby ensure operability of all equipment within the switchgear rooms.

BGE also reviewed the potential for a missile generated by a motor generator (MG) set in 45-foot elevation rooms destroying ductwork that is common to both ventilation trains. Based on information available on the design and testing of the MG set, BGE concluded that this was not a credible event. However, if a missile did damage the ductwork, the emergency fans would be available to provide cooling.

BGE reviewed the concern for tornado-generated missiles damaging rooftop equipment and concluded that tornado missile protection of all equipment outside of Class I structures was not part of the plant design basis. However, in the switchgear room ventilation system configuration report, dated March 1994, BGE did address the need to be able to safely shut down the plant in the event of the loss of the mechanical refrigeration portion of the system due to tornado missiles. The conclusions reached in this evaluation were that the switchgear room air handling units would maintain the switchgear room temperatures below 150°F and thereby ensure operability of components located

in those rooms. Also, the portable fan units would remain available to provide cooling in the event of a total loss of ventilation.

BGE also had a consultant perform an evaluation of the switchgear room ventilation system to determine if it was necessary to shut down the plant in the event of a fire and, if required, to assess whether the system design met the requirements of 10 CFR 50, Appendix R. The results of this review were documented in a report titled, "Summary of the Switchgear Room HVAC System Appendix R Evaluation and Development of Modification Alternatives," that was approved by BGE on October 26, 1994. This study concluded that the switchgear room ventilation system was required to achieve and maintain safe shutdown conditions and that the present configuration of the system was in violation of 10 CFR 50, Appendix R, due to a lack of adequate separation between redundant trains. However, the study also concluded that when the portable fans and generators are considered, all Appendix R concerns were adequately addressed.

BGE reviewed modification alternatives that addressed the Appendix R concerns and decided to maintain the portable fans and generator available as the long-term resolution of the issue.

NRC Review/Conclusions

The inspector reviewed the actions taken by BGE and discussed the issues with the responsible engineers. Portions of the supporting calculations and engineering analyses were also reviewed. The inspector verified that the portable fans and generator were staged and that procedures were in place to verify operation of both the fans and generator on a monthly basis. The use of the portable fans as a long-term resolution of the identified issues will be reviewed further by the NRC during an inspection of the BGE Appendix R self-assessment, currently scheduled for March 1996. This item remains open.

4.8.5 Fire in Wall Between Auxiliary and Turbine Buildings (Unresolved Item 95-03-02)

Issue

Concrete walls, floors and ceilings throughout the plant contain expansion joints, most filled with about one to two inches of cork. During welding in the turbine building, slag ignited the cork in one joint. Due to the pressure difference between the turbine and auxiliary buildings, the fire propagated through the expansion joint into the auxiliary building. The fire was extinguished in just over 10 minutes with no damage to plant equipment.

BGE Actions

BGE performed an operability determination for the expansion joints with respect to their ability to function as fire barriers. BGE concluded that if one side of the cork had a metal plate installed (clipped) or if the joint was sealed on one side with a polysulfide-based caulk, then the fire barriers were operable. This was based on preventing direct flame or spark impingement on the cork and limiting the air flow through cracks that existed at the cork and

concrete interface The operability conclusion was based on the plant technical specification bases statement that the fire barrier penetration seals were intended to "prevent or adequately retard the spread of fires between areas." BGE established fire watches for those areas not separated by an operable fire barrier.

BGE also developed and was in the process of implementing a plant modification to install a 3-hour-rated fire barrier in the expansion joint required by plant technical specifications.

NRC Review/Conclusions

The inspector reviewed the operability determination and discussed the evaluation conclusions with BGE engineers and NRC fire protection specialists. During this review, the inspector had the following concerns regarding the acceptability of the cork expansion joints to function as fire barriers:

- The cork expansion joints were not designed or tested as fire barriers. BGE could not provide any engineering data or analysis to show that the cork would "prevent or adequately retard the spread of fires between areas." This lack of data applied to the cork-only and cork-caulk-metal configurations.

- The cork material in the expansion joint was a combustible material and burned during the fire on April 14, 1995. The fire started in the turbine building, penetrated the cork-filled expansion joint wall into the auxiliary building fan room, and actuated the fan room fire alarm. The inspector also noted that Section 5.a.(3) of NRC Branch Technical Position 9.5.1, "Fire Protection Program," stated that penetration designs should utilize only noncombustible materials and should be qualified by tests.

- The polysulfide caulk sealant credited in the operability consideration for maintaining a seal to prevent air flow was not a fire-rated sealant, and its ability to withstand heat and/or flames was not known. Damage or degradation of the caulk by fire could permit air flow through the expansion joint, allowing fire propagation from one area to another.

- The metal covers were credited in the operability evaluation for protecting the cork from direct exposure to fire and/or preventing air flow through the joint. The inspector noted that the metal covers would conduct heat from the fire to the cork and that the covers were installed with metal clips and were not installed in a manner that would prevent air flow through gaps in the cork.

The inspector informed BGE that the NRC did not agree with BGE's conclusion that the cork expansion joints with the caulk and/or metal plates were operable fire barriers. BGE then established fire watches in accordance with the technical specifications while their engineering staff reevaluated their position and revised the operability evaluation.

BGE provided the resident inspectors a revised operability evaluation on August 31. This evaluation was reviewed by the NRC Region I and NRR staff and discussed on a conference call on September 12, 1995. The NRC staff acknowledged that the revised operability evaluation provided additional details with respect to the overall defense-in-depth aspects of the overall fire protection program and thereby provided a better insight into the overall safety significance of the condition. However, although the safety significance was not high, the NRC staff position remained that the cork expansion joints were not operable fire barriers. BGE continued to provide the fire watches required by technical specifications.

Generic Letter 91-18, "Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions And On Operability," provides guidance to NRC inspectors for the review of operability determinations. In reviewing operability determinations, the NRC recognizes that engineering judgement can be used in establishing a valid basis for operability conclusions. Also, the NRC recognizes that systems may be considered to be operable even when they are not fully qualified. However, in this case, the cork expansion joints were not engineered fire barriers, and their capabilities to prevent or adequately retard the spread of fire, were not sufficiently understood by BGE to conclude they were operable based on engineering judgement.

The inspector concluded that the failure to have rated fire barriers was a violation of the requirements of 10 CFR 50.48, "Fire Protection." Specifically, fire areas were not separated by barriers having a 3-hour rating as required by Section III.G.2 of 10 CFR 50, Appendix R (VIO 95-08-01). Unresolved Item 95-03-02 is administratively closed.

4.8.6 Management Oversight and Self-Assessment

The inspector found that the plant management was knowledgeable of the open item issues and that the resultant engineering reviews to resolve unresolved electrical system open items were thorough and well documented. BGE management supported the expenditure of significant resources to upgrade the electrical systems, as demonstrated by the installation of 13.8 kV voltage regulators, the modifications to increase the capacity of the existing emergency diesel generators, the installation of two additional emergency diesel generators, the performance of system load flow studies, and planned modifications to replace the degraded grid and bus undervoltage protection relays.

5.0 PLANT SUPPORT (IPs 92904, 83750, 71750, 84750)

5.1 Radiological Environmental and Meteorological Monitoring Programs

5.1.1 Management Controls

The inspectors reviewed BGE's organization for implementing the radiological environmental monitoring program (REMP) and the meteorological monitoring program (MMP), and discussed with BGE changes made in the responsibilities and organization since the last inspection conducted in January 1994. In

September 1994, oversight of the REMP was transferred from Air and Radiation Management, Corporate Affairs (Baltimore) to Chemistry Programs, Chemistry Department, Technical Support at the Calvert Cliffs site. At the same time, the Chemistry Unit of Technical Services moved from Fossil Support Services (Baltimore) to Fossil Engineering and Maintenance Department (FEMD) (Baltimore). The Radiological Chemistry Group within the Chemistry Unit works as a contractor to the site collecting and analyzing the environmental sample media for the REMP, except for surface water from the plant discharge and intake, which is collected by a chemistry technician from the site Analytical Services, Chemistry Programs. The inspectors noted that the collection and analysis of environmental media continued to be performed by the same personnel. Responsibility for the Meteorological Monitoring Program remains with the Electrical and Controls (E&C) Systems Engineering Unit, Plant Engineering Section.

The inspectors reviewed the Quality Assurance Audit (Report Number 94-2). The audit was conducted from March 29 to July 6, 1994 by members of the Quality Assurance Unit and a technical specialist, and covered the REMP and the MMP. No items of safety significance were identified in the audit. The inspectors noted that the audit was thorough and of sufficient technical depth to assess the REMP and the MMP.

The inspectors reviewed the Radiological Environmental Monitoring Program Annual Reports for 1993 and 1994, as well as the selected analytical data for 1995. The reports provided a comprehensive summary of the results of the REMP around the Calvert Cliffs site and met the technical specifications reporting requirements. The reviewed results indicated that all samples were collected and analyzed as required by the TS. The reports were complete and no obvious omissions or anomalous data were identified.

5.1.2 Direct Observations and Procedures

The inspectors examined selected sampling stations to determine whether samples were being obtained from the locations designated in the ODCM and whether air samplers were operable and calibrated. The sampling stations included air samplers for iodines and particulates, the composite water sampling stations located at the plant intake and discharge, vegetation locations, and thermoluminescent dosimeter (TLD) stations for measurement of direct ambient radiation. The inspectors witnessed the weekly exchange of charcoal cartridges and air particulate filters at selected sampling stations. The inspectors noted that the exchanges were performed according to the appropriate procedure. All air sampling equipment at the selected locations was operational at the time of the inspection. The above environmental sampling media were available at the locations designated in the ODCM and TLDs were placed at locations designated in the ODCM. The inspectors also noted that BGE collected and analyzed more samples than required by TS.

The inspectors reviewed BGE's air sampler calibration procedure and records. Calibration of the low volume air samplers was performed according to the specified frequencies. All results of these calibrations were within BGE's specified acceptance criteria.

Inspectors also reviewed the following procedures for the REMP and the MMP.

- Air Particulate Beta Counting Using the Tennelec LB5100
- Gamma Counting Using the GeLi Detectors and the Genie PC Counting System
- Air Iodine Counting Using the NaI Detector and the ND6700 Counting System
- TLD Annealing and Readout Using the Panasonic UD-512A and UD-505A Readers with UD-200S Dosimeters
- Tritium Counting Procedure Using the Packard Tri-Carb 2560 TR/LX Liquid Scintillation Spectrometer
- Quality Assurance/Quality Control Program Implementing Procedures for the Chemistry Unit Laboratory
- Quality Assurance/Quality Control Plan for the Chemistry Unit Laboratory
- STP-M-461-0, Meteorological Calibrations

The procedures contained guidance for sample collection and preparation, analysis of environmental samples, and laboratory quality control. The REMP procedures were under revision and the inspectors noted that the changes made reflected the organization changes noted above. BGE's procedures provided sufficient guidance and instructions to ensure consistency and quality in the implementation of the REMP and MMP.

Based on the above review, the inspectors determined that BGE continued to effectively implement a very good REMP.

5.1.3 Quality Control Program

The inspectors reviewed BGE's programs for quality assurance (QA) and quality control (QC) of analytical measurements for radiological environmental samples to determine whether BGE had adequate control with respect to sampling, analyzing, and evaluating data for the implementation of the REMP. The Chemistry Unit, FEMD, participated in an intercomparison cross-check (EPA cross-check) program required by TS. The inspectors reviewed the results and noted that the results were within acceptance criteria. BGE's QC program consisted of measurements of duplicate and split samples. The inspectors reviewed the analytical results and noted that the results were generally within BGE's acceptance criteria. When discrepancies were found, reasons for the discrepancies were investigated and resolved.

Based on the above review and discussions with BGE, the inspectors determined that BGE continued to conduct very good QA and QC programs.

5.1.4 Meteorological Monitoring Program

The inspectors examined BGE's meteorological monitoring equipment calibration procedures and most recent calibration results to determine whether the instrumentation and equipment were operable, calibrated, and maintained. E&C staff calibrated and maintained all sensors at the meteorological monitoring tower for the Calvert Cliffs site. Calibrations were performed semiannually as required by TS. The inspectors reviewed the calibration records for the tower, with emphasis on wind speed, wind direction, and temperature sensors. All reviewed calibration results were within BGE's defined acceptance criteria. The inspectors compared the wind speed, wind direction, and delta temperature outputs of the tower's strip chart recorders and computer terminal) to the control room outputs (computer terminals). The results were in close agreement.

Based on the above review, the inspectors determined that BGE continued to effectively implement a very good MMP.

5.2 Radiological Controls

5.2.1 Inadvertent Removal of Neutron Radiation Area Posting

A work coverage radiation safety technician (RST) inadvertently removed the neutron radiation area postings and barricade from the Unit 2 containment personnel air lock (PAL) area on August 25. The postings were down from approximately 2:30 p.m. on August 25 until 2:45 a.m. on August 26, when the shift RST discovered the error.

Following routine maintenance activities in the containment, the coverage RST had completed decontamination and surveys of the area outside the PAL. The RST was then called away to cover work at another area of the auxiliary building. The RST returned about an hour and a half later to remove the contaminated area posting from the PAL area, and inadvertently removed the neutron radiation area posting as well.

Upon discovery by the shift RST, the PAL area was immediately re-posted as a neutron radiation area. Survey data indicated that general area readings outside the PAL were 3-8 mrem/hr neutron and 0.5-1.0 mrem/hr gamma radiation.

The inspectors reviewed BGE's investigation and discussed the issue with radiation safety supervisors. The Unit 2 PAL is an infrequently travelled area. Based on a review of dosimetry, there were no unplanned exposures as a result of the event. The RST inadvertently removed the posting while hurrying to try to complete work before the end of the shift. As corrective action, the RST received disciplinary action, the event was promulgated and discussed with all radiation safety personnel, and the event was added to the training program to stress the importance of procedural compliance and attention to detail. The inspectors assessed that the event had low safety significance, because there were no adverse consequences and BGE took prompt corrective action.

Technical Specification (TS) 6.11 states that, "Procedures for personnel radiation protection shall be prepared consistent with the requirements of 10 CFR part 20 and shall be approved, maintained and adhered to for all operations involving personnel radiation exposure." The requirement was implemented. in part, by Radiation Safety Procedure (RSP) 1-104, "Area Posting and Barricading," which required that if the neutron radiation contribution to the general area dose rate exceeds 5 mrem/hr, then "neutron radiation area" is added to the radiation area posting. The failure to comply with the procedure was a violation of TS 6.11, however; this licensee-identified and corrected violation is being treated as a Non-Cited Violation, consistent with Section VII of the NRC Enforcement Policy.

5.2.2 Locked High Radiation Area Door Found Unlatched

On August 21 at about 8:00 a.m., a BGE worker discovered the Unit 1 auxiliary building 27 foot level Valve Alley door unlatched. The room was posted as a locked high radiation area (HRA) because of potential "transient" high radiation area conditions in the room during some evolutions that could cause radiation levels to exceed 1 rem/hr.

The worker immediately notified radiation safety staff and guarded the door until a radiation safety technician (RST) arrived. The RST checked that no one was in the room, latched and locked the door, and performed radiation surveys of the room. All dose rates were below 1 rem/hr.

Inspectors reviewed BGE's root cause analysis and corrective actions and discussed the event with radiation safety supervisors. The latching mechanism for the door was found to be sticking, requiring the door to be physically shut to ensure latching, rather than latching under its own closing momentum. The mechanism was lubricated and operated properly. No deficiencies were found on other doors with similar latches. BGE reviewed the security door usage logs, HRA key sign-out log, briefing records, and control room logs, and interviewed personnel who might have entered the room over the weekend time period, but could not determine the responsible individual. BGE reviewed the dosimetry records for all personnel who entered the auxiliary building over the potential time period that the door was unlatched. There were no unexpected radiation exposures. BGE also confirmed that there were no high radiation transient evolutions in the room over the period. BGE concluded that the most likely cause was an over reliance on the latching mechanism and failure to check that the door actually closed.

As corrective actions, BGE directed shift RSTs to check HRA boundaries and doors each shift, notified site personnel of the event, and began a review of applicable procedures and preventive maintenance requirements for adequacy. BGE had a previous HRA boundary posting event that was a Non-Cited Violation during a refueling outage in March 1994. The issue was documented in NRC Inspection Report 50-317 and 318/94-18; however, this event and the 1994 event appeared to be dissimilar.

Subsequent to the end of the period, a shift RST found a HRA boundary rope unclasped in the Unit 2 auxiliary building 27 foot level Volume Control

Tank (VCT) Valve Chase. The rope was found down at about 4:00 a.m. on September 24. It had previously been checked by the shift RST at about 4:00 p.m. the previous afternoon. A BGE investigation was initiated. BGE's apparent difficulty in maintaining HRA boundaries is an unresolved item (URI 95-08-02) pending completion of BGE's investigation and further NRC review.

5.3 Housekeeping

Strong housekeeping and safety practices were evident throughout the site. The turbine and auxiliary buildings were generally clean and well lit. Management continuously emphasized safety during meetings and pre-job briefings. Throughout the site, workers were extremely conscientious about wearing eye, ear, and head protection.

5.4 Emergency Preparedness

5.4.1 Hurricane Preparations

On August 15, BGE initiated efforts to prepare the site for the possible effects of Hurricane Felix. BGE had revised their emergency response procedure (ERPIP 3.0) dealing with severe weather in July, 1994, incorporating lessons learned from Hurricane Andrew in 1992. (See NRC Inspection Report 50-317/318/ 94-26 for details.) BGE's implementation efforts included:

- Energizing the 13kV service bus 23 from a separate off-site source;
- Maximizing condensate storage tank inventories;
- Ensuring that required safety systems were operable and that all watertight doors were closed;
- Review of the applicable abnormal and emergency operating procedures; and,
- Ensuring emergency diesel generator fuel oil suctions were aligned to the 21 fuel oil storage tank (hardened structure).

BGE security and maintenance personnel performed walkdowns of both the protected and owner-controlled areas to identify items needing to be removed or restrained.

The inspectors reviewed BGE's procedures and toured the protected area, including the new emergency diesel generator building, noting that the new station blackout (SBO) diesel generator set was available to supply power to Unit 2 should off-site power be lost. While not formally turned over to the plant staff, there were sufficient personnel on each operations shift crew trained on the operation of the SBO diesel to safely run the diesel if necessary. The inspectors concluded that BGE had properly prepared the site in accordance with their procedures. BGE secured from their hurricane monitoring status on August 18 after the National Weather Service cancelled the hurricane watch for the Calvert Cliffs area.

6.0 REVIEW OF WRITTEN REPORTS (IPs 90712, 92700)

The inspectors reviewed LERs and other reports submitted to the NRC to verify that the details of the events were clearly reported, including accuracy of the description of cause and adequacy of corrective action. The inspector determined whether further information was required from the licensee, whether generic implications were indicated, and whether the event warranted onsite followup. The following LERs were reviewed:

Unit 1:

LER 95-003: Entry into Technical Specification 3.0.3 Due to High Bay Water Temperatures. The issue was documented in NRC Inspection Report 50-317 and 318/95-06.

Units 1 and 2:

LER 95-004: Discovery of Inoperable Fire Barrier Penetration Seal. This issue was documented in NRC Inspection Report 50-317 and 318/95-03, and also discussed in section 4.8.5 of this report.

The above LERs were reviewed with respect to the requirements of 10 CFR 50.73 and the guidance provided in NUREG 1022. Generally, they were found to be of high quality with good documentation of event analyses, root cause determinations, and corrective actions.

7.0 FOLLOWUP OF PREVIOUS INSPECTION FINDINGS

Licensee actions taken in response to open items and findings from previous inspections were reviewed. The inspectors determined if corrective actions were appropriate and thorough and previous concerns were resolved. Items were closed where the inspectors determined that corrective actions would prevent recurrence. Those items for which additional licensee action was warranted remained open. The following items were reviewed.

7.1 Engineering

(Closed) Unresolved Item 50-317 and 318/93-31-02: Service Water System Boundary Isolation Valve Issues. The item was reviewed and closed as documented above in section 4.1.

(Closed) Unresolved Item 50-317 and 318/94-09-01: Excessive Corrosion of ICI Flange Components. The item was reviewed and closed as documented above in section 4.2.

(Closed) Violation 50-317 and 318/94-25-01: Lack of Protection of Safety-Related Equipment During Construction. The violation was reviewed and closed as documented above in section 4.5.

(Open) Unresolved Item 50-317 and 318/95-01-01: Lack of Seismic Evaluation for On-Site Modification of Pre-qualified Safety-Related Control Cubicle. The issue remains open as documented in section 4.6 above.

(Closed) Violation 50-317 and 318/94-05-01: Design control measures were not provided for verifying the installation of the 13 kV voltage regulator modification. This issue was reviewed and closed in section 4.7.

(Closed) Violation 50-317/89-27-05: Inadequate Cable Separation;
(Closed) Unresolved Item 50-317 and 318/92-80-05: EDG Adequacy to Support Worst Case Loads; and,
(Closed) Unresolved Item 50-317 and 318/92-80-06: Degraded Bus Relay Setpoints and Load Flow Study.

The issues were reviewed and closed in section 4.8.

(Open) Unresolved Item 50-317 and 318/92-80-09: HVAC for Electrical Distribution System Equipment. The issue remains open pending evaluation of BGE's Appendix R self-assessment, as discussed in section 4.8.

(Closed) Unresolved Item 50-317 and 318/95-03-02: Fire in Wall Between Auxiliary and Turbine Buildings. The unresolved item was administratively closed and a violation was cited, as discussed in section 4.8.

8.0 MANAGEMENT MEETING

During this inspection, periodic meetings were held with station management to discuss inspection observations and findings. At the close of the inspection period, an exit meeting was held to summarize the conclusions of the inspection. No written material was given to the licensee and no proprietary information related to this inspection was identified.

8.1 Preliminary Inspection Findings

Two Non-Cited Violations were identified regarding the use of the incorrect solenoid in a component cooling water valve and the inadvertent removal of a neutron radiation area posting. Two instances of failure to maintain high radiation area boundaries were an Unresolved Item. A Violation was identified with regard to failure to provide fire barriers required by 10 CFR 50 Appendix R.

ATTACHMENT 1

Routine Maintenance and Surveillance Observations

MO 2199502561	Clean 21 SRWHX Tubes
MO 2199405239	Clean 21 CCHX Tubes
MO 2199403817	Replace 2-RV-3827 (21 SDCHX RV)
MO 1199405885	Inspect/Repair 11 Vital Inverter
MO 2199404125	Replace 23 Battery Charger
MO 1199502966	Repair Broken Hanger on SGFP C/D Bypass Line
MO 1199502794	Repair Ceiling Leaks in 11 EDG Room
MO 2199503237	Overhaul 22 AFW Pump
MO 1199503076	Inspect/Replace #11 EDG #10 Bearing
MO 1199503077	ETP 95-061 to support #11 EDG Bearing Run-in
MO 2199503173	Pull tubes from 21 SRWHX
MO 1199502229	AFW Flow Control 1-CV-4535 Won't Stroke Open
MO 1199500731	Replace the secondary disconnect on the 11 LPSI pump breaker cabinet
MO 1199502525	Sample oil in 11 service water pump motor
MO 1199503076	Inspect and replace 11 emergency diesel generator upper crankshaft bearing for the No. 10 cylinder
MO 0199501043	Remove, measure and reinstall one thrust bearing cover bolt and radial cover bolt from the spare salt water pump
MO 1199305916	Recurring ground on No. 11 vital AC bus
STP M-520C-1	ESFAS Containment Pressure Channel ZF Calibration
STP M-310-2	Linear Power Channel Calibration
SAT 1A024F	1A Diesel Generator Endurance Test
STP O-73I-1	HPSI Pump Performance Test
STP M-520B-1	ESFAS Containment Pressure Channel ZE Calibration
STP-M-520C-1	ESFAS Containment Pressure Channel ZF Calibration
STP-O-8A-2	12 EDG and 4kV Bus 21 LOCI Sequencer Test
STP O-73I-2	HPSI Pump Performance Test