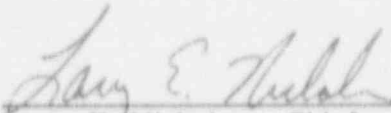


U.S. NUCLEAR REGULATORY COMMISSION  
REGION 1

Report Nos. 50-317/92-07; 50-318/92-07  
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: February 16, 1992, through March 1, 1992  
Inspectors: Peter R. Wilson, Senior Resident Inspector  
Allen G. Howe, Resident Inspector  
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Approved by:

  
Larry E. Nicholson, Chief  
Reactor Projects Section No. 1A  
Division of Reactor Projects

4/14/92  
Date

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.

## EXECUTIVE SUMMARY

### Calvert Cliffs Nuclear Power Plant, Units 1 and 2

### Inspection Report Nos. 50-317/92-07 and 50-318/92-07

**Plant Operations:** (Operational Safety Inspection Module 71707, Prompt Onsite Response to Events at Operating Power Reactors Module 93702) Overall, the facility was operated safely. Excellent operator performance was observed during the shutdown of both units. Improvements were noted in housekeeping, but problems continued to be observed in the service water pump rooms. The improper storage of transient equipment in safety related areas and ineffective actions to correct this concern were a violation of NRC requirements (50-317 and 50-318/92-07-01).

**Maintenance and Surveillance:** (Maintenance Observations Module 62703, Surveillance Observations Module 61726) During numerous maintenance observations, an acceptable level of performance was observed. Maintenance performed on safety related equipment was conducted in a timely manner. Corrective actions taken in response to previous NRC concerns with cleanliness controls were appropriate. BG&E failed to perform required surveillance testing on the spent fuel pool ventilation system. Effective and timely actions were taken to correct this problem. BG&E demonstrated a strong safety perspective in resolving concerns with ultrasonic flow meters.

**Engineering and Technical Support:** (Module 71707) BG&E performed a thorough evaluation of a saltwater leak. Concerns with the adequacy of hot leg flushing following a loss of coolant accident remain unresolved (50-317 and 50-318/92-07-02). Previous NRC concerns with seismic qualifications of containment instrument lines were resolved.

**Safety Assessment/Quality Verification:** (Modules 71707, 30703) The implementation of temporary alterations on the containment spray actuation system and the containment isolation system logic circuits without Plant Operations Safety Review Committee review was a violation of NRC requirements (50-317 and 50-318/92-07-03).

## DETAILS

### 1.0 SUMMARY OF FACILITY ACTIVITIES

At the beginning of the period both units were operating at full power. On March 15, Unit 1 began a power and temperature coastdown procedure in preparation for entering the cycle 10 refueling outage, which was scheduled to begin on March 20. On March 19, an Unusual Event was declared when all of the site emergency diesel generators (EDGs) were declared inoperable. The shutdown of both units commenced at 5:25 a.m. At approximately 10:00 p.m., both units entered hot shutdown (mode 4). The Unusual Event was terminated at 2:45 a.m. on March 20 following installation of temporary alterations which allowed the diesels to be declared operable in modes 4 and 5. Unit 1 completed cooldown to mode 5 at 11:15 p.m. on March 20. Unit 1 then entered the refueling outage where it remained through the end of the period. Unit 2 was cooled down and entered mode 5 at 12 noon on March 23 in order to conduct modifications to the engineered safety features actuation system. Unit 2 remained in Mode 5 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 the temporary modifications log. Plant housekeeping controls were monitored, including control and storage of flammable material and other potential safety hazards. The inspector 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 portions backshifts (evening shifts) and deep backshifts (weekend and midnight shifts). Extended coverage was provided for 48 hours during backshifts and 38 hours during deep backshifts. Operators were alert and displayed no signs of inattention to duty or fatigue. Except where noted below, the inspectors observed an acceptable level of performance during the inspection tours detailed above.

Housekeeping in most safety related areas was adequate; however, the cleanliness in the service water pump rooms was found to be weak. Excessive dirt and debris were observed on horizontal surfaces. A significant buildup of dust was observed in the service water pump motor casing vents and the observable portions of the motor internals. The inspectors discussed the housekeeping concerns with BG&E's Superintendent of Nuclear Maintenance; and by the end of the period, the inspectors noted some improvement in the cleanliness of the above rooms.

