U.S.NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos.	50-317/93-10; 50-318/93-10
License Nos.	DPR-53/DPR-69
Licensee:	Baltimore Gas and Electric Company Post Office Box 1475 Baltimore, Maryland 21203
Facility:	Calvert Cliffs Nuclear Power Plant, Units 1 and 2
Location:	Lusby, Maryland
Inspection conducted:	March 14, 1993, through April 24, 1993
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Inspection Summary:

This inspection report documents resident inspector core, regional initiative, and reactive inspections performed during day and backshift hours of station activities including: plant operations; radiological protection; surveillance and maintenance; emergency preparedness; security; engineering and technical support; and safety assessment/quality verification.

Results:

See Executive Summary.

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EXECUTIVE SUMMARY

Calvert Cliffs Nuclear Power Plant, Units 1 and 2

Inspection Report Nos. 50-317/93-10 and 50-318/93-10

Plant Operations: (Operational Safety Inspection Module 71707, Prompt Onsite Response to Events at Operating Power Reactors Module 93702) Operators appropriately implemented the emergency response plan during a loss of meteorological instrumentation. Housekeeping was generally good. Unit 2 defueling operations were found to be adequate.

Radiological Protection: (Module 71707) Based on direct observation of access controls and radiological safety practices and discussions with radiological controls personnel, the radiological protection program and its overall implementation was excellent. A non-cited violation resulted from improper entries into the radiologically controlled area by a worker who had not completed the requisite training.

Maintenance and Surveillance: (Maintenance Observations Module 62703, Surveillance Observations Module 61726) A maintenance technician demonstrated excellent attention to detail by discovering a failed condenser fan bearing while performing a maintenance order. BG&E's efforts to prevent foreign material entry into the reactor coolant system and to reduce the consequences of failed foreign material controls were appropriate. BG&E's enhancements to the maintenance planning, trending, post maintenance testing, and repeat maintenance programs have provided good success in reducing maintenance backlogs and in meeting maintenance goals.

Engineering and Technical Support: (Module 71707) BG&E's response to a leak on a Unit 2 vessel head penetration was prompt, comprehensive, and well organized. BG&E's investigation into a suspected secondary calorimetric inaccuracy on Unit 1 demonstrated a good safety perspective. BG&E also demonstrated a good safety perspective following the identification of a Unit 1 sample line that did not conform to design.

DETAILS

1.0 SUMMARY OF FACILITY ACTIVITIES

Unit 1 began the period at full power. The thermal operating limit was reduced from 2700 MW to 2685 MW on April 7 due to concerns about the accuracy of the secondary calorimetric, as discussed in Section 7.4. This resulted in a reduction in power to 99.5%. The thermal operating limit was returned to 2700 MW on April 16. The unit operated at full power for the remainder of the period.

Unit 2 began the period in mode 6 (refueling) with reactor defueling in progress. Defueling was completed on March 19. Unit 2 continued the refueling outage for the remainder of the period.

2.0 PLANT OPERATIONS

2.1 Operational Safety Verification

The inspectors observed plant operation and verified that the facility was operated safely and in accordance with licensee procedures and regulatory requirements. Regular tours were conducted of the following plant areas:

-- control room
-- primary auxiliary building
-- radiological control point
-- electrical switchgear rooms
-- auxiliary feedwater pump rooms
-- security access point
-- protected area fence
-- intake structure
-- diesel generator rooms
-- turbine building

Control room instruments and plant computer indications were observed for correlation between channels and for conformance with technical specification (TS) requirements. Operability of engineered safety features, other safety related systems and onsite and offsite power sources was verified. The inspectors observed various alarm conditions and confirmed that operator response was in accordance with plant operating procedures. Routine operations surveillance testing was also observed. Compliance with TS and implementation of appropriate action statements for equipment out of service was inspected. Plant radiation monitoring system indications and plant stack traces were reviewed for unexpected changes. Logs and records were reviewed to determine if entries were accurate and identified equipment status or deficiencies. These records included operating logs, turnover sheets, system safety tags and temporary modifications log. Plant housekeeping controls were monitored, including control and storage of flammable material and other potential safety hazards. The inspectors also examined the condition of various fire protection, meteorological, and seismic monitoring systems. Control room and shift manning were compared to regulatory requirements and portions of shift turnovers were observed. The inspectors found that control room access was properly controlled and that a professional atmosphere was maintained.

In addition to normal utility working hours, the review of plant operations was routinely conducted during backshifts (evening shifts) and deep backshifts (weekend and midnight shifts). Extended coverage was provided for 41 hours during backshifts and 24 hours during deep backshifts. Operators were alert and displayed no signs of inattention to duty or fatigue.

The inspectors observed an acceptable level of performance during the inspection tours detailed above. Housekeeping was generally good. Most work areas were kept free of dirt and debris.

2.2 Followup of Events Occurring During Inspection Period

During the inspection period, the inspectors provided onsite coverage and followup of unplanned events. Plant parameters, performance of safety systems, and licensee actions were reviewed. The inspectors confirmed that required notifications were made to the NRC. During event followup, the inspectors reviewed the corresponding CCI-118N (Calvert Cliffs Instruction, "Nuclear Operations Section Initiated Reporting Requirements") documentation, including the event details, root cause analysis, and corrective actions taken to prevent recurrence. The following event was reviewed.

a. Unusual Event

On March 23, 1993, at 4:40 p.m., BG&E declared an Unusual Event due to the loss of meteorological instrumentation. Power was lost to the primary meteorological instrumentation due to a power cable fault. Secondary meteorological instrumentation was out of service awaiting repairs. This instrumentation provides information for determining radioactive release paths and associated protective action recommendations under severe accident conditions. Meteorological instrumentation is required by BG&E's emergency response plan if either unit is at power.

The inspectors discussed the impact of the loss of this instrumentation with the shift supervisor and reviewed the emergency response contingency plans for this condition. The inspectors found that BG&E was taking appropriate action and that adequate contingency plans were in place. An interim human/telephone link was established to transfer data from offsite meteorological instrumentation to the control room. The event was reported the NRC in accordance with 10 CFR 50.72.

The Unusual Event was terminated on March 25, 1993, at 7:05 a.m. following the repair of the faulty power cable. The inspectors concluded that operators appropriately implemented the emergency response plan during the event.

b. Severe Winter Storm

On March 13, 1993, a severe winter storm impacted much of the eastern United States. The storm had no affect on the operation of either plant. In addition, there was no significant volume of snow in the local area as a result of the storm. BG&E assigned an additional shift of operators during the storm as a contingency. The inspectors verified that the appropriate severe weather abnormal operating procedures were entered as required. The inspectors concluded that BG&E took appropriate actions during the storm and that the assignment of an additional operating crew demonstrated a strong safety perspective

2.3 Engineered Safety Features System Walkdown

In addition to routine observations made during regular plant tours, the inspectors conducted walkdowns of the accessible portions of selected safety related systems. The inspectors verified system operability through reviews of valve lineups, control room system prints, equipment conditions, instrument calibrations, surveillance test frequencies and results, and control room indications. The inspectors performed a detailed walkdown of the Unit 1 boration flow paths during the inspection period.

Inspectors walked down the system, reviewed the system prints, and reviewed the results of surveillance test procedures (STPs) O-62-1, "Monthly Valve Position Verification," and O-87-1, "Borated Water Source 7 Day Operability Verification," and the operations department locked valve verification performance evaluation. No discrepancies were noted in the system electrical or mechanical lineup. The material condition of the system was adequate.

2.4 Refueling Activities

The inspectors reviewed BG&E's fuel handling procedures and observed fuel off-load operations to verify compliance with technical specifications (TS). The inspectors found that: (1) fuel off-load operations were performed in accordance with TS and approved BG&E procedures, (2) plant conditions and staffing were maintained as required by TS, (3) personnel involved with operation of the refueling machine were well trained, and (4) good housekeeping and loose object controls were maintained in the refueling area.

The inspectors also noted that neither the fuel off-load procedure (Fuel Handling Procedure 210) nor the refueling machine operating instruction (OI 25C) provided a step-by-step description of how to operate the refueling machine. The refueling machine operating instruction did provide general information on how to operate each of the controls, and described the associated interlocks; however, the integrated sequence of operations necessary to move fuel was not described. BG&E subsequently revised the procedures to provide much more specific operating guidance. The inspectors had no further concerns.

3.0 RADIOLOGICAL CONTROLS

During tours of the accessible plant areas, the inspectors observed the implementation of selected portions of the licensee's Radiological Controls Program. The utilization and compliance with special work permits (SWPs) were reviewed to ensure detailed descriptions of radiological conditions were provided and that personnel adhered to SWP requirements. The inspectors observed that controls of access to various radiologically controlled areas and use of personnel monitors and frisking methods upon exit from these areas were adequate. Posting and control of radiation areas, contaminated areas and hot spots, and labelling and control of containers holding radioactive materials were verified to be in accordance with licensee procedures.

Health Physics technician control and monitoring of these activities were determined to be good. Overall, an excellent level of performance was observed.

3.1 Entry Into Radiologically Controlled Area Without Required Training

Inspectors reviewed the circumstances surrounding three improper entries into the Radiologically Controlled Area (RCA) by a contract worker who had not satisfactorily completed General Orientation Training (GOT) Part 2 for radiation workers. GOT Part 2 provides indoctrination in radiological protection for personnel requiring access to the RCA.

The worker was given GOT as part of his check-in to the site on February 6. He failed GOT Part 2 and respiratory protection training. He was then issued a plant identification badge with a red background and a keycard that was not coded for access to the Radiologically Controlled Vital Areas, including the Auxiliary Building and containments. The worker first attempted to enter the Auxiliary Building on March 5. He was denied entry and an alarm was caused when he used his keycard in the card reader. A nuclear security officer responded and informed the worker that he would need an escort because his badge and keycard were not coded for the RCA. The worker made escorted entries to the RCA on March 5, 6 and 23.

Following his last entry, a dosimetry technician reviewing the dosimetry record noted that the worker was limited to a radiation exposure of 90 mrem/qtr, which indicated that he was not a radiation worker. An issue report and a radiological control report were generated to document the issue and to initiate an investigation. The worker's access to the RCA was immediately restricted and his dosimetry was read. He did not receive any radiation exposure as a result of his RCA entries.

Inspectors found several contributing factors leading to the improper entries:

1. The GOT Study Guide states that, "Personnel with access to RCAs will have a red background color on their picture badge." However, Security Plan Implementing Procedure (SPIP) 1004, "Unescorted Access Authorization and Personnel Badging

Procedures," was changed by the Nuclear Security Section in November 1992, to allow issuance of red background badges without radiologically controlled zones pending completion of GOT Part 2. The change was made to facilitate check-in of the large number of contract workers expected for the Spring 1993 refueling outage. Dosimetry, Radiation Control, and Nuclear Training Section supervisors and personnel were unaware of the change in meaning of the red background badge.

2. The worker did not realize that he had failed GOT Part 2. He was given GOT and site check-in on a Saturday in a class of approximately 100 workers. He stated that he only had about 10 minutes to review the GOT Part 2 material before taking the exam, because the instructor announced that the class would end at 4:30 p.m. After reviewing the completed exam with the instructor, he understood that he had failed only the respiratory protection training. He was then issued a red background badge, which he believed indicated he had completed the requirements for radiation workers.

3. Nuclear Training Section sent a written notification to the contractor office on February 15 that the worker had failed GOT Part 2 and respiratory protection training; however, the notification could not be traced.

4. The dosimetry record computer defaults to a quarterly exposure limit of 100 mrem/qtr. The record must then be manually changed to 90 mrem/qtr for non-radiation workers. The worker's exposure limit had not yet been changed in the computer when new dosimetry records were printed out. As a result, dosimetry clerks at the RCA access desk had no reason to question the worker entering the RCA, since he had a valid red background badge and a 100 mrem/qtr exposure limit. When the dosimetry records were later updated, a dosimetry technician did discover the discrepancy and the unauthorized RCA entries.

5. Radiation Safety Procedure (RSP) 1-110, "Controlled Area Access Control," states that personnel entering an RCA must have successfully completed GOT Parts 1 and 2, be an authorized Member of the Public per RSP 1-116, or have completed GOT Part 2 Job Specific Training in accordance with Calvert Cliffs Instruction (CCI) 602, "Calvert Cliffs GOT," Section III.G. The worker did not meet any of the three criteria. The GOT Study Guide states that only personnel who have completed GOT Part 2 and who are working under a valid Special Work Permit shall enter an RCA.

6. SPIP 1004 states that any person authorized unescorted access into the Vital Areas may act as an escort in their authorized access area. However, the GOT Study Guide and CCI 602 require that escorts to the RCA be approved by the Supervisor of Radiation Control-Operations or his designee.

Following the discovery of the RCA entries, the worker was reissued a yellow background badge to signify unescorted access to only non-Radiologically Controlled Vital Areas. A review of training records indicated several other contractor workers who had been issued

red background badges pending completion of GOT Part 2. None of them had entered the RCA. They were subsequently reissued yellow background badges. A review of records did not reveal any other instances of RCA entry without the requisite training.

Dosimetry, Nuclear Security, and Radiation Control Sections conducted investigations of the issue. In addition, a root cause analysis by the independent assessment unit was in progress as the period ended. In the interim, dosimetry clerks were alerted to the issue. Dosimetry records of non-radiation workers were clearly labeled to help prevent unauthorized RCA entry. Nuclear Training Section began sending failure notifications via electronic mail immediately to applicable supervisors and then providing followup memorandums to help ensure the notifications reached their destinations. Final corrective actions are pending BG&E's evaluation of their internal investigations.

Inspectors interviewed the worker and discussed the entries with applicable contract supervisors, supervisors of dosimetry, radiation control, nuclear security, nuclear training, training instructors, and dosimetry clerks and technicians. They also reviewed applicable training and dosimetry records and instructions. Inspectors assessed that the primary causes of the improper entries were: (1) failure to adequately evaluate the effect on plant routine of a change in the meaning of the red background badge, (2) failure to adequately disseminate the change to plant personnel, and (3) miscommunication of the training status of the worker to both him and his supervisors.

Actual safety consequences of the RCA entries were minimal. The worker did not receive any radiation exposure as a result of his RCA entries. The worker did not enter any high radiation or airborne radioactivity areas or the containment. No other similar instances of improper RCA entry were discovered. He was an experienced radiation worker and had been employed at several other nuclear power plants prior to Calvert Cliffs. BG&E's immediate corrective actions were prompt and comprehensive.

Notwithstanding BG&E's corrective actions, 10 CFR 19.12 requires that all individuals working in or frequenting any portion of a restricted area shall be kept informed of the storage, transfer, or use of radioactive materials or of radiation in such portions of the restricted area; shall be instructed in the health protection problems associated with exposure to such radioactive materials or radiation, in precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed... The extent of these instructions shall be commensurate with potential radiological health protection problems in the restricted area. Consequently, entry into the RCA without the requisite training is a violation of 10 CFR 19.12. The violation was not cited because the criteria for discretion specified in Section VII.B. of the NRC Enforcement Policy, 10 CFR 2, Appendix C, were satisfied.

4.0 MAINTENANCE AND SURVEILLANCE

4.1 Maintenance Observation

The inspector reviewed selected maintenance activities to assure that:

-- the activity did not violate technical specification limiting conditions for operation and that redundant components were operable;

-- required approvals and releases had been obtained prior to commencing work;

-- procedures used for the task were adequate and work was within the skills of the trade;

-- activities were accomplished by qualified personnel;

-- where necessary, radiological and fire preventive controls were adequate and implemented;

-- quality verification hold points were established where required and observed; and

-- equipment was properly tested and returned to service.

The work observed was performed safely and in accordance with proper procedures. Inspectors noted that an appropriate level of supervisory attention was given to the work depending on its priority and difficulty. Notable observations are included below for selected activities. Maintenance activities reviewed included:

MO 19205594	Test run 12 CS pump following oil change and bearing lubrication
MO 29105118	Modify/install helical spacers in 22 SDCHX
MO 19205521	Inspect coupling on 12 BA pump
MO 19300535	Repack 12 BA pump suction valve
MO 29005055	VOTES testing of 2-MS-4045-MOV
MO 29104684	Overhaul of 2-SI-659-MOV
MO 09102099	Upgrade roughing filters for 12 Control Room Heating Ventilation and Air Conditioning (HVAC)
MO 09203020	Inspect and lubricate 12 Control Room HVAC condenser fans

During the performance of MO 09203020, a maintenance technician observed small metal filings around one of the condenser fan bearings. Upon further investigation, the technician determined that the bearing had failed. The responsible maintenance supervisor, the system engineer and the control room were promptly notified. The bearing was subsequently replaced. The inspectors concluded that the maintenance technician demonstrated excellent attention to detail and took appropriate action after discovering the failed bearing.

4.2 Surveillance Observation

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

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

STP M-212B-1 Monthly RPS Channel B Functional Test

STP O-5A-1 Quarterly AFW System Test

4.3 Foreign Material in Fuel Assemblies

Prior to the start of the refueling outage, BG&E determined, based on reactor coolant chemical analysis, that a small number of the Unit 2 fuel rods had minor cladding damage. The most likely cause of the damage was foreign material rubbing against the cladding. Consequently, BG&E performed a visual inspection for foreign material via remote camera of each of the fuel assembly lower end fittings. They found foreign material on 26 of the 217 assemblies. The material ranged from small pieces of wire to a bolt and some washers.

BG&E has removed the foreign material from the assemblies that will be reloaded into the core. BG&E identified four fuel pins that had failed due to debris. All of the damage was in assemblies that will not be reloaded.

To prevent future problems with debris in the reactor coolant system, BG&E initiated the following actions following the Unit 1 Spring, 1992, outage: (1) revising their foreign material controls; (2) increasing worker sensitivity to the maintenance of proper foreign material controls; and (3) loading fuel with a lower end fitting design that greatly reduces the susceptibility of the fuel to damage from foreign material.

The inspectors observed some of the fuel visual inspections and discussed the foreign material problem with the fuel manufacturer and BG&E personnel. The inspectors concluded that BG&E's efforts to prevent foreign material entry into the reactor coolant system and to lessen the consequences of failed foreign material controls were appropriate.

4.4 Maintenance Program Changes

During the period, the inspectors reviewed several recent enhancements and changes made in BG&E's maintenance program to improve performance and reduce the backlog of outstanding maintenance orders. The areas reviewed included maintenance planning, trending, post maintenance testing, and repeat maintenance.

a. Maintenance Planning and Scheduling

At the beginning of 1992, BG&E had a non-outage maintenance backlog of 1912 outstanding maintenance orders. The NRC had previously noted that the maintenance planning process was cumbersome and the work packages were at times difficult to follow (see NRC Inspection Report 50-317 and 318/91-80). In 1992, BG&E implemented several program improvements to accelerate the backlog reduction and to improve program implementation.

In 1992, BG&E enhanced communications between maintenance planners and the various line and support organizations. This included the establishment of a daily meeting between the operations and maintenance sections to ensure that these organizations had a common understanding of daily work activities. The meetings were led by the operations shift supervisor and attended by supervisors from maintenance, system engineering, maintenance planning, scheduling, safety tagging, radiation protection, chemistry and the shift outage manager (during outages). The inspectors attended the meetings on several occasions. The inspectors found that the meetings were effective in communicating the priority work scheduled for the day, emergent work which needed to be scheduled, and other items of interest to the shift supervisor.

BG&E also shifted the focus of the work planning and work execution meetings to ensure that engineering was completed and parts were available when the work was scheduled to be performed. The inspectors noted a reduction of approximately 50% in maintenance orders on engineering or parts delay since January, 1992.

In September, 1992, the maintenance planning organization implemented a process to minimize planning delays of repetitive maintenance activities. The inspectors found that work packages for activities such as charging pump packing and spent fuel pool filter replacement were prepared in advance to eliminate any planning delays.

The inspectors also found that BG&E had enhanced their Quarterly System Schedule (QSS) process. The QSS is a 12-week schedule which provides a systematic process for scheduling system maintenance. Enhancements included the development of a user-friendly system outage plan provided to the control room operators and a three month rolling QSS schedule to better coordinate projects and testing.

In NRC Inspection Report (IR) 50-317 and 318/91-82, the NRC noted that BG&E lacked a formal process to provide feedback to and from the users of maintenance packages to the maintenance planning organization. In March, 1993, BG&E implemented a formal feedback process. The process required the preparation of a feedback form when work was delayed greater than one hour, when errors were found in a work package, or for parts problems and support group delays. The inspectors found that the process was being effectively utilized.

The inspectors found that BG&E made improvements in the work packages. These included a simplified maintenance order and the addition of a post maintenance review checklist.

During a previous NRC inspection (IR 50-317 and 318/91-82), it was noted that, frequently, routine work packages were not prepared far enough in advance to allow for adequate maintenance supervisor review before implementation. The inspectors found that this weakness had been corrected. The majority of routine work packages were available for maintenance supervisor review five days in advance.

In conclusion, these maintenance program enhancements have been effective in helping to reduce BG&E's maintenance backlog. At the end of 1992 the backlog of outstanding maintenance orders decreased to 822. The inspectors noted that the backlog began to increase in February 1993; however, this was expected as maintenance resources were diverted to the current Unit 2 refueling outage. Since 1992, BG&E has maintained the backlog of priority 1 and 2 maintenance orders to less than a site goal of 30. Priority 1 and 2 maintenance orders cover maintenance activities that are required to ensure the safe operation of the plant.

b. Maintenance Trending

In 1992, BG&E significantly expanded the maintenance trending program. The current trending program covered both maintenance program performance and specific areas of concern. Items trended by the maintenance organization included maintenance order backlog, overdue preventive maintenance (PM) activities, control room deficiencies, maintenance, scheduling performance, measuring and test equipment failed calibrations, repeat maintenance, and procedure violations and events. Areas of special concern that were also trended included missed quality verification notifications, foreign material exclusion concerns, and welding related issues.

The inspectors found that performance was measured against predetermined goals included in most trends. Areas where goals were not met were non-outage backlog and overdue PMs where performance was only slightly below the established goal. The Superintendent-Nuclear Maintenance informed the inspectors that within the maintenance organization the trends were broken down by maintenance section and were used as tools to improve section performance. The inspectors concluded that the trending program was significantly improved. The trending program provided an effective tool for BG&E management to monitor and improve maintenance performance.

c. Post Maintenance Testing

Inspectors discussed changes in the post maintenance testing (PMT) planning process with the assistant general supervisor for planning. BG&E established a PMT task force last year to identify means of improving the PMT process, to assign responsibilities for different testing requirements, to recommend procedural changes, and to review the PMT guidance for adequacy.

One of the changes implemented as a result of recommendations of the PMT task force was having an operations section PMT coordinator identify operational testing requirements early in the maintenance order development process. This was in addition to verifying the testing requirements following work completion. PMT coordinators also identified and maintained a status of equipment availability to support requisite functional testing. To maintain timeliness, additional personnel were assigned to PMT to handle the increased work load of the refueling outage.

Efforts to improve PMT have resulted in work packages with PMT requirements clearly and more specifically stated. As a more objective measurement, the number of maintenance orders on PMT delay has been reduced from well over 100 to approximately 20.

d. Repeat Maintenance

In NRC Inspection Report 50-317 and 318/91-82, the NRC found that BG&E had no program or procedure for tracking and evaluating rework or recurring maintenance. In 1992, BG&E implemented a program to evaluate and trend repeat maintenance. BG&E's repeat maintenance program was divided into two components, rework and recurring maintenance.

BG&E defined rework as maintenance activities required to return equipment to service which had failed as a result of improper maintenance, material installation, or operating conditions occurring within the previous 12 months. BG&E identifies rework through both post maintenance testing failures and equipment history reviews. To improve performance, individual rework items found to be routine were reviewed with applicable maintenance supervisors. BG&E set a site goal for rework of less than one percent of the total maintenance performed. The inspectors noted that BG&E was meeting the goal.

BG&E defined recurring maintenance as maintenance activities that were repeatedly performed due to system design, equipment drift, or a history of failure. Activities that are categorized as recurring maintenance are evaluated by BG&E to determine if modifications or additional preventive maintenance is appropriate.

The inspectors concluded that BG&E had implemented an effective program to evaluate and trend repeat maintenance. In addition, the low number of maintenance activities requiring rework indicated good performance by maintenance personnel.

5.0 EMERGENCY PREPAREDNESS

The inspectors toured the onsite emergency response facilities to verify that these facilities were in an adequate state of readiness for event response. The inspectors discussed program implementation with the applicable personnel. BG&E's response to an Unusual Event is discussed in Section 2.2.a. of this inspection report.

6.0 SECURITY

During routine inspection tours, the inspectors observed implementation of portions of the security plan. Areas observed included access point search equipment operation, condition of physical barriers, site access control, security force staffing, and response to system alarms and degraded conditions. These areas of program implementation were determined to be adequate. No unacceptable conditions were identified.

7.0 ENGINEERING AND TECHNICAL SUPPORT

7.1 Reactor Vessel Level Monitor Probe Leak

On April 13, during an inspection of the Unit 2 reactor vessel head, BG&E found boric acid on top of the vessel head insulation at the base of the No. 13 Reactor Vessel Level Monitoring System (RVLMS) penetration. The penetration previously held a partial length control element assembly (CEA), but was modified in 1985 to be used for the RVLMS. The boric acid crystals extended upward from the reactor head approximately two feet to a weep hole in the bottom of a shroud surrounding the RVLMS assembly. BG&E found that the source of the leak was from a defect in the omega seal weld at the seam between the upper pressure housing of the RVLMS probe and the CEA motor housing, approximately 200 inches above the reactor vessel head.

The No. 13 and 11 partial length CEAs were modified in 1985 to house RVLMS probes. The RVLMS assembly consists of an upper pressure housing assembly, a motor housing assembly, and a shroud. The upper pressure housing has a threaded connection to the motor housing assembly. In the seam between the upper pressure housing and the motor housing, an omega seal weld was made to contain leakage past the threaded connections. The inner walls of the upper pressure housing and the motor housing form the pressure boundary for

the assembly. The assembly is enclosed by a shroud that bolts to the top of the upper pressure housing. Two weep holes are located 180 degrees apart at the bottom of the shroud.

BG&E immediately established three investigative teams to determine the root cause, to determine an acceptable repair method and appropriate testing, and to conduct the repair and post maintenance testing. In addition, BG&E evaluated the possibility of any generic implications that might affect Unit 1 and concluded that there were none. The possibility of intergranular stress corrosion cracking was also considered, but nondestructive examination (NDE) showed no evidence of the phenomenon.

Using liquid dye penetrant (PT), low magnification, and impression examination methods BG&E determined the source of the leak to be a weld defect in the omega seal weld. The defect was described by BG&E as a lack of fusion between the base metal and the weld material.

Examination of the No. 11 penetration and assembly revealed no abnormalities, and there was no sign of vessel head degradation as a result of the leak. BG&E excavated the defect and performed an ASME code repair of the seal weld. NDE results of the repair were satisfactory. The vessel head insulation which was wetted by the leak was being replaced as the period ended.

Inspectors noted that BG&E's response to the problem was prompt, comprehensive, and well organized. Good coordination was observed between all departments involved in the issue.

7.2 Reactor Coolant Sample Line Deficiency

On March 4, 1993, a BG&E engineer identified that the Unit 1 reactor coolant system (RCS) sample line between the containment penetration and the outside containment isolation valve (1-CV-5464) had shorter dimensions than documented on design drawings. Initial engineering evaluation of this condition determined that the possibility existed that this line could fail during a seismic event while RCS sampling was in progress. This condition was of particular concern since a sample line failure concurrent with one of the three inside containment sample lines failing to open would result in a RCS leak outside containment. The inspectors reviewed BG&E's response to this discovery.

BG&E's initial action was to declare the sample inoperable and control room operators isolated the affected line. BG&E engineers performed a walkdown of the Unit 2 RCS sample line and determined that the as-built condition of the Unit 2 sample line was correct. In addition, a detailed engineering and operability evaluation were initiated.

BG&E subsequently determined that the sample line was operable and it was unisolated. Using the criteria in Appendix F of Section III of the ASME Code, BG&E found that primary stresses caused by a seismic event meet the operability criteria. In addition, using

the guidance in NUREG/CR-3243, "Comparison of ASME Code Fatigue Evaluation Methods for Nuclear Class 1 Piping with Class 2 or Class 3 Piping," BG&E determined that the secondary stresses due to thermal expansion, taking into account the number of fatigue cycles, permitted continued use of the line at least up to the next Unit 1 refueling outage. A modification request was initiated to correct the nonconforming line.

The inspectors found that BG&E took appropriate and prompt action upon discovery of the problem. The initial actions of isolating the affected line while awaiting a detailed operability evaluation demonstrated a strong safety perspective. The subsequent operability evaluation was performed in accordance with the guidelines provided in NRC Generic Letter 91-18 and was well documented.

7.3 Reduction in Thermal Operating Limit

On April 7, BG&E reduced the thermal operating limit on Unit 1 from 2700 MW to 2685 MW while investigating a suspected mismatch between actual reactor power and power as indicated from the secondary calorimetric.

The most accurate method used to determine reactor power is by performing a modified heat balance around each of the steam generators. This heat balance calculation is referred to as the secondary calorimetric. The measurement uncertainty associated with the secondary calorimetric is 2%. Less accurate means of determining reactor power are the primary calorimetric, reactor power as calculated from the incore neutron detectors, trending of certain reactor protection system (RPS) potentiometer settings, and electrical generation output.

Comparisons by BG&E engineers of trend data gathered on Unit 1 indicated that actual reactor power may have exceeded calorimetric power by a much a 0.4% during the two week period prior to April 7. The mismatch then stabilized. There was a maximum disagreement between the secondary calorimetric and the other indications of reactor power of approximately 10 MW. While BG&E concluded that existing controls were sufficient to prevent exceeding the 2% uncertainty assumed in the calorimetric calculation, they conservatively lowered the thermal operating limit while investigating the cause of the disagreement.

BG&E established an engineering team to review the secondary calorimetric uncertainty calculation and to evaluate future power anomalies. In addition, procedures were revised to require daily trending of the various parameters which provide indication of thermal power, and administrative limits were established within the current RPS power potentiometer setting limits to initiate evaluation of potential problems.

BG&E returned the thermal operating limit to 2700 MW on April 16 following a change in the secondary calorimetric steam quality constants. The steam quality is a measure of the dryness of the steam from the steam generators. Similarly, moisture carryover is a measure

of the wetness in the steam. If the steam from the steam generators has a higher quality than the steam quality constants used in the secondary calorimetric, the calorimetric will calculate a lower than actual reactor power. The steam quality constants had been changed following the 1992 refueling outage based on test results which showed that moisture carryover had increased over the life of the steam generators, as expected. The change in steam quality constants was a better reflection of actual conditions in the steam generators, but it removed some of the conservative margin in the secondary calorimetric calculation.

Test results from March 1993, however, showed that moisture carryover had increased more since the steam quality constants were changed in 1992. This had not been expected. In order to restore the more conservative margin to the secondary calorimetric, the steam quality constants were returned to their original values on April 16. Following the increase in the conservative margin of the calculation, BG&E felt it was no longer necessary to impose a reduction in the thermal operating limit. It has not been determined if the change in steam quality constants in 1992 is related to the suspected inaccuracy in the secondary calorimetric.

The original steam quality values were those expected from new, clean steam generators with steam separators working at peak efficiency. These values ensured that the secondary calorimetric will provide a conservative estimate of reactor power.

BG&E was continuing to investigate the mismatch in actual reactor power and indicated power from the secondary calorimetric as the period ended. Inspectors assessed that BG&E's actions demonstrated a good questioning attitude and a good safety perspective.

8.0 SAFETY ASSESSMENT AND QUALITY VERIFICATION

8.1 Plant Operations and Safety Review Committee

The inspectors attended several Plant Operations and Safety Review Committee (POSRC) meetings. TS 6.5 requirements for required member attendance were verified. The meeting agendas included procedural changes, proposed changes to the TS, Facility Change Requests, and minutes from previous meetings. Items for which adequate review time was not available were postponed to allow committee members time for further review and comment. Overall, the level of review and member participation in fulfilling the POSRC responsibilities was good. No unacceptable conditions were identified.

8.2 Review of Written Reports

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

Units 1 and 2:

LER 93-001 TS 3.0.3 Entry; Loss of Control Room Air Conditioning

Unit 2:

LER 93-001 Pressurizer Code Safety Valve High As-Found Setpoints

The above LERs were reviewed with respect to the requirements of 10 CFR 50.73 and the guidance provided in NUREG 1022. Generally, the LERs were found to be of high quality with good documentation of event analyses, root cause determinations, and corrective actions. The pressurizer safety valve setpoint issue is documented further in NRC Inspection Report 50-317 and 318/93-05.

9.0 MANAGEMENT MEETING

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

9.1 Safeguards Status Briefing

On April 2, 1993, the Director-Nuclear Security and two other staff members met with members of the Safeguards Section staff at the Region I office, King of Prussia, Pennsylvania. Discussion topics included the security computer replacement project, the nuclear security facility currently under construction, and a briefing on initiatives related to a pending revision to the Security Training and Qualification Plan. Details of those topics are considered to be safeguards information protected from unauthorized disclosure by 10 CFR 73.21.

In response to an inquiry by a BG&E representative concerning the NRC's Access Authorization Rule, it was explained that the intent of 10 CFR 73.56 as stated in paragraph 3 of the Clarification to the Guidelines, Regulatory Guide 5.66, was that a licensee is expected to ascertain that whatever activities an employee engaged in during his or her absence from an approved behavioral observation program would not have the potential to affect the

employee's trustworthiness and reliability. This position is also clarified in NUMARC 91-03, October 1992. Part III, B.4 states that the licensee must ascertain that the activities of the employee during his or her absence, if more than 30 consecutive days, would not affect his or her trustworthiness, but if the individual has not been away from a licensee or approved contractor/vendor behavioral observation program for more than 30 consecutive days, there is no requirement to ascertain activities nor to do any suitable inquiry checks.

No commitments or concurrences on the part of BG&E or the NRC were made during this meeting.

9.2 Preliminary Inspection Findings

An improper entry into the radiologically controlled area by a worker who had not completed the requisite training resulted in a non-cited violation, as documented in Section 3.1.

9.3 Attendance at Management Meetings Conducted by Region Based Inspectors

Date	Subject	Inspection Report No.	Reporting Inspector
3/19/1993	ISI	50-318/93-08	R. McBrearty
4/2/1993	Chemistry Measurements	50-317/93-09 50-318/93-09	J. Kottan
4/9/1993	Emergency Preparedness	50-317/93-03 50-318/93-03	J. Lusher
4/15/1993	EDG Project	50-317/93-12 50-318/93-12	L. Kay