U.S.NUCLEAR REGULATORY COMMISSION
REGION I

License Nos.	DPR-53/DPR-69
Report Nos.	50-317/96006; 50-318/96006
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:	July 7, 1996 through August 24, 1996
Inspectors:	J. Scott Stewart, Senior Resident Inspector Henry K. Lathrop, Resident Inspector Fred L. Bower III, Resident Inspector Edward King, Physical Security Inspector, DRS Ron Albert, Physical Security Inspector, DRS David Silk, Senior Emergency Preparedness Specialist, Division of Reactor Safety Nancy McNamara, Emergency Preparedness Specialist, DRS Thomas Moslak, Project Engineer, DRP Gregory Galletti, Human Factors Specialist, NRR
Approved by:	Lawrence T. Doerflein, Chief Reactor Projects Branch 1 Division of Reactor Projects

EXECUTIVE SUMMARY

Calvert Cliffs Nuclear Power Plant, Units 1 and 2
Inspection Report Nos. 50-317/96-06 and 50-318/96-06

This integrated inspection report includes aspects of BGE operations, maintenance, engineering, and plant support. The report covers a seven week period of resident inspection and includes the results of announced inspections by emergency preparedness and security specialists. In addition, the results of a team inspection of the BGE corrective action programs are summarized.

Plant Operations

- A reactor coolant pump impeller replacement included an extended period of reduced inventory and was accomplished safely with appropriate management oversight and very good coordination of plant activities.

- The inspectors considered the delay of outage maintenance and other preparations for severe weather during the threat of Hurricane Bertha to be appropriately focused on plant safety.

- The Unit 1 startup was well coordinated and completed with appropriate attention to detail. Feedwater system operations during startup were completed smoothly indicating that modifications to the feedwater control system made during the outage were effective.

- The identification of a nuclear instrument problem in the early phase of power escalation was an example of thorough monitoring of reactor protection system (RPS) performance by operations and engineering personnel.

- The recurrence of mispositioning of safety related components following service water system maintenance was considered evidence that additional attention was needed to ensure that the heat exchanger realignment for maintenance did not result in a reduction of system reliability. The issue was cited as a violation of NRC requirements.

Maintenance

- The miswiring of two reactor protection system detectors required an unplanned entry into technical specification 3.0.3 and a power reduction. The miswiring was repaired and power escalation was resumed. The inspectors considered the issue unresolved pending completion of the BGE root cause evaluation.

- During emergency diesel generator testing (EDG) following maintenance, the engine shutdown on high jacket water cooling temperature when the actual temperature was normal. BGE identified that jacket water cooling temperature sensors had been removed from the system, incorrectly calibrated, and replaced in the EDG. Although setpoint drift as high as 70 degrees was observed on the bench, no evaluation of continued operability of the switches was conducted and system engineering personnel stated that they were not aware that the switches were

found out-of-calibration. BGE conducted an extensive evaluation of the event and identified root causes and specified appropriate corrective actions. The issue was considered a non-cited violation in accordance with the NRC enforcement policy.

- Troubleshooting of reactor coolant pump high vibration was well-planned and completed in a systematic manner. The subsequent pump replacement required extensive preparations by maintenance, operations, engineering, and radiation controls personnel. The replacement was well coordinated with proper focus on nuclear and personnel safety.

Engineering

- The continued operability of the service water system has been challenged by micro and macrofouling of the service water heat exchangers. Repeated mechanical cleanings have resulted in extended out-of-service time and has challenged operations and maintenance personnel. BGE stated that the simultaneous degradation of both trains of service water on August 21 was due to accelerated and unanticipated biofouling from the Chesapeake Bay.

- Saltwater system pumps, pump motors, and pump discharge check valves have been subject to recurring failures. Additional engineering attention appears warranted to these problems.

- The inspectors concluded that BGE's investigation of the issues surrounding the 11B RCP suction deflector had been rigorous and detailed.

Plant Support

- Excellent ALARA principles were used to maintain a low overall exposure for the Unit 1 reactor coolant pump replacement.

- BGE continued to maintain a good emergency preparedness program. The emergency response plan and implementing procedures were current and effectively implemented.

- Emergency response facilities, equipment, instruments and supplies were found to be maintained in a state of readiness. All required 1995 and 1996 surveillances were completed. A sampling of emergency response organization personnel training records indicated that training and qualifications were current, although the training manual was not specific regarding required topics. Quality assurance audits and surveillances were thorough and satisfied NRC requirements.

- Based upon interviews and training records, BGE was found to maintain a very good rapport with off-site agencies and support organizations.

- BGE had an effective security program. Management support was good as evidenced by the timely completion of a computer software upgrade and aggressive follow-up on security events that occur at other nuclear plants.

- The inspectors found that central and secondary alarm station operators were knowledgeable of their duties and responsibilities and were not engaged in activities that would interfere with their response functions.

- Security training was being performed in accordance with the NRC-approved training and qualification plan. The nuclear security officers were found to possess the requisite knowledge to carry out their assigned duties and that the training program was effective.

- Maintenance of security equipment was being performed in a timely manner as indicated by minimal compensatory postings associated with security equipment repairs.

- The inspectors concluded that BGE audits of security activities were comprehensive in scope and depth, that the findings were reported to the appropriate levels of management, and that the programs were being properly administered.

Safety Assessment / Quality Verification

- The inspectors found that an appropriate threshold was being used for initiating issue reports for potential conditions adverse to quality and an extensive process with multiple barriers had been established for reviewing and prioritizing issue reports. Appropriate controls were in place for resolving and escalating disagreements identified during the review process. The inspectors also concluded that effective controls were established to track the closure of issues and conditions adverse to quality.

- An effective program has been established for identifying and tracking issues to resolution. However, BGE management expectations concerning corrective action timeliness and effectiveness monitoring were not being consistently met.

- Regular and thorough self-assessments and quality assurance audits have been generally effective in identifying issues and focusing management attention on continued improvement of the corrective action process.

- Although root cause analyses were generally effective in describing the issues, the probable causes, and recommending corrective actions, many examples of weaknesses in the documentation of past similar events and planned effectiveness reviews were noted. A BGE evaluation of the quality of issue reports and root cause analyses was an initiative that has provided valuable program feedback.

- Periodic, routine, reactive, and preemptive assessments were properly focused on safety; balancing compliance and performance issues. As a result, performance problems were being identified, evaluated and effectively resolved to preclude recurrence.

- The Trip Prevention Program was a notable broad based initiative that has apparently contributed to a reduction in the number of plant trips at Calvert Cliffs.

TABLE OF CONTENTS

Taole of Contents (cont'd)

ATTACHMENTS

Report Details

Summary of Plant Status

Unit 1 began the inspection report period in a refueling outage. Following repairs to the 11B reactor coolant pump, the reactor was taken critical on July 29 and Mode 1 was entered on July 31. On August 2, Unit 1 was placed in Mode 2 following identification of a problem with two channels of the reactor protection system (RPS). On August 3, the unit returned to Mode 1 and full power was achieved on August 10. Unit 1 remained at full power for the remainder of the report period.

Unit 2 remained at full power for the inspection period with exception of a planned power reduction to 90 percent on August 2 for preventive maintenance.

I. Operations

O1 Conduct of Operations [1]

O1.1 General Comments (71707)

Overall plant operations were conducted safely with a proper focus on continued nuclear safety. The reactor coolant pump impeller replacement included an extended period of reduced inventory and was accomplished safely with appropriate management oversight and very good coordination of plant activities. The inspectors considered the delay of outage maintenance and preparations for severe weather during the threat of Hurricane Bertha to be appropriately focused on plant safety.

The Unit 1 startup was well coordinated and completed with appropriate attention to detail. Feedwater system operations during startup were completed smoothly indicating that modifications to the feedwater control system made during the outage were effective. The identification of a nuclear instrument problem in the early phase of power escalation was an example of thorough monitoring of RPS system performance by operations and engineering personnel. Continued performance problems in the saltwater and service water systems challenged plant operators and additional management attention in this area is warranted.

During the inspection period, the inspectors reviewed the recent Institute for Nuclear Power Operations (INPO) performance evaluation of Calvert Cliffs Nuclear Power Plant. No items for further NRC review were identified.

---

[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.

O1.2 ECCS Room Cooler Switch Not Restored Following Maintenance

a. Inspection Scope

The inspectors reviewed BGE activities associated with the mechanical cleaning of 11 service water heat exchanger. Following the cleaning, operators returned the system to operation using Calvert Cliffs Operating Instruction OI-29, "Saltwater System." Operators subsequently determined that a safety related switch had not been properly positioned during the restoration.

b. Observations and Findings

On August 13, the 11 saltwater system header was taken out of service for bulleting of the 11 service water heat exchanger and other maintenance. Following the maintenance, plant operators returned the header to service then established conditions to complete a thermal performance test on the heat exchanger. The test conditions included removing the 1B emergency diesel generator (EDG) from service.

During the thermal performance test, operators determined that the 11 header emergency core cooling system (ECCS) room cooler fan control switch, 1-HS-5406, was in the STOP position. The specified operational position for the switch was AUTO to allow the fans to cycle on and off for ECCS pump room temperature control. When the 1B EDG had been removed from service, the operators had inadvertently entered technical specification (TS) 3.0.5, because the 11 ECCS room cooler was out of service due to the switch position and the 12 ECCS room cooler backup power supply was out of service due to the 1B EDG. The operators formally entered the action statement which required unit shutdown if at least one train of room coolers were not made fully operable within two hours. The inspectors noted that the Calvert Cliffs Updated Safety Analysis Report, Section 9.8.2.3, states that operation of the ECCS pump room ventilation and the resultant effects on offsite dose calculations were assumed in the accident analysis.

Within minutes of discovery, the switch was returned to the AUTO position and the technical specification was exited. The operations department initiated a review of the occurrence and identified that the reactor operators had improperly performed a procedure step which placed the fan switch in the AUTO position when returning the saltwater header to service. A root cause evaluation of the occurrence was initiated by BGE.

During July and August, the reactor operators had aligned saltwater and service water systems for heat exchanger cleaning nominally twice per week and had also completed other corrective maintenance system alignments. On March 20, 1996, the 21 service water heat exchanger had been removed from service and, on restoration, blowdown recovery valve 2-SRW-640 was not placed in the correct position. The March 20 occurrence was considered a noncited violation of NRC requirements in accordance with Section VII.B of the NRC enforcement policy, (NUREG 1600). The recurrence of a failure to properly position safety related

components following service water system maintenance on August 13, was considered evidence that the BGE corrective actions for the March 20 occurrence were not effective. The inspectors were concerned that the switch mispositioning following heat exchanger cleanings had resulted in a reduction of safety system reliability. The failure to follow procedures during the return to service of the 11 saltwater header following maintenance was considered a violation of NRC requirements **(VIO 50-317&318/96-06-01)**.

c. Conclusions

During July and August, each service water heat exchanger was required to be mechanically cleaned every two weeks. Therefore, operators made SW heat exchanger lineup changes about twice per week. On two occasions, one of which occurred during this inspection period, safety related components were not returned to their normal operational position during restoration from the cleanings. The recurrence of mispositioning of safety related components following service water system cleanings was considered a violation of NRC requirements. Additional BGE management attention was needed to ensure that heat exchanger realignment from maintenance did not result in a reduction of system reliability.

O7 Quality Assurance in Operations

O7.1 Problem Identification and Resolution

a. Inspection Scope (40500)

The inspectors reviewed BGE's processes for identifying, tracking, reviewing, resolving, and preventing recurrence of problems. A sample of issue reports (IRs), program deficiency reports, corrective action reports, and associated administrative procedures were reviewed. The inspection also included observations of issue report review group (IRRG) meetings and interviews of BGE personnel. Although the IR process is for both hardware and programmatic problems, this inspection concentrated primarily on issues in the programmatic portion of the IR process.

b. Observations and Findings

BGE procedure QL-2-100, "Issue Reporting and Assessment," provided for initiating, reviewing, and processing issue reports for controlling hardware and equipment deficiencies and for resolution of issues. The procedure was most recently revised in January 1996 to incorporate management expectations that were expected to address concerns related to the timeliness and effectiveness of the corrective action program. Two main areas of concern with the corrective action program were quality of root cause analyses (RCAs) and issue resolution.

The inspectors found that issue reports were initiated by BGE staff and included the hardware and/or non-hardware information, and whether there were safety, operability, reportability, or trip concerns. If any of these concerns were identified immediate supervisory was required; otherwise, three days were specified for

supervisory review. In the plant, tags were used to identify hardware or equipment that had outstanding issue reports. Between July 1, 1995, and June 30, 1996, 10,125 issue reports were initiated to identify 6918 hardware issues, 2587 programmatic issues, and 610 issues that were included in both categories. Based on a review of a sample of issue reports the inspectors concluded that BGE personnel effectively identified and documented problems with an appropriate threshold.

Following documentation, hardware issues were forwarded to the operations maintenance coordinator for verification that an operability concern did not exist and initiation of a maintenance work order. Programmatic issues were forwarded to the issues assessment unit (IAU) for independent screening and entry into the IR tracking system. Issues that contained both hardware and programmatic facets were processed by both groups.

The Issues Assessment Unit (IAU) screener performed an initial review of issue reports for programmatic issues, mode change restraints, security concerns, Appendix R concerns, and assigned a safety significance classification. Those programmatic issues at the lowest level of significance (L-3) were closed without further action. Work orders for low priority hardware issues were tracked in the maintenance tracking system. Those issues at the highest level of significance (L-1) were processed in accordance with QL-2-103, "Program Deficiency Reporting." Program Deficiency Reports required quality assurance to review proposed corrective actions and estimated completion dates. Quality assurance was also responsible for verification of the corrective actions prior to the closure of program deficiencies.

The issue reports with a significance classification of L-2 were screened and processed further by the IAU to identify a proposed issue resolution sponsor and to assign a category. The IAU screener used a risk matrix that was based on significance and recurrence probability factors to categorize class L-2 issue reports. These issue reports were put into one of three categories: category III required no formal documentation of corrective action; category II required cause determination and tracking to completion; and category I required a formal root cause analysis (RCA) and IAU verification of completion. Of the 3197 programmatic issue reports initiated between July 1, 1995, and June 30, 1996, 410 were determined to be category I issue reports requiring an RCA.

An assigned BGE sponsor determined the appropriate level of corrective and preventive actions for each issue report. QL-2-100 identified several management expectations related to the resolution process. For category I and II issue reports, acknowledgement of the issue report in the tracking system was expected within seven days and establishment of a completion due date was expected within an additional 14 days. Additionally, QL-2-100 required the development of milestones for verifying the effectiveness of corrective actions for each category I issue report. QL-2-100 identified a goal that category I issue report be resolved within 90 days. However, due dates were expected to be established based on priority. Extensions

were expected to be justified based on safety significance and the probability of recurrence prior to the completion of corrective actions.

A BGE quality assurance audit of the corrective actions program in April 1996, identified that some issue reports were not being reviewed and accepted by the resolution sponsor within the 21 days allotted. The audit noted that plant engineering section (PES) had worked effectively with the IAU to implement corrective actions that would eliminate the 21 day delay. Discussions with PES personnel indicated that this was achieved by having the PES representative to the IRRG accept issue reports with a blanket 90 day due date immediately after each IRRG meeting. The inspectors questioned whether this corrective action met the management expectation that due dates be established based on priority. BGE management stated that future issue report due dates would be prioritized and that the backlog of issue reports in PES would be reviewed to verify that an appropriate due date was assigned.

BGE also identified that the goal of 90 days for fully resolving category I issue reports was being exceeded. The average time to complete RCA was 185 days and the average time to achieve resolution was 271 days. The oldest outstanding RCA was 823 days as of July 17, 1996. BGE management had identified this as an issue and a team was assembled to complete a priority 2 root cause.

A sample of issue reports that had root cause and resolution due dates extended was reviewed to assess the adequacy of the justification for extension, in terms of risk to safety and/or probability of recurrence. The inspectors found that 9 of 10 extension forms were marked to indicate that the risk was considered but they did not have documented justification. Discussions with BGE management indicated that documented justification was expected and that this expectation would be reinforced. An issue report was written to capture and investigate the issue and identify corrective actions.

The most recent revision to QL-2-100 added an action item to track the performance of an effectiveness review of corrective actions for category I issue reports. Discussions with BGE personnel indicated that the process enhancement to review the effectiveness of corrective actions for each category I issue report was not being consistently implemented by all site groups. The inspectors noted that although this has been highlighted in several status reports to management since as early as April 1996, no issue report had been issued to investigate and resolve this issue. An issue report was generated during this inspection and BGE management indicated that this management expectation would be reinforced.

The inspectors discussed the information in the administrative procedures with several staff members from operations, plant engineering, maintenance, IRRG and the IAU. In all cases individuals were knowledgeable of the guidance regarding the issue report and RCA screening and review processes, reviewer responsibilities, categorization of the issue reports, and the prioritization of RCAs.

BGE evaluated the effectiveness of the Corrective Action Program (CAP) by mid-year self-assessments performed by the Issues Assessment Unit. As a result of critical evaluation, changes were under review for improving the timeliness and methods for gauging process effectiveness. The inspectors concluded that candid evaluations of the corrective action program had been conducted that identified where BGE management attention should be directed.

c. Conclusions

The inspectors found that an appropriate threshold was being used for initiating issue reports. An extensive process with multiple barriers had been established for reviewing and prioritizing issue reports. IAU and IRRG categorization of issue reports was found to be conservative. Appropriate controls were in place for resolving and escalating disagreements identified during the review process. The inspectors also concluded that effective controls were established to track the closure of issues and conditions adverse to quality.

The inspectors concluded that an effective program has been established for identifying and tracking issues to resolution. The BGE management expectations concerning timeliness of issue report closures, justification of extension of issue report closures, establishing due dates based on priority and significance, and performance of effectiveness reviews were not always met; however, based on the IRs reviewed, no immediate safety concerns were noted. Regular and thorough self-assessments by BGE have identified timeliness issues and focused management attention on continued improvement of the corrective action process.

O7.2 Root Cause Analysis and Human Performance

a. Inspection Scope

The inspectors reviewed the BGE programs for root cause analysis (RCA) to assess the adequacy of the related administrative controls and implementing procedures, and to ensure that the BGE staff were performing the root cause analyses in a manner consistent with this guidance. A sample of root cause analyses were reviewed to ensure that the issues were adequately described, that causes were identified, and that recommendations were appropriate. The inspectors reviewed the BGE methods of trending and evaluating the results of RCAs and BGE training on RCA and human performance investigations.

b. Observations and Findings

The root cause analysis programs were controlled primarily through site quality assurance administrative procedures QL-2-100, "Issue Reporting and Assessment," and QL-2-101, "Event Investigations and Root Cause Analysis." Several line organizations had further implementing guidance for their specific RCA reports, including self-evaluation of RCAs (e.g., Plant Engineering Guideline (PEG)-6, "Root Cause Analysis").

The inspectors reviewed the guidance in QL-2-101 regarding the categorization of issue reports and the criteria used to prioritize the level of RCA required for a given issue. A sample of issue reports were reviewed to determine if the resolution sponsor's classification of the report was commensurate with the guidance in QL-2-101 and to determine if the reviewers were qualified (i.e., had completed human performance evaluation system (HPES) or other root cause training) to perform the reviews. The inspectors found the root cause program to be effective for identifying plant and personnel performance issues, determining the causes for the events, and providing reasonable recommendations for preventing recurrence of the issues. The inspectors noted that in all cases, individuals assigned responsibility for the RCA review had completed the BGE required RCA training. The inspectors observed that the level of detail associated with the report narratives, probable causes for the events, and proposed corrective actions generally appeared appropriate. However, the inspectors determined that the current implementation of the QL-2-100 and QL-2-101 guidance appeared to be non-uniform across line organizations with respect to content of the RCA reports as well as categorization when IRs require an RCA.

A review of a sample of IRs and RCAs indicated that various interpretations of QL-2-101 guidance were being implemented. Guidance for RCA content regarding past identification and treatment of similar events, and inclusion of an effectiveness monitoring discussion were not consistent. In some cases there did not appear to be any method to determine if similar events were identified or evaluated. In many cases the sources of the historical information provided were not apparent. Additionally, the inspectors could not determine if appropriate databases had been reviewed in cases where the screenings were not documented. For those reports where similar events were identified, the corrective actions associated with the earlier incidents were not consistently recorded. In at least one instance the corrective actions following RCA were not documented in such a manner that they could be retrieved for the review.

The inspectors reviewed the database of issue reports since January 1, 1996 to determine what percentage of reports were being downgraded from Category I (RCA required) to other categories which do not require such review. The data indicated that several line organizations were frequently downgrading the issue report categorizations contrary to the IRRG recommendations and the guidance from QL-2-100 and QL-2-101. Discussions with BGE staff indicated that in some cases the issue reports were downgraded as a result of additional information on the issue being subsequently identified. One area where it appeared that a large percentage of downgrades were occurring involved the implementation of the QL-2-101 criteria for the functional failure of the maintenance-rule scoped equipment. BGE staff noted that the issue was primarily one of interpretation of what constituted a functional failure and not one of downgrading issue reports which were determined to be functional failures. BGE acknowledged that there was a need to clarify the criterion in QL-2-101 and to disseminate management expectations in this area.

The inspectors reviewed the methods employed by the BGE operations, maintenance, and plant engineering departments as well as the operations

experience group (OER) to determine if controls were in place to effectively evaluate the quality of the RCAs issued. The inspectors reviewed sample documents and discussed the program effectiveness with management and OER personnel. In all cases BGE personnel were knowledgeable of the methods used to assess the RCA programs and were able to provide written reports and discuss the self-assessment findings from their organizations. The plant engineering group developed detailed RCA evaluation criteria which was incorporated into their departmental procedures. This evaluation tool provided a method for supervision to judge the thoroughness of root cause investigations. This method was being considered by BGE for site-wide implementation at the time of the inspection.

In addition the inspectors reviewed the various databases the line organizations had established to track their human performance and equipment performance issues. In all cases the databases provided a detailed method for trending and tracking information. The inspectors noted that as a result of developing these databases BGE had been able to identify some negative equipment and personnel performance trends and take actions (e.g., initiate issue reports, develop event free seminars) to further identify and correct the problems. In addition the databases were used to provide insight on precursors to potential performance problems. Most notable was the operations gold card program database which provided operations line management with an effective tool for assessing operations performance and was used routinely to support their event free seminar reports.

c. Conclusions

The inspectors concluded that the RCA programs were generally effective in providing detailed narratives of the issues, the probable causes for the events, and proposed recommendations for mitigating recurrence. However, the inspectors noted the format and content of RCAs varied widely among line organizations and weaknesses were noted in the documentation of past similar events and planned effectiveness reviews. The inspectors also noted many examples where RCAs were apparently downgraded due to lack of explicit guidance in administrative control documents. BGE acknowledged that there was a need to clarify the management expectations in this area.

The inspectors concluded that the BGE evaluation of the quality of issue reports and RCAs provided valuable program feedback. The reviews of human and equipment performance that the line organizations as well as those the IAU and OER groups conducted were considered a proactive initiative directed at continuous improvement.

O7.3 Self-Assessment Activities

a. Inspection Scope

The scope of this inspection was to evaluate the effectiveness of the self-assessment activities including the scope and frequency of periodic audits, routine assessments, pre-emptive assessments performed prior to implementing major

programmatic changes, and reactive assessments conducted in response to site incidents.

b. Observations and Findings

BGE's philosophy and expectations for conducting self-assessments were articulated by senior management in nuclear program policy and mission statements. These expectations for "continuous quality improvement" had resulted in the self-assessment process being ingrained into the normal work routines of the site departments as well as formalized, detailed, periodic audits of station activities. The Quality Audits Section within the Nuclear Quality Assurance Department had responsibility for carrying out routine audits as required by 10CFR50 Appendix B. The inspectors reviewed a sample of completed audits addressing the Corrective Action Program (Audit 96-02), Nuclear Safety Oversight (Audit 96-03), Special Processes (Audit 96-06), and Fuel Management & Independent Spent Fuel Storage Installation (Audit 96-08).

The inspectors determined that the audits were performed at the proper frequency, addressed performance as well as compliance related issues, documented findings in issue reports (IR) and program deficiency reports for departmental response and action plan development, and received the appropriate level of management attention. The assessments were constructed using procedure QL-3-300, "Audit Program," for developing checklists to assure pertinent safety issues and departmental performance were appropriately addressed. Particular noteworthy is that audit findings as a separate entity are eliminated and are promptly captured as issue reports or program deficiencies for expeditious follow-up.

Routine self-assessments were a continuous process within the Calvert Cliffs organization. The inspectors reviewed these activities within the Operations and Nuclear Engineering Departments. Operations Administrative Policy 91-8, "Operations Self-Assessment Program," provided the methodology and the responsibilities for the operations staff and management to critically evaluate and track watchstanding, procedural use, shutdown safety, and various operational practices to identify process improvements. Through a combined strategy, program elements included supervisory observations, gold card (documentation identifying low threshold concerns that do not require an Issue Report), administrative reviews, and operator rounds validation audits. Twenty-two separate checklists identifying specific management expectations were provided to assist supervision in observing such diverse activities as post-maintenance testing, procedure use, radiological controls practices, and plant operator rounds. Strengths and weaknesses were rated and the results were discussed with the individual observed. A matrix classifying operational significant incidents caused by personnel or procedural inadequacy by severity level and documentation of "near misses" using the gold cards and issue reports provided a method of identifying event precursors and recognizing negative performance trends. Data was categorized and compiled in the Operations Monthly Performance Indicator Report for management review and overall performance trends were graphically presented for communications, self

verification, conservative decision making, demonstration of a questioning attitude, pre-evolution briefs, and responsibility/accountability.

A similar self-assessment program was established in the Nuclear Engineering Department, using the gold card (customized to engineering activities) as the primary means of reporting and tracking low-threshold concerns that affect the quality and effectiveness of this department's products and services.

Quarterly safety performance evaluations were performed by the Plant Operating Experience Group of the Operating Experience Review (OER) section. These reports assessed operations, engineering, maintenance, and plant support using the categories of performance indicators, events, and performance management (self-assessment, corrective actions, and precursors). Scoring of these categories provided a ready measurement of adverse performance symptoms and facilitated management analysis of contributing factors. The Industry Operating Experience Group of the OER section performed reviews to apply industry experience to Calvert Cliffs. The inspectors concluded that relevant industry experience was being screened and systematically applied to site activities.

Refueling Outage self-assessments were conducted. The assessment was a joint effort of departmental site managers to critique the control and execution of outage related activities from the standpoint of pre-outage planning and scheduling, change control, contingency planning, control of high risk evolutions, and identification of incident precursors.

A Joint Utility Management Audit, in which an independent audit by external (third party) organizations, was performed to assess the effectiveness of the Nuclear Quality Assurance Department (NQAD) programs and initiatives. In response to audit findings, several NQAD program enhancements were underway including establishment of an Audit Process Improvement Team, development of an Operations Integrated Assessment Team (in which a multi-disciplinary team performs quarterly audits vice a biannual audits by a sole auditor), and re-alignment of responsibilities within the NQAD.

As a result of the maintenance rule implementation shortcomings identified in a 4th Quarter BGE Multi-Area Audit (95-04), BGE management directed that a dedicated assessment be performed by a consultant to correct program deficiencies prior to the Rule's effective date. The results of this effort have better prepared site organizations for carrying out the regulatory requirements.

Reactive self-assessments have been performed by the Independent Safety Evaluation Group (ISEG) within the Operating Experience Review Section. The inspectors reviewed ISEG Evaluation 95-16 that addressed differences between the approved plant configuration drawings and the actual field conditions. This evaluation was found to be of high quality; addressing root causes, safety implications, and corrective actions. This effort was a prompt and aggressive response to issue reports that captured print/as-found mismatches.

In response to a high reactor trip rate during 1994 and 1995, BGE management directed that a causal analysis be performed and corrective actions be implemented to preclude recurring problems. Four causes were identified: (1) certain activities were conducted without an adequate evaluation of trip potential, (2) an inconsistent discipline in problem solving and work control was applied before and after events, (3) an inconsistent accountability to site standards and expectations existed, and (4) equipment aging was not aggressively managed. Corrective action plans were developed for each of these causes and responsibilities assigned.

Collectively the resolutions are known as the "Trip Prevention Program" and consist of a variety of supporting programs. Specific programs included: the Event Free Operations program that provided performance indicators and trending mechanisms for "near misses" and unplanned plant transients as a means to identify incident precursors; the development and use of the "Why Staircase" to comprehensively evaluate critical factors, including the human performance, behavioral and work culture aspects, contributing to an incident; and the development of system Report Cards for evaluating and trending the performance of selected systems. Additional corrective actions included the identification of trip sensitive equipment and areas, wide dissemination of performance standards/expectations to site personnel, and initiation of the Reactivity Management Program and the System Maintenance Improvement (SMI) plan. The inspectors concluded that the Trip Prevention Program was a broad based initiative that has apparently contributed to a significant reduction in the number of plant trips at Calvert Cliffs.

The inspectors reviewed two "Why Staircase" case studies: (1) Case Study 9 that addressed the partial loss of off-site power and reactor trip of February 29, 1996, and (2) Case Study 10 that addressed the potential fatal near-miss when keys on an electrician's belt touched an energized circuit on April 15, 1996. The case studies addressed (per the established methodology) accurate event description, specific symptoms leading to the event, problems resulting from procedure non-adherence, programmatic shortcomings, team behavioral traits, and work culture weaknesses. In response to the lessons learned, supervision was tasked with providing staff training to improve work controls.

c. Conclusions:

BGE management had used self-assessments as a tool to monitor progress in achieving performance goals through a continuous quality improvement philosophy. Periodic, routine, reactive, and pre-emptive assessments were properly focused on safety and balanced compliance and performance issues. Resources were available and utilized for tracking, trending, and retrieving assessment data. Through the self-assessment process, performance problems were being promptly identified and comprehensively evaluated. In particular, the Trip Prevention Program was a notable broad based initiative that has apparently contributed to a reduction in the number of plant trips at Calvert Cliffs.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Routine Maintenance Observations

Using Inspection Procedures 62703, 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:

MO1199600459	Repack Manual Valve 1-SI-311
MO1199504597	Votes Test 1-SI-656 MOV
MO2199601410	Sample Oil and Lubricate 21 AFW pump Turbine
MO1199603264	Replace 11 AFW Pump Inboard Bearing
MO2199603238	Clean Tubes in No. 21 Service Water Heat Exchanger

M1.2 Emergency Diesel Generator Shutdown on High Jacket Water Temperature

a. Inspection Scope

The inspectors reviewed scheduled preventive maintenance conducted on an emergency diesel generator (EDG) during plant operation. The inspection was focused on the BGE evaluation of crankshaft strain and a calibration check of jacket water cooling temperature sensors. An engine shutdown that occurred due to high jacket water temperature during testing that followed the maintenance was also reviewed.

b. Observations and Findings

On July 10, 1996, scheduled preventive maintenance was initiated on the 2A EDG. The maintenance included an evaluation of crankshaft strain and a calibration check of the jacket water cooling temperature sensors. BGE stated that the crankshaft strain was monitored to ensure that excessive loads were not placed on the engine crankshaft, particularly from generator misalignment, which could cause premature bearing failure.

During the preventive maintenance, BGE identified a crankshaft strain of -0.00275 inches which exceeded the vendor recommended allowable range of 0 to $\pm$.002 inches. The vendor was contacted and BGE initiated additional inspections to evaluate wear to the crankshaft bearings and to check overall engine alignment. Also, an evaluation of continued operability was completed.

The additional inspections did not identify any unusual component degradation. BGE stated that all inspections and measurements on the main and generator

bearings were within specifications. Oil and grease samples did not indicate bearing erosion. Additionally, BGE identified no other indications of alignment problems.

BGE stated in their operability determination that the condition was a slow trend of increasing strain that would not result in equipment damage without additional indication. To ensure that the additional indications were identified, BGE specified additional monitoring and specified a temporary strain limit of -0.004 inches. Also, generator vibration data would be evaluated to monitor generator bearing performance during engine operation.

The preventive maintenance also included a calibration check of the three jacket water cooling temperature switches. The temperature switches were removed from the engine for the calibration check which was done in accordance with BGE Technical Procedure FTI-339, "Calibration of Allen Bradley Temperature Controllers and Switches." The procedure specified that the switches be placed, one at a time, in a temperature bath in which the temperature was slowly raised or lowered until the switch tripped or reset, as appropriate. A temperature standard was also placed in the temperature bath for the calibration.

On July 10, the instrument technicians used a dry block heat source instead of a water bath as was customary for the calibration check. The procedure did not specify a heat source for the calibration. The inspectors were told by BGE that the dry block was selected because the temperature controllers were known to drift high out-of-specification, were calibrated to 195 ±2, 200 ±2, and 205 ±2 degrees Fahrenheit (°F), and the water bath was not able to be easily raised to these temperatures.

The calibration of the temperature switches resulted in the following adjustments, in degrees Fahrenheit.

July 10, 1996	TS-4803	TS-4804	TS-4805
AS FOUND	263	237	275
AS LEFT	197	201	205
DESIRED	195 ± 2	200 ± 2	205 ± 2
ADJUSTMENT	-66 Deg	-36 Deg	-70 Deg

After calibration, the switches were reinstalled in the engine cooling system. The post-maintenance operability test was conducted on July 12, 1996. Approximately 46 minutes after start of the engine, the high jacket water temperature alarm actuated. Personnel in the diesel room noted that indicated jacket water temperature was normal, at about 158°F, the engine was running as expected, and other engine temperature indications were normal. Within two minutes after the high temperature alarm, the engine shutdown on high jacket water temperature when temperature switches, TS-4803 and TS-4805 actuated.

Engineering review of the engine shutdown indicated that a problem with the temperature switches might have been the cause. The switches were removed from the diesel and a calibration check was performed using the wet bath as a heat source. The switch setpoints were found approximately 50 degrees below the desired values at 153, 168.5, and 158.3°F for TS4803, 4804, and 4805, respectively.

BGE evaluation of the miscalibration identified that use of a dry bath heat source contributed to the problem. It was determined that the dry bath heat blocks did not provide an equilibrium temperature for the particular switches because the insertion length of the switch did not fully match the receptive fit of the dry bath and the dry bath did not provide even heating over the length of the switch because the upper portion of the dry bath was not heated. The temperature standard properly indicated dry bath temperature but in the configuration used to calibrate the switches, the sensed temperature was not that of the inserted switch.

BGE retrieved new temperature switches from stock and after calibration using a wet bath heat source, installed the switches in the generator and completed a successful operability test. The dry block heat sources were removed from service and an operability evaluation of components calibrated using the dry block was completed.

The inspectors considered the installation of miscalibrated temperature switches in the 2A EDG to be a safety significant issue. Specifically, had the miscalibration gone undetected during the operability run, the diesel may not have been available to provide safety related needs following a loss of offsite power event. Additionally, the miscalibration of the temperature sensors was an example of a common mode failure for the water cooled EDGs.

The inspectors reviewed calibration history for the temperature switches and found that in the previous two calibrations in March 1994 and January 1992, switch TS-4803 had drifted two degrees low but otherwise, no adjustments were required. Calibrations prior to 1992 required negative setpoint adjustments because the switches had drifted high. The inspectors questioned BGE as to the acceptability of returning to service temperature sensors with an identified as-found drift as high as 70 degrees. BGE stated that replacement of the switches was scheduled for October 1996, therefore the occurrence was an isolated case and excessive sensor drift was not considered in returning the switches to service. No evaluation of the observed setpoint drift was conducted and system engineering personnel stated that they were not aware that the switches were found out-of-calibration.

BGE conducted a root cause evaluation of the factors that contributed to the engine shutdown during testing on July 10. The factors identified by BGE included that the test equipment shop was not consulted when the dry bath was selected for calibration, technicians were not familiar with the differences between the dry bath calibrators and the wet bath, and both the technicians and supervision did not recognize when they had deviated from routine practice, therefore evaluation of the change was not conducted. Corrective actions addressed the identified causes.

The inspectors considered the issue to be a violation of 10CFR 50, Appendix B, Criterion XII, Control of Measuring and Test Equipment, which required that instruments be properly calibrated. However, because the issue was identified by BGE, including completion of a formal root cause evaluation, corrective actions have been specified and were being implemented, the miscalibration was not willful, and the occurrence was not a repeat occurrence, discretion not to issue a Notice of Violation was used in accordance with NUREG 1600, Section VII, B.1.

c. Conclusions

During 2A emergency diesel generator maintenance on July 10, jacket water cooling temperature sensors were removed from the system, incorrectly calibrated, and replaced in the EDG. As a result, the engine shutdown on high jacket water cooling temperature when the actual temperature was as expected. Although setpoint drift as high as 70 degrees was observed on the bench, no evaluation of continued operability of the switches was conducted and system engineering personnel stated that they were not aware that the switches were found out-of-calibration. BGE conducted an extensive evaluation of the event and identified root causes and specified appropriate corrective actions.

BGE identified the 2A EDG crankshaft strain exceeded the vendor recommendations. BGE actions to evaluate the issue, perform an operability determination, and perform additional monitoring were appropriate.

M1.3 Reactor Coolant Pump Failure and Replacement

a. Inspection Scope (71707)

The inspectors reviewed the circumstances surrounding mechanical failure of the 11B reactor coolant pump (RCP) and its repair, The inspectors also assessed BGE's root cause analysis of the failure.

b. Observations and Findings

On July 7, in preparation for Unit 1 startup, control room operators started the 11B RCP. Immediately after pump start, increasing vibration was observed. When vibration increased rapidly from the normal 8-10 mils, operators tripped the pump. The maximum vibrations recorded were 34 mils on the motor and 73 mils on the pump.

BGE suspended preparations to restart Unit 1 and formed an investigative team to diagnose the cause of the high vibration. The team conducted troubleshooting in a preplanned sequence so as to not destroy any potential evidence. No problems were found with either the motor or the motor-pump alignment. The motor bearings and the pump hydrostatic bearing were also found in good condition. Upon examination of the pump casing and impeller using a camera placed inside the reactor coolant system, BGE found that the suction deflector had broken off and wedged against one of the impeller vanes. The suction deflector was normally held

in place by two 5 1/2 inch long, A-286 stainless steel cap screws, torqued to 50 ft-lbs. The cap screw was prevented from backing out by a tack-welded locking bar on the cap. BGE found that both of the cap screws for the suction deflector had broken at the thread/shank interface and one of the screws had broken the locking bar. Both the locking bar and the broken screw were missing. The other cap screw although broken at the shank, remained attached to the deflector by the locking bar.

The pump was removed from the reactor coolant system and inspections verified that the cap screw and locking bar were the only missing parts. The pump impeller remained intact with no evidence of erosion or damage. A search of the reactor coolant piping in the vicinity of the removed pump was conducted and neither of the missing parts was found. Also, the cold-leg resistance temperature detector (RTD) wells downstream of the RCP were examined visually and by inserting a rod in each well to detect any bending which could have resulted from impact by the failed cap screw. No abnormalities were observed.

The rotating assembly of the 11B RCP was replaced with a new assembly that did not incorporate a suction deflector. In this model, the impeller was welded to the pump shaft to eliminate suction deflector failures and to improve pump shaft balance. Also, BGE inspected the 11A, 12A and 12B RCPs and found no indication of degradation to the suction deflectors, cap screws or locking bars for these pumps. The pump replacement required extensive planning and preparations by maintenance, operations, engineering, and radiation controls personnel. Component staging, reactor coolant system inventory control, and maintenance conduct were well coordinated with significant focus on nuclear and personnel safety. Cameras were used to limit personnel exposure and the replacement was conducted with an overall exposure of 4.2 person-rem.

BGE performed an evaluation of the potential deleterious effects of the missing cap screw and locking bar on the RCS. Based in part on previous experience with the failure of the 22B RCP suction deflector in June 1987, BGE concluded that the most likely location of the broken cap screw was the flow skirt region of the reactor vessel. An analysis performed in 1988 by Combustion Engineering (CE) demonstrated that in the worst case, the cap screw would not erode through the cladding of the reactor vessel over the period of the operating cycle. This worst case required that the cap screw remain agitated by RCS flow in one location for the operating cycle. The analysis also determined that the resultant corrosion would be minor if wear through the clad occurred.

BGE could not limit the location of the missing locking bar to areas outside the fuel assemblies. Because Calvert Cliffs used fuel assemblies (216 out of a total of 217) incorporating a special debris filter on the bottom of each assembly (Guardian™ fuel), there was a reduced possibility of fuel damage due to erosion from the locking bar. BGE indicated that operation of Unit 2 after the 22B RCP event resulted in five fuel pin leaks over the period, which was about normal for that time. To date, there were no known debris-related failures of Guardian™ fuel either at Calvert Cliffs or other CE plants using that fuel. The BGE analysis concluded that fuel damage due

to debris from the failed suction deflector was bounded by technical specification fuel damage limits.

BGE also evaluated the possibility of future suction deflector failures and concluded that the cap screw failures observed were unlikely once the RCPs were in operation. The analysis indicated that the failure of the deflector cap screws occurred on pump start due to high torque on the deflector plate. Hydrostatic pressure and the recess into which the deflector was fitted held the deflector in position when the pump was running, regardless of cap screw condition. BGE also evaluated each of the other uses of the A-286 stainless steel material in the RCS and concluded that no significant hazard to continued reactor operation existed.

Based on the results of the analysis and review by the plant operations safety review committee (POSRC) the plant general manager concluded on July 25, 1996, that there were no adverse safety consequences from the missing parts and authorized restart of Unit 1. Additionally, there were no identified concerns with the continued operation of Unit 2.

c. Conclusions

A reactor coolant pump replacement required extensive planning and preparations by maintenance, operations, engineering, and radiation controls personnel. Troubleshooting was well-planned and completed in a systematic manner. Excellent ALARA principles were used to maintain a low overall exposure for the effort. The replacement was well coordinated with proper focus on nuclear and personnel safety.

The inspectors concluded that BGE's investigation of the issues surrounding the 11B RCP suction deflector had been rigorous and detailed.

M1.4 Unit 1 Reactor Protection System Detectors Incorrectly Installed

On August 2, during power escalation following the Unit 1 refueling outage, BGE personnel noted a diverging trend in axial shape index (ASI) at 30% power. Nuclear instrument excore detector channels A and D were trending as predicted, but channels B and C were not as expected. Based on divergence between the two channel pairs, the operators declared ASI out of service for channels B and C and entered Technical Specification 3.0.3. A report was made to the NRC and operators reduced power to Mode 2 to place the unit in a mode where the technical specifications for ASI did not apply.

BGE wrote an issue report to track the resolution of this issue and a root cause investigation was initiated. The detectors for channels B and C had been replaced during the outage while channels A and D were not disturbed. BGE identified that the divergence was due to reversed leads for the upper and lower detectors in the B and C channels. A containment entry was made, and the reversal of the leads was corrected. A licensee event report for this issue was initiated. The inspectors

considered the miswiring of the detectors to be unresolved pending completion of the root cause evaluation by BGE **(URI 50-317&318/96-06-02)**.

M1.5 Routine Surveillance Observations

The inspectors witnessed/reviewed selected surveillance tests to determine whether 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. 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:

OI-30	Nuclear Instrument Channel Calibration (Daily)
STP-O-5-2	AFW Monthly Surveillance Test
STP-O65E-2	Saltwater Pump Discharge Check Valve Test
STP-M200-1	Reactor Trip Breaker Testing
STP-O8A-1	Test of 1A Emergency Diesel Generator
STP-F696-0	Fire Pump Flow Test
OI-89	Seismic Instrument Monthly Surveillance

III. Engineering

E2 Engineering Support of Facilities and Equipment

E2.1 Service Water Heat Exchanger Cleaning and Continued Operability

a. Inspection Scope

The inspectors reviewed biofouling of the service water heat exchangers and problems with the saltwater system pumps, pump motors, and pump discharge check valves.

b. Findings and Observations

On August 21, the inspectors observed mechanical cleaning of the 21 service water heat exchanger. The heat exchanger had closely approached a differential pressure limit for operability due to a combination of micro and macro fouling. With BGE mechanical maintenance personnel approximately 50 percent complete with the cleaning, operations personnel halted the cleaning and requested that maintenance restore the heat exchanger to service to allow expedited cleaning of the 22 service water heat exchanger. The 22 heat exchanger also had approached the differential pressure limit for continued operability and either additional fouling or an increase in bay temperature would require entry into technical specification 3.0.3, which required reactor shutdown.

BGE stated that the simultaneous degradation of both trains of service water was due to accelerated and unanticipated biofouling from the Chesapeake Bay. Since bay temperatures had been relatively low, engineering personnel delayed mechanical cleaning of the heat exchangers to for seven days from the planned 14 day routine that had been implemented in July. However, the delay did not was not made in full consideration to possible differential pressure degradation due to shells and debris clogging the heat exchanger tubes.

The inspectors also noted there have been repeated mechanical problems with the saltwater pump discharge check valves. During the cleaning of 21 header, the check valve for 21 pump was replaced because reverse flow had been observed through the valve. After replacement, a satisfactory test of the valve was conducted; however, the next day, when maintenance again secured 21 saltwater header for mechanical cleaning of the service water heat exchanger, the pump was observed rotating backwards indicating that the check valve had not fully reseated. The inspectors noted that check valve failures due to debris was a recurring problem.

The inspectors also noted degradation of differential pressure and flow for the saltwater pumps. At the time of the Unit 1 reactor startup, two of the three saltwater pumps was identified in the alert range for differential pressure, as measured during ASME Section XI inservice testing. The inspectors also observed that one pump and two pump motors on Unit 2 required recent replacement due to operational failures.

Biofouling of the service water heat exchangers had also impacted control room operations by requiring reactor operators to perform additional monitoring of saltwater flow to the service water heat exchangers, differential pressure across the service water heat exchangers, and bay temperature. Operators were required to perform system alignments for emergent and scheduled heat exchanger cleanings and bulleting, shift component cooling flow to the reactor coolant pumps to allow adequate saltwater flow to the service water heat exchangers when differential pressure was high, and determine system operability using a series of complex graphs and charts. Frequent realignment of the service water system for cleaning of the heat exchangers has contributed to two component misalignments by control room operators (See section O1.2).

The inspectors found that frequent maintenance on the system challenged reactor operators by requiring mechanical and electrical alignment changes, affected reliability of plant safety systems due to overall out of service time, and challenged maintenance personnel by requiring emergent corrective maintenance. The operability of the service water system appears to have been challenged by repeated biofouling of the service water heat exchangers. The effectiveness of the BGE corrective actions was indeterminate at the time of the inspection. The issue is considered unresolved **(URI 50-317&318/96-06-03)**.

c. Conclusions

The continued operability of the service water system was challenged by micro and macrofouling of the service water heat exchangers. Repeated mechanical cleanings of service water heat exchangers had increased out-of-service time and challenged operations and maintenance personnel.

Saltwater pump discharge check valves were subject to recurring failures due to debris in the system preventing seating of the valves. Saltwater pumps and pump motors have been subject to degradation and have required replacement.

IV. Plant Support

P1 Conduct of Emergency Preparedness (EP) Activities

a. Inspection Scope (82701)

The inspectors reviewed the BGE action item tracking system, the Emergency Planning Unit's (EPU) self-assessment program and root cause analysis reports to determine the effectiveness of licensee controls in emergency preparedness.

b. Observations and Findings

The EPU performed numerous self-assessments of the EP program in 1995 and 1996 that included assessments of exercise deficiencies and audit findings. The EPU management closely monitored the program for trends of repeated discrepancies or issues. If an actual or suspected deficiency or non-conformance was identified, an issue report (IR) was submitted to the Issues Assessment Unit (IAU) and tracked as an action item.

The EPU performed 144 self-assessments in 1995 and over 100 in 1996. The EPU submitted 39 of the assessments as issue reports. Three findings from issue reports were assigned a Category I; 28 were assigned a Category II and eight were assigned a Category III. The inspectors reviewed a selection of the self-assessments and all Category I, II, and III action items and determined that the assessments appeared to be appropriately self-critical; and, with one exception, corrective actions were implemented for the closed action items.

The inspectors noted that one Category II action item was closed without correcting the initial problem identified by the EPU. (Details are in Section P8.1.) BGE representatives stated that, since the action item was assigned a Category II, no independent review had been done to verify if the corrective action taken was appropriate.

The inspectors reviewed the root cause analysis reports that were performed for the three Category I action items. The reports were detailed and thorough, and conclusions were supported with additional documentation.

c. Conclusions

BGE has an adequate action item tracking system in place for tracking issue reports identified in EP exercises, audits, or self-assessments. The EPU utilizes the self-assessment program for program enhancements, identification of program weaknesses, and resolution of issues.

P2 Status of EP Facilities, Equipment, and Resources

a. Inspection Scope (82701)

The inspectors conducted an audit of emergency equipment in the Control Room, Operations Support Center, Technical Support Center (TSC), TSC Annex, Emergency Operations Facility, Farm Demonstration Building, and Joint Information Center. A tour of the local community hospital and a county Emergency Operations Center (EOC) was also conducted (see Section 8.3). The inspectors reviewed facility equipment inventories conducted during the past year for completeness and accuracy.

b. Observations and Findings

The inspectors checked several emergency equipment kits and emergency supply cabinets located in the emergency facilities and found them to be stocked in accordance with BGE procedures. They also verified that survey meters, personnel dosimetry, and respirator canisters were calibrated and operational.

The inspectors reviewed equipment and supply inventory checklists for 1995 and two quarters in 1996. The inspectors determined that inventories were conducted in a timely manner, inventory checklists were properly completed and reviewed, and immediate corrective actions were taken on identified deficiencies.

c. Conclusions

The inspectors concluded that the BGE maintained a very good inventory program, and that the emergency facilities and equipment were operationally ready.

P3 EP Procedures and Documentation

a. Inspection Scope (82701)

The inspectors reviewed recent emergency response plan (ERP) and implementing procedure (ERPIP) changes to assess the impact on the effectiveness of the EP

program. The inspectors also assessed the process that BGE uses to review ERPIPs and changes made to them.

b. Observations and Findings

The inspectors reviewed the BGE commitments in the ERP, Section 6.V, "Program Review and Update," and ERPIP-900, "Preparation of Emergency Response Plan and Implementation Procedures," regarding the processing of ERP and ERPIP changes and reviews. The ERP and ERPIPs received the required reviews from on-site and off-site review committees. As a new initiative, BGE assigned specific procedures to be reviewed by the appropriate technical unit. The inspectors considered this to be a good initiative. The Emergency Preparedness Director (EPD) regularly certified that the ERP and the ERPIPs were current.

In accordance with ERPIP-900, proposed changes to these documents were to be reviewed against federal requirements, guidance in NUREGs, and commitments in the updated final safety analysis report (UFSAR). The inspectors reviewed several change packages and determined that BGE had reasonable explanations to justify and support the changes. An in-office review of revisions to the ERP and ERPIPs submitted by BGE was completed by the inspectors. A list of the changes reviewed are included in Attachment 2 to this inspection report. The inspectors concluded that the revisions did not reduce the effectiveness of the EP program.

The inspectors determined that BGE had no documentation specifying the required training for the site emergency coordinator position. The inspectors inquired about the original commitment regarding training for the site emergency coordinator. The licensee showed the inspectors Revision 2 (1982) of the ERP, which contained a list of the training topics for the site emergency coordinator. The inspectors found that, over time, the list of topics was moved from the ERP into an ERPIP; and, eventually, in subsequent changes, the list no longer existed. The inspectors reviewed the topics in Revision 2 and determined that they were necessary and applicable to the site emergency coordinator position in the performance of his duties. By reviewing the current training material, the inspectors also determined that the topics stated in Revision 2 of the ERP were still being taught because of stability in the BGE EP staff. However, without a specific list of required topics, staff changes in the EP unit could result in incomplete site emergency coordinator training. That would fail to meet the original commitments of the ERP and could result in an unintentional reduction in the effectiveness of the ERP. In response, BGE conducted a review of the issue and updated the training manual accordingly.

c. Conclusions

BGE had sufficient processes and controls to address ERP and ERPIP reviews and changes.

P5 Staff Training and Qualification in EP

a. Inspection Scope (82701)

The inspectors reviewed EP training records, training procedures, lesson plans, ERPIPs and the BGE ERP to evaluate the BGE EP training program.

b. Observations and Findings

The inspectors verified that drills (fire, medical, post-accident sampling) and annual exercises were being conducted as stated in the ERP and ERPIP-905, "Exercises, Tests and Drills." Critiques were forwarded to management for review. The inspectors reviewed the BGE documentation for tracking exercise objectives and determined that they were being accomplished as required.

The inspectors reviewed individual emergency response organization (ERO) training records and determined that all ERO qualifications were current. BGE performed a monthly check to monitor ERO qualification status. As stated in Section P.3 for the site emergency coordinator, the inspectors noted that there was no specific listing of topics to be covered during initial or annual retraining. BGE reviewed previous document revisions that specified training topics and put those topics into the Emergency Response Training Program Manual (ERTPM) to ensure that those topics will continue to be covered in future training.

BGE had implemented the following training initiatives: (1) exercise and drill critiques were electronically distributed to everyone to inform them of identified issues; (2) training conducted at the emergency response facilities for the responders assigned to that facility covered major points of the specific procedure for each position to familiarize the duties of each position; and (3) ERO training is conducted during the months of June, July, and August as a means to effectively utilize training resources. The inspectors considered these initiatives to be enhancements to the training program.

The inspectors verified by reviews and interviews that appropriate training was being conducted for off-site agencies and support organizations. Annual emergency action level (EAL) training for state and counties was very comprehensive. Fire, rescue, and medical training were well attended. Training materials provided for media personnel were informative and well organized.

c. Conclusion

The inspectors determined that all ERO members were qualified and their qualification status was being closely monitored by the EPU. Training of off-site agencies and support organizations was of good quality and was being completed as required. The initiatives implemented demonstrated a progressive attitude to improve the training process. Overall, the inspectors assessed this area as very good.

P6 EP Organization and Administration

a. Inspection Scope (82701)

The inspectors reviewed EP group staffing and management to determine what changes have occurred since the last program inspection (January 1995) and if those changes had any adverse effect on the EP program.

b. Observations and Findings

There were no changes within the EPU since the last inspection; however, the emergency preparedness director plans to eliminate the emergency planning technician position by January 1997. He has concluded that elimination of this position will not reduce the ability to administer the EP program effectively.

The inspectors interviewed the Nuclear Support Services Manager (NSSM) and emergency preparedness director separately regarding the EP program, program initiatives and significant issues. All responses were consistent.

In a May 1996 memo to the NSSM, the emergency preparedness director committed to several program initiatives for 1996 and 1997. The inspectors reviewed those initiatives and found them to be appropriate. BGE stated that each of the suggested initiatives have management support.

c. Conclusions

The EP staff was able to meet its commitments with the present staffing level. Management support of EP program was good, as evidenced by the findings of this inspection.

P7 Quality Assurance (QA) in EP Activities

a. Inspection Scope (82701)

The inspectors reviewed QA audit and surveillance reports of the EP program, conducted in 1994 and 1995. The inspectors interviewed the lead QA auditor regarding the process for conducting a program audit.

b. Observations and Findings

Annual QA surveillances and audits were conducted by individuals independent of the EPU. The 1994 and 1995 reports were appropriately detailed and contained positive and negative comments, with recommendations, addressing the areas specified in 10 CFR 50.54(t). No repeat items were found by the inspectors. The reports were distributed to BGE management and off-site agencies as appropriate. No programmatic problems were identified.

The lead auditor was familiar with the EP program. There was not any specific EP expertise on the audit or surveillance teams. However, the lead auditor used technical specialists, as necessary, to evaluate areas within their expertise program.

c. Conclusion

The QA findings were detailed and critical, and the reports met the requirements of 10 CFR 50.54(t). The inspectors assessed this area as good.

P8 Miscellaneous EP Issues

P8.1 Updated Final Safety Analysis Report (UFSAR) Inconsistencies

The inspectors observed no discrepancies between the UFSAR and the ERP or ERPIPs. Since the UFSAR does not specifically include EP requirements, the inspectors compared BGE activities to the ERP. The inspectors reviewed off-site training, media training, public information, post-accident sampling system procedures and training, and recovery phase actions and organization. No discrepancies were noted. The quality of the annual EAL training and the materials available for media and public information were strengths. However, the inspectors found that in October 1995, BGE removed digital voice protection (DVP) from the emergency response radios to improve the quality and clarity of the signal received.

In January 1996, the EPU performed a self-assessment and identified that a reference to DVP remained in UFSAR Section 7.8.2.6, "Radio Telephone System," and this section was not consistent with the ERP or ERPIPs. The EPU initiated an issue report that was assigned as a Category II action item. The corrective action was to change ERPIP-900, "Preparation of Emergency Response Plan and Implementation Procedures," to include a review for UFSAR inconsistencies when changes are made to the ERPIPs. However, the corrective action did not include changing the UFSAR for the removal of the DVP. The inspectors stated that, while the corrective action taken by the EPU was a good initiative in assuring that a UFSAR review would be conducted, the corrective action did not address, nor resolve, the initial problem. Prior to the exit meeting, BGE initiated a UFSAR/USAR Change Request to remove the DVP reference in order to accurately describe their current radio system. This item is an unresolved item **(URI 50-317&318/96-06-04)**.

P8.2 ERO Response and Availability

Whenever the ERO is activated, the entire organization is notified to respond. The inspectors determined that there were no administrative controls to ensure that all positions were capable of being filled. For example, the inspectors determined that four ERO positions had only two personnel currently qualified to fill those positions. (BGE is in the process of qualifying additional personnel for these positions.) The inspectors asked if there were any methods to ensure that the qualified individuals in these, and other, positions were available to respond to an event because individuals may be physically unable to respond due to health reasons or being out

of the area. BGE personnel stated that no administrative controls were in place to verify an individual's status. The licensee demonstrated that, historically, there have always been ample personnel who have responded to fill every position.

P8.3 Off-site Interface

The inspectors toured the Calvert County EOC and interviewed the County Emergency Management Chief to assess the BGE interface with the off-site agency. The county official indicated that BGE had maintained an excellent rapport, is very responsive to the county's concerns, and that there were no outstanding issues.

The inspectors also visited one local hospital, toured the designated emergency radiological area, and interviewed members of the medical staff to verify the adequacy of the radiological training provided by BGE. The inspectors found that a portable radiological detection instrument was malfunctioning and two storage bags, containing thermoluminescent dosimeters (TLDs), had no calibration date. Apparently, the instrument had failed since the last quarterly inventory conducted by BGE, and the calibration stickers had fallen from the bags. BGE immediately verified that the TLDs were in calibration, placed a calibration sticker on each bag, and replaced the malfunctioning instrument.

Based upon the interviews, the inspectors concluded that the quality of training for off-site agencies and support organizations (Section P.05.b) was very good and that BGE maintains a very good rapport with off-site entities.

P8.4 (Closed) Follow-Up Item 50-317&318/95-01-02:

Determine whether the training requirements of ERTPM are being met. This item was opened because emergency response training program ownership was undergoing a transition from the EPU to various training units. The ERTPM was written to outline the requirements of this new program. However, the manual was not being distributed to all responsible individuals and there was no method to control changes made by the various units to ensure that the ERTPM was being properly implemented. The ERTPM is now being distributed to all applicable individuals who have signed an acknowledgement statement describing their training responsibilities and limitations. The inspectors determined that the ERTPM addressed the concerns raised during issue report 95-01 and effectively controls the administration of training.

S1 Conduct of Security and Safeguards Activities

a. Inspection Scope

The inspectors reviewed various areas of the security program including previously identified items; effectiveness of management controls; management support and audits; protected area detection equipment; alarm stations and communications; testing, maintenance and compensatory measures; and training and qualifications.

The purpose of this inspection was to determine whether the BGE security program, as implemented met NRC requirements.

b. Observations and Findings

The inspectors conducted a physical inspection of the protected area (PA) intrusion detection systems (IDSs). The inspectors determined by observation that the IDSs were installed and maintained as described in the NRC-approved security plan (the Plan). Additionally, the inspectors observed licensee testing of the IDSs at the independent spent fuel storage installation (ISFSI) on August 15, 1996. The inspectors determined, based on observations and discussions with security supervision, that the IDSs were being properly tested in accordance with licensee procedures and the Plan, and that the IDSs detection capability was effective.

The inspectors observed Central Alarm Station (CAS) and Secondary Alarm Station (SAS) operations, and verified that the alarm stations were equipped with the appropriate alarm, surveillance, and communication capabilities. The inspectors interviewed CAS and SAS operators and found them knowledgeable of their duties and responsibilities. The inspectors also verified that the CAS and SAS operators were very alert and attentive to duties, and were not required to engage in activities that would interfere with assessment and response functions, and that the licensee had exercised communications methods with the local law enforcement agencies as committed to in the Plan.

The inspectors reviewed testing and maintenance records for security-related equipment and confirmed that the records were on file and that BGE was testing and maintaining systems and equipment as committed to in the Plan. A review of these records indicated that repairs were being completed in a timely manner and that a priority status was assigned to each work request. The inspectors also noted that security equipment repairs are normally completed within 24 hours from the time a work request is generated and that security equipment rework has decreased due to the focused efforts of the maintenance group.

The inspectors reviewed the use of compensatory measures and found them to be appropriate and minimal. It was apparent that priority repair efforts were carried out by the maintenance group when equipment problems required compensatory measures.

The inspectors reviewed the training, physical, and firearms qualification and requalification records of nine nuclear security officers (NSOs) selected at random. The inspectors determined that training had been conducted in accordance with the NRC-approved security training and qualification (T&Q) plan and that it was properly documented.

The inspectors observed tactical range and tactical movement training for one NSO on August 15, 1996. The training consisted of tactical weapons manipulation, target acquisition and tactical movement, and stressed the use of cover and concealment. The instructors did an excellent job controlling the drills and the

range was controlled in a safe manner. Additionally, the inspectors interviewed several NSOs and determined that, based on the NSOs responses to the inspectors' questions, the training provided by the security training staff was effective.

Management support for the physical security program was determined to be excellent. This determination was based on the inspectors' review of various program enhancements made since the last inspection, which was conducted in April 1996. These included completion of the vehicle barrier system installation, procurement of the personnel access data system (PADS), the approval to hire additional NSOs to address manning needs, the allocation of monetary resources for additional training initiatives, and the aggressive review and follow-up of security events that occur at other nuclear plants to determine the susceptibility of the Calvert Cliff's security system and program to similar events.

The inspectors determined that the licensee had controls for identifying, resolving, and preventing security program problems. These controls included the performance of the required annual quality assurance (QA) audits, an ongoing and active suggestion program for the NSOs that addresses programmatic concerns, performance of benchmarking exercises, and ongoing security shift supervision oversight. The licensee also utilizes industry data, including adverse data, such as violations of regulatory requirements identified by the NRC at other facilities, as a basis for self-assessment to determine if similar conditions exist in its program. A review of documentation applicable to the aforementioned programs indicated that initiatives to minimize security performance errors and to identify and resolve potential weaknesses were being implemented and were effective.

c. Conclusions

BGE had an effective security program in place. Management support was good as evidenced by the timely completion of the vehicle barrier system, the completion of a computer software upgrade and aggressive follow-up on security events that occur at other nuclear plants. The central and secondary alarm station operators were knowledgeable of their duties and responsibilities and were not engaged in activities that would interfere with their response functions.

Security training was being performed in accordance with the NRC-approved training and qualification plan, and management controls for identifying, resolving, and preventing programmatic problems were effective. The nuclear security officers were found to possess the requisite knowledge to carry out their assigned duties and that the training program was effective.

Protected area detection equipment was installed and maintained in accordance with the NRC-approved Physical Security Plan (the Plan) commitments and security equipment testing was being performed as required by the Plan. Maintenance of security equipment was being performed in a timely manner as indicated by minimal compensatory postings associated with security equipment repairs.

S7 Quality Assurance in Security and Safeguards Activities

The inspectors reviewed the 1995 Quality Assurance (QA) audit of the security program conducted in October 1995, five surveillances (Surveillance Nos. S-95-4-7, S-95-4-9, S-95-4-12, S-95-4-13, and S-95-4-14), and the 1995 audit of the fitness for duty (FFD) program (Surveillance S-95-3-8) conducted in August 1995. The inspectors determined that the audits were conducted in accordance with the Plan and FFD rule. To enhance the effectiveness of the FFD audit, the audit team included an independent technical specialist. The 1995 security program audit identified one finding concerning the manner in which security plan changes were processed and the 1995 FFD audit identified one finding concerning the collector's failure to adhere to procedural guidance during a pre-access drug and alconol test. The audits also included recommendations. The inspectors determined that the findings were not indicative of programmatic weaknesses, and the recommendations would enhance program effectiveness. The inspectors also determined, based on discussions with security and FFD supervision and a review of the responses to the findings, that the actions taken in response to the audits were effective.

The inspectors concluded that BGE audits of security activities were comprehensive in scope and depth, that the findings were reported to the appropriate levels of management, and that the programs were being properly administered.

S8 Miscellaneous Security and Safeguards Issues

(Closed) IFI 50-317 and 50-318/96003-01: During Inspection No. 95-04, the inspector noted a weakness concerning the lack of a control to alert security screening unit personnel when a person has been absent from a behavioral observation program for more than 30 days. During inspection 96-03, conducted in April 1996, the inspectors reviewed the actions taken to resolve the concern and noted that the applicable revised procedure had not been implemented in a timely manner. Therefore, the procedure's effectiveness could not be properly evaluated.

During this inspection, the inspectors determined that the action taken to resolve the concern was adequate. The action involved the revision of Security Standard #11, titled "30 Day Hold," dated April 9, 1996. Based on a review of applicable documentation and discussions with security management, the corrective actions appear adequate. No similar problems were noted.

V. Management Meetings

X1 Exit Meeting Summary

During this inspection, periodic meetings were held with station management to discuss inspection observations and findings. On September 9, 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. Inconsistencies were noted concerning emergency preparedness activities as discussed in Section P8.1.

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
J. Hardinson, Emergency Preparedness Training Coordinator
M. Polak, Supervisor - Quality Assurance Unit
J. Thorpe, General Supervisor, Instrument and Controls Maintenance

Department of Public Services and Safety (Calvert County)
D. Hall, Chief, Calvert County Emergency Management

NRC
R. Keimig, Chief, Emergency Preparedness and Safeguards Branch, DRS

INSPECTION PROCEDURES USED

IP 62703: 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&318/96-06-01	VIO Safety system misalignments during saltwater and service water system maintenance.
50-317&318/96-06-02	URI Two nuclear instrument detectors were miswired
50-317&318/96-06-03	URI Effectiveness of corrective actions regarding biofouling of the saltwater cooling systems
50-317&318/96-06-04	URI Survey team radios noncompliance with UFSAR

Closed

50-317&318/95-01-02	IFI Determine whether the training requirements of ERTPM are being met
50-317&318/96-03-01	IFI Lack of a control to alert security screening unit personnel when a person has been absent from a behavioral observation program for more than 30 days

LIST OF ACRONYMS USED

ALARA	As Low As Reasonably Achievable
RCA	Root Cause Analysis
SWP	Special Work Permit
kV	Kilovolts (1000 volts)
GS-NPO	General Supervisor - Nuclear Plant Operations
UFSAR	Updated Safety Analysis Report
MOV	Motor Operated Valve
LPSI	Low Pressure Safety Injection
EDG	Emergency Diesel Generator
DVP	Digital Voice Protection
EAL	Emergency Action Level
EOC	Emergency Operations Center
EP	Emergency Preparedness
EPU	Emergency Preparedness Unit
ERP	Emergency Response Plan
ERPIP	Emergency Response Plan Implementing Procedure
ERTPM	Emergency Response Training Program Manual
ERO	Emergency Response Organization
IR	Issue Report
IAU	Issues Assessment Unit
NSSM	Nuclear Support Services Manager
PASS	Post-Accident Sample System
QA	Quality Assurance
SEC	Site Emergency Coordinator
TLD	Thermoluminescent Dosimeter
RCAR	Root Cause Analysis Report

ATTACHMENT 2
EMERGENCY RESPONSE PLAN AND IMPLEMENTING PROCEDURES REVIEWED

Document	Document Title	Revision, Change
	ERP	22
ERPIP-102	Superintendent - Nuclear Operations	2
ERPIP-104	NRC Emergency Notification System Communications	0, Change 3; 1
ERPIP-105	Control Room Communicator	3
ERPIP-107	Interim Radiological Assessment	2
ERPIP-108	Interim Radiation Protection	0
ERPIP-109	Radiation Monitoring System (RMS) Communicator	1
ERPIP-201	Technical Support Center Director	2, Change 3
ERPIP-202	Plant General Manager	2
ERPIP-203	Chemistry Director	1
ERPIP-207	TSC Computer Maintenance Staff	2
ERPIP-208	Plant Parameters Communications, TSC	1
ERPIP-209	Technical Support Center Communicator	3
ERPIP-210	CR/TSC Monitor	1; 2
ERPIP-3.0	Radioactivity Release - Dose Estimate	18, Change 6
ERPIP-3.0	Placekeeper, Attachment 22	18, Change 1
ERPIP-301	Operational Support Center	3, Changes 1 & 2
ERPIP-302	Engineering Director	1, Change 1
ERPIP-303	Radiation Protection Director	1, Change 2
ERPIP-304	Operational Support Center (OSC) Engineer	1, Change 1
ERPIP-307	Operations Team Leader	2
ERPIP-309	Dosimetry Team Leader	2
ERPIP-310	Maintenance Team Leaders	1, Change 1
ERPIP-311	Chemistry Team Leader	1, Change 1
ERPIP-312	First Aid Team Leader	1, Change 2
ERPIP-314	OSC Communicator	1, Change 1
ERPIP-315	Plant Parameters Communicator	0, Change 3
ERPIP-316	Operational Support Center Monitor	1; 2; 2, Change 1
ERPIP-319	Dosimetry Team Members	1
ERPIP-322	First Aid Team Members	1
ERPIP-403	NEF Monitor	1; 2
ERPIP-501	Site Emergency Coordinator	3
ERPIP-502	Recovery Officer	2
ERPIP-503	Emergency Operations Facility (EOF) Director	2, Change 1
ERPIP-504	Environmental Assessment Director	1
ERPIP-507	Off-site Monitoring Team	0, Change 3, 4, 5
ERPIP-508	Plant Parameters Communications, EOF	1
ERPIP-509	Emergency Operations Facility Communicator	3
ERPIP-511	Radiological Assessment Director	1
ERPIP-512	Radiological Assessment Specialist	1
ERPIP-700	Cafeteria Assembly Area	1, Change 2
ERPIP-701	Warehouse 3 Assembly Area	1
ERPIP-703	Security Processing Building Monitor	0, Change 4
ERPIP-710	Farm Demonstration Building Decontamination Facility	1
ERPIP-720	Technical Representatives	2
ERPIP-750	Security	4

ERPIP-760	Plant Parameters Communications, Media Access	1
ERPIP-801	Core Damage Assessment Using Containment Radiation Dose Rates	1
ERPIP-802	Core Damage Assessment Using Core Exit Thermocouples	1
ERPIP-803	Core Damage Assessment Using Hydrogen	1
ERPIP-804	Core Damage Assessment Using Radiological Analysis of Samples	1
ERPIP-810	Main Steam System Radioactivity Release Estimate	1
ERPIP-821	Accidental Radioactivity Release Monitoring and Sampling Methods	1
ERPIP-831	Radiation Exposure Guidance	2
ERPIP-832	Emergency Work Permits	2
ERPIP-840	RCS/LPSI Instructions	2
ERPIP-841	Containment Atmosphere Instructions	1
ERPIP-842	Wide Range Noble Gas Monitor Instructions/ Precautions	1
ERPIP-900	Preparation of Emergency Response Plan and Implementation Procedures	4
ERPIP-901	Communications Equipment	2
ERPIP-902	Records	1, Change 1
ERPIP-904	Training	3
ERPIP-905	Exercises, Tests and Drills	1; 1, Change 1
ERPIP-B.1	Equipment Checklist	18, Change 3; 19