During the period, the inspectors observed inadequately restrained transient equipment in safety related areas. This concern is discussed in more detail in Section 2.3.

## 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 the required notifications were made to the NRC. During event followup, the inspector 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 events were reviewed.

### a. Loss of Containment Spray Capability

At 5:10 a.m. on March 5, operators declared both Unit 2 containment spray (CS) systems inoperable and entered TS 3.0.3. Unit 2 was operating at full power. Operators declared the No. 21 CS system inoperable due to the discovery of inadequate component cooling (CC) water flow to the No. 21 shutdown cooling heat exchanger (SDCHX). They declared the No. 22 CS system inoperable based on the unavailability of No. 21 emergency diesel generator (its emergency power supply) combined with the loss of the redundant system as required by TS 3.0.5.

The inadequate CC flow was discovered during post maintenance testing following replacement of the manual operator on the 22 SDCHX component cooling inlet valve, 2-CC-266. The component cooling system is normally cross connected upstream of the SDCHXs. This configuration necessitates system flow balancing to ensure proper flow to both SDCHXs.

Operators adjusted CC flow to the No. 21 and No. 22 SDCHXs, declared the CS systems operable, and exited TS 3.0.3 at 5:20 a.m. BG&E initiated an evaluation of the event and the method of returning the SDCHXs to service following maintenance. The inspectors reviewed the evaluation and found it to be adequate.

The inspectors reviewed the event and interviewed the operators immediately after its occurrence. The event was assessed to be of low safety significance due to its short duration and the availability of offsite power. The operators reacted promptly and with due regard for safety to restore CS to service.

b. Post LOCI Core Flush Concerns

On March 18, 1992 at 1:30 p.m., with both units at full power, BG&E determined that emergency operating procedure, EOP-5, did not specify adequate flow for core flushing needed to prevent boric acid precipitation following certain loss of coolant incident (LOCI) conditions. Immediate actions included interim guidance to operators specifying the proper injection flow rate and flush path. EOP-5 was subsequently changed to correct the problem. This issue was reported to the NRC via the ENS. This issue is further discussed in section 7.2 of this report.

c. Shutdown of Both Units Due to EDG Inoperability

On March 19 at 5:25 a.m., an Unusual Event was declared and a dual unit shutdown was commenced when all of the site emergency diesel generators (EDGs) were declared inoperable. The declaration was made following a BG&E design review conducted as a result of questions raised during an NRC Electrical Distribution Safety Functional Inspection.

The design review showed that during a small break loss of coolant incident (LOCI) concurrent with a loss of offsite power, a potential existed for multiple loads to start on an EDG simultaneously, resulting in degraded emergency bus voltage. The degraded voltage condition could render the engineered safety features (ESF) systems inoperable. This potential existed because the existing ESF actuation system LOCI and shutdown sequencer designs could allow EDG loading outside of the desired and analyzed sequence. This issue is discussed further in NRC Inspection Report (IR) 50-317 and 50-318/92-80.

Unit 1 entered mode 4 at 10:00 p.m. on March 19. Unit 2 entered mode 4 at 10:30 p.m. The Unusual Event was terminated at 2:45 a.m. on March 20 following installation of temporary alterations which allowed the diesels to be declared operable in modes 4 and 5. The temporary alterations are further discussed in Section 8.2 below.

Inspectors monitored the dual unit shutdown from the control room. Operators conducted the shutdown in a controlled, professional manner. An additional operations crew was brought in to ensure that personnel were available to assist the on-watch crew if required. Procedures were conscientiously used. It was noted that senior BG&E managers were present in the control room for portions of the shutdown. The conduct of the dual unit shutdown is considered an example of significant strength by the operations department.

### 2.3 Inadequately Restrained Transient Equipment

During the previous inspection period (IR 50-317 and 50-318/92-02) the inspectors had identified a concern involving inadequately restrained transient equipment in safety related areas. The inspectors had identified numerous examples of unrestrained transient equipment. They had discussed this concern with BG&E management and had noted some reduction in the amount of unrestrained transient equipment.

During this inspection period, the inspectors continued to identify numerous examples of unrestrained transient equipment located in safety related areas. This included erected stepladders, carts, gas bottles, shelves, and storage cabinets. In addition, some transient equipment were found secured to conduit or instrument lines. Some of the items identified during this period were the same items which had been previously identified in the last period. BG&E promptly corrected the items identified by the inspectors.

The inspectors found that BG&E's management expectations for the control of transient equipment was contained in Maintenance Superintendent Guideline MSG-05, "Control of Transient Equipment/Materials." MSG-05 contained detailed requirements regarding transient equipment. The guideline specified the acceptable methods of restraining equipment including allowable anchor locations. The inspectors noted that the guideline prohibited the use of conduit and instrument lines as anchor points.

The inspectors discussed the transient equipment issue with the Superintendent of Nuclear Maintenance (SNM). The inspectors were concerned that BG&E's management policy for transient equipment as contained in MSG-05 had not been effectively communicated site wide. The SNM stated that he concurred with the inspectors' concerns and was intending to upgrade MSG-05 to a sitewide procedure (Calvert Cliffs Instruction).

The inspectors reviewed historical information regarding BG&E policy for transient equipment. A review of the minutes of Calvert Cliffs Startup Review Board (SURB) meetings indicated that, in 1990, BG&E had identified concerns with unrestrained equipment. The SURB had been established to provide enhanced senior BG&E management oversight during plant startup in 1990 and 1991. The inspectors noted that, in April 1990, an action item was opened by the SURB to evaluate and implement actions to reduce the possibility of equipment damage caused by unrestrained transient equipment. As a result of the action item, MSG-05 was developed and implemented. This issue was further discussed in a SURB meeting on August 30, 1990, where concerns were raised as to whether MSG-05 should be upgraded to a site wide procedure. The SURB decided to re-evaluate the issue after walkdowns were performed to determine the effectiveness of the measure taken to date. The SURB closed the action item during a February 1, 1991 meeting. The SURB concluded that the control of transient material should be addressed in a site wide procedure. It was not clear to the inspectors why MSG-05 had not been upgraded to a site wide procedure.

Based on the apparent inability to resolve unrestrained transient equipment concerns and failure to implement the corrective actions prescribed in the February 1, 1991, SURB's resolution of the above action item, the inspectors concluded that the corrective actions taken to resolve this concern have been ineffective. 10 CFR 50, Appendix B, Criterion XVI, requires that measures be established to assure that conditions adverse to quality be promptly identified and corrected. Therefore, the failure to promptly correct concerns with unrestrained transient equipment is a Violation (50-317 and 50-318/92-07-01).

### 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 adequate. Overall, an acceptable level of performance was observed.

#### 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;
- QV hold points were established where required and observed; and
- equipment was properly tested and returned to service.

Maintenance activities reviewed included:

MO 19201271	Replace No. 11 EDG air cooler check valve and temperature control valve
MO 19201362	Repair No. 11 Salt Water leak
MO 29107243	Tube bulleting of 21 service water heat exchanger (SRWHX)
MO 29107244	Tube bulleting of 21 component cooling heat exchanger (CCHX)
MO 29200455	21 emergency core cooling system (ECCS) pump room air cooler channel head inspection
MO 29200451	21 emergency core cooling system (ECCS) pump room air cooler anode replacement
MO 29200488	Oil sample and change on 21 High Pressure Safety Injection pump
MO 29201275	Replace No. 21 Emergency Diesel Generator Air Start Filters



MO 29005495	Replace 2-SW-1128, 21 CCHX saltwater discharge header pressure instrument isolation valve
MO 291105153	Replace 2-SW-1062, 21 SRWHX saltwater inlet header pressure instrument isolation valve
MO 28805505	Replace 2-SW-121, 21 saltwater header supply isolation valve to the circulating water pump seal header
MO 29107580	Tube bulleting of 22 service water heat exchanger (SRWHX)
MO 29200466	Tube bulleting of 22 component cooling heat exchanger (CCHX)
MO 29103652	22 emergency core cooling system (ECCS) pump room air cooler anode replacement
MO 29103497	Replace 2-PT-5203, the 22 saltwater header pressure transmitter
MO 29106274	Replace 2-SW-193, the 22 SRWHX vent valve
MO 29005541	Replace 2-SW-123, the 22 saltwater header supply isolation valve to the circulating water pump seal header

There were no notable observations except as documented below.

a. Repair of Leak on 11 Saltwater Header

On February 19, ultrasonic thickness measurements were taken at the through wall leak located on the 11 saltwater header upstream of the 11 service water heat exchanger. This leak was discovered in November, 1991, and a temporary non-ASME Code repair was implemented as documented in NRC Inspection Report 50-317 and 50-318/91-30. The measurements were taken as part of the periodic examination required by Generic Letter (GL) 90-05. Evaluation of the measurements by BG&E demonstrated that erosion/corrosion had continued in the header to the point that the flaw no longer met the criteria of GL 90-05. As a result, the 11 saltwater header was declared out of service at 12:25 p.m. on February 20. This placed Unit 1 in a 72 hour action statement leading to plant shutdown per TS 3.7.5.1.

After consideration, BG&E decided to do an ASME Code repair (MO 19201362) to the header by cutting out the flawed area and welding in a flush replacement per ANSI B31.1, 1967. A temporary alteration was required because the original header was lined with concrete to prevent erosion/corrosion; however, the proposed method of repair did not allow coating the replacement material with concrete after installation. Temporary Alteration 1-92-036 was approved by the Plant Operations Safety Review Committee to allow the repair to be done without replacing the concrete liner that had been in the original header. The saltwater piping in question is scheduled to be replaced with rubber lined piping during the March 1992 refueling outage.

The inspectors examined the leak location, reviewed the ultrasonic measurements and the engineering evaluation for the temporary alteration, and discussed the repair with plant design, engineering, and maintenance personnel.

BG&E originally determined that it was necessary for the equipment doors to the service water room to remain open during the repair in order to run cables for the welding equipment and hoses for dewatering the header. In anticipation of these requirements, BG&E requested and was granted a temporary waiver of compliance from TS 3.7.10, which requires that the watertight doors be closed except for normal entry and exit. This TS leads to plant shutdown if the doors are not shut within 24 hours. The inspectors attended the POSRC discussion of the waiver request and reviewed the compensatory measures to be put in place if the doors were opened. Subsequently, BG&E was able to complete the repair without having to use the waiver.

Repair of the leak was completed and the 11 saltwater header was restored to service at 12:40 a.m. on February 23. The inspectors observed the repair effort, reviewed the work package, and discussed the issue with cognizant BG&E personnel. The inspectors concluded that the issue was appropriately evaluated and resolved.

#### b. Saltwater Header Outages

Inspectors observed portions of the Quarterly System Schedule planned systems outages for the 21 saltwater header conducted on February 26 and for the 22 saltwater header performed on March 4. This included both preventive and corrective maintenance on the saltwater system, the service water system, the component cooling system, and the high pressure safety injection system. Specific maintenance orders are listed above. With respect to the field work observed for the above activities, the maintenance was successfully completed. Inspectors noted a high level of coordination and cooperation between operations and maintenance during the outages. The activities were well planned and executed, particularly for the 21 saltwater header, allowing completion of all work and restoration of the headers in a timely manner.

c. Replace No. 21 Emergency Diesel Generator Air Start Filters

The work to replace No. 21 emergency diesel generator air start filters was stopped after a quality verification (QV) inspector raised concerns regarding the use of a technical manual drawing to modify the filter installation. The QV concerns were based on recent BG&E policy regarding the use of technical manual drawings. Independent of the QV concerns, the inspectors had requested that the system engineer provide the design basis documents that authorized the modification. Proper documentation was located and the work was completed. QV documented the problem on an issue report for resolution. The design documentation was reviewed by the inspectors and found to be approved and technically adequate. In response to the issue report, BG&E has reinforced the requirements for design authorization of modifications to maintenance personnel and maintenance planners. Also under evaluation are methods to link technical manual drawings to design documents. These actions appear to be adequate. The inspectors concluded that BG&E's QV process was effective in identifying this issue, but noted that this was a backup to the line responsibility.

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 following surveillance testing activities were reviewed:

STP 0-8-0	11, 12, 21 Diesel Generator Test
STP 0-1-2	Main Steam Isolation Valve Full Stroke Test
STP M-310-2	Linear Power Channel Calibration
ETP 91-111	12 EDG Coolers Baseline Performance Evaluation (This ETP is a portion of BG&E's response to GL 89-13. The ETP measured the thermal performance of the air cooling water heat exchanger, the lube oil cooler, and the jacket water cooler under various EDG load conditions.)
STP M-220F-2	Refueling Water Tank Low Level Bistable Setpoint Verification Test
STP 0-5-2	Auxiliary Feedwater System Test

There were no notable observations except as discussed below.

During the performance of STP 0-5-2, "Auxiliary Feedwater System Test," the inspectors noted that operators were tripping the turbine with the trip throttle valve handle rather than the overspeed trip push lever. When questioned about the proper trip device, the operators contacted the surveillance test coordinator. The surveillance test coordinator confirmed that the overspeed trip push lever was the appropriate method. The problem was documented on an issue report and the procedure was modified to indicate the specific trip device to be used. The requirement to use the overspeed trip lever was added in 1990 but the description of the device was not explicit. Also, training for that change was not effective since operator knowledge varied. The inspectors determined that BG&E took proper actions to correct this issue.

#### 4.3 Cleanliness and Foreign Material Exclusion Controls

Inspectors reviewed the corrective actions taken by BG&E in response to a notice of violation for failure to implement adequate cleanliness controls (NV4 50-317 and 50-318/91-13-01). Weaknesses in the foreign material exclusion and area cleanliness controls program resulted in the intrusion of foreign material into several safety related systems, including the containment emergency sumps. NRC review of this issue is documented in NRC Inspection Reports 50-317 and 50-318/91-03 and 91-13.

Inspectors reviewed the following BG&E instructions and programs, which were revised, upgraded, or implemented in order to clarify and formalize cleanliness control requirements and to raise awareness of the foreign material control (FMC) issue:

- Calvert Cliffs Instruction (CCI) 107, "System Cleanliness Criteria."
- CCI-206, "Foreign Material Controls."
- MN-1-100, "Conduct of Maintenance." (Formerly CCI-231)
- MN-1-103, "General Plant Housekeeping."
- HE-50, "Containment Recirculation Sump Cover Installation and Removal."
- Lesson plans for Parts 1 and 2 of General Orientation Training.
- Self Study Guide and Performance Evaluation for Certification of Level 1 Inspectors: Chemistry Technician for Closeout Inspections.
- Confined Space and Confined Space Job Supervisor Training lesson plans.
- Basic Operator Orientation qualification manual.
- Rad Safety Indoctrination qualification card.
- Systems Engineer qualification card.

These instructions clearly stated BG&E management expectations and requirements for area cleanliness and foreign material controls.

Inspectors discussed the role of the maintenance planner in the work package process with the General Supervisor for Plant Work Control (GS-PWC). While the planner is given the initial responsibility of establishing the level of FMC for a job per CCI-206, nothing in his procedure for preparing a maintenance order, Maintenance Superintendent Guideline (MSG) 12, tells him to do so. The inspectors expressed concern that the planner might overlook this responsibility without formal guidance or a checklist to aid him. The GS-PWC stated that the maintenance order checklist was under revision and that FMC requirements would be addressed in a revision to MSG-12. The inspectors had no other concerns with the reviewed instructions.

Inspectors toured the spent fuel pool area and discussed control and accountability of material in the pool with the spent fuel pool area coordinator. He appeared to be very knowledgeable in his area of responsibility.

Routine inspector observation of preventive and corrective maintenance over the past three months had also shown a higher level of awareness of foreign material control. The most visible evidence of this was found in the FMC checklists and boundaries that were established and used at work sites. Job supervisors and workers demonstrated an adequate level of awareness of the FMC issue.

Inspectors discussed the issue with the Superintendent of Nuclear Maintenance and with the General Supervisor for Operating Experience Review (GS-OER). In addition, they reviewed the third and fourth quarter 1991 trend reports for system cleanliness, and individual issue reports charged to the trend. The trend continued at five to ten issue reports per quarter. The majority of the issue reports were being written on potential debris problems rather than on actual debris problems. The GS-OER noted that BG&E's decision to shut down Unit 1 last spring to inspect the containment sump and safety injection lines did more to establish management's credibility with maintenance personnel on the seriousness of the issue than all of the previous training.

The inspectors concluded that BG&E's corrective actions were appropriate and appear to have been effective. Based on BG&E's response to the issue, further NRC review is not required.

#### 4.4 Maintenance Organization and Initiatives

The Superintendent Nuclear Maintenance (SNM) was responsible for all plant maintenance activities and reports to the Plant General Manager. The principal organizations in the maintenance organization included mechanical maintenance, electrical and controls (E&C), and plant work control.

The principal mechanical maintenance organizations were Unit 1, Unit 2, plant modifications, and procedure development. The total staffing was adequate to meet management expectations based on workload and the projected turnover rate.

The E&C organization consisted of instrument maintenance, electrical and controls maintenance, electrical and instrument modifications, and procedures and support. A recent organization change was made to split the instrument and controls group into a Unit 1 and Unit 2 function to allow better focus and oversight of activities. Staffing levels were adequate in all groups except the electrical and controls group where minor personnel shortages existed. Efforts were underway to increase levels in this group.

The plant work controls (PWC) group was formed in August 1991 and tasked with planning and scheduling support. One of the specific performance tasks of PWC was to track the backlog of non-outage corrective maintenance and support its reduction. While the goal for 1991 was not met, the overall trend was a reduction in the backlog. Increases in the backlog that occurred in the fall of 1991 were attributed to the implementation of a new computer system for maintenance order planning and processing called NUCLEIS. Several corrections and adjustments to NUCLEIS and work control changes were made after the system was implemented as a result of problems that were identified.

One such work control change was a new meeting schedule to plan work scope and commitments. At these meetings operations, maintenance, and plant engineering representatives coordinate priorities, work scope and other issues. Adjustments have been effective in increasing the time that planning and scheduling discussions occur from about one day before actual work to about two weeks before actual work.

PWC also tracks high priority maintenance activities. The definitions of maintenance priorities were revised in the fall of 1991 to include operational concerns. The goal for the total number of outstanding work has not been met, however the overall trend was a reduction in the number. The duration of outstanding high priority work was also tracked and about 75% of the work was completed within two weeks of initiation.

Overall, the inspectors concluded that the maintenance organizations were sufficiently staffed with some shortages noted. The implementation of the PWC was a good initiative. Aggressive BG&E maintenance backlog goals have not been met; however, a downward trend has continued that demonstrated continued management attention in this area.

#### 4.5 Ultrasonic Flow Meters

On March 5, 1992, site organizations which utilized ultrasonic flow meters (UFM) were informed that the calibrations of some of the UFM's were invalidated. BG&E had been utilizing UFM's to monitor flow rates in the several safety related cooling water systems including the salt water systems, service water systems and component cooling water systems. UFM were used during the performance of surveillance tests, engineering tests, and NRC Generic Letter 89-13 testing. In addition, operators utilized UFM's to monitor the cleanliness of service water heat exchangers to determine if heat exchanger flow was degrading due to biofouling.

The inspectors reviewed BG&E's response to this issue. This included personnel interviews, examination of operability determinations and test procedure changes.

The UFM's in question were supplied by Controlotron. The models of concern were the Controlotron 960 series and 990 series. Controlotron-supplied UFM's were calibrated by either a "wet" calibration test or an "intrinsic" calibration test. The "wet" flow calibrations were found to be traceable to a specific flow. However, the "intrinsic" calibration, which consisted of electronics checks, could not be traced to a specific flow rate and therefore could not be supported by valid statistical methods for analyzing data. The accuracy of the wet calibration was  $\pm 1$  percent; however, the accuracy of the intrinsic calibration was found to be as large as  $\pm 7$  percent.

BG&E performed a review to determine where the intrinsically calibrated UFM's had been utilized to monitor flow. BG&E found that these UFM's had been utilized for flow measurement in the Unit 1 and Unit 2 saltwater headers and Unit 1 component cooling water headers to the shutdown cooling heat exchanger.

BG&E system engineers promptly performed and documented an operability determination for the affected systems taking into account the worst case accuracy of the UFM's. The engineers determined that the affected system remained operable due to the low Chesapeake Bay water temperatures. The inspectors reviewed the operability evaluation and found the conclusion to be well supported.

To provide additional assurance, BG&E performed several flow tests using annubar (pitot tubes) flow measuring devices or wet calibrated UFM's. The data from these tests indicated that adequate flow existed in the affected systems. In addition, the measured flows were consistent with the flow data from the intrinsically calibrated UFM's. This testing was continuing at the end of the inspection period.

The inspectors found that BG&E became aware of the UFM calibration issue through a Nuclear Procurement Issue Committee survey performed by a member utility. As a result, BG&E removed the Controlotron for intrinsic calibration from BG&E's approved vendors list.

The inspectors concluded that BG&E demonstrated a strong safety perspective in resolving the UFM issue. Operability determinations were promptly made. In addition, flow testing was initiated to provide additional assurance that the water flows through the affected safety related systems were adequate. The inspectors determined that no further review of this issue was required.

#### 4.6 Failure to Perform Required Testing on Spent Fuel Pool Filters

On February 29, BG&E determined that a required post-maintenance test needed to determine operability of spent fuel pool ventilation system had not been performed following the replacement of the system high efficiency particulate air (HEPA) filters. BG&E had conducted fuel movements in the spent fuel pool between February 11, 1992, when the HEPA filters had been replaced and the time of discovery. T.S. 3.9.12 prohibited the movement of fuel in the spent fuel pool if the HEPA filters were inoperable.

The inspectors reviewed the event including the applicable maintenance order (MO 09200129), test procedures, maintenance control procedures, and BG&E's root cause evaluation. In addition, they interviewed the personnel involved in the event and discussed the issue with maintenance and operations supervisors.

T.S. 4.9.12.b.3 required that BG&E verify that the HEPA filters could remove  $\geq 99$  percent of dioctyl phthalate (DOP) after the replacement filter was installed. The post-maintenance test (PMT) requirements specified in MO 09200129 did not include the DOP test. Following the filter replacement, the MO was subsequently reviewed by the responsible maintenance group supervisor, the control room supervisor (CRS), and the PMT coordinator, each of whom signed the recommended PMT section of the MO without comment.

The BG&E organization responsible for performing the DOP test was the Test Equipment Unit (TEU). The TEU had been informed that the filters had been replaced and that DOP testing was required. The DOP test had been scheduled to be performed on February 29. The TEU was not aware that fuel handling was planned before the test performance date. When the TEU attempted to perform the test, the shift supervisor recognized that the spent fuel pool ventilation system was inoperable and suspended fuel movement in the spent fuel pool. The DOP testing was subsequently successfully completed and fuel handling was resumed.

BG&E conducted a thorough investigation into the event. BG&E concluded that there were several contributing causes to the event: (1) a failure of personnel involved to fully understand their individual responsibilities in the MO process, (2) a misunderstanding by maintenance personnel of the implications of the change in 1991 from support MOs to the single MO process, (3) a failure of the CRS to verify adequate testing per the TS before declaring the system operable, and (4) a lack of reference material to identify the surveillance requirements associated with a given component.



Immediate corrective actions taken by BG&E included re-emphasizing to the maintenance planners the procedural requirement of recommending all required TS testing in the MO, re-emphasizing to the PMT coordinator the expectation that all MO PMT is to be reviewed for adequacy with regard to TS operability, and briefing all operators on the event and the need for a questioning attitude when closing out MOs. A cross reference of equipment to surveillance requirements and surveillance test procedures for operations and maintenance personnel was being prepared. Further corrective actions were awaiting the completion of BG&E's investigation into the human factors and process problems of the event.

BG&E documented the event under Licensee Event Report 92-01. The inspectors found no history of similar occurrences.

The inspectors found that the failure to perform the post maintenance in-place DOP testing as required by TS before the spent fuel pool ventilation system was declared operable was of low safety significance since the HEPA filters were available to perform their intended function the entire time. Therefore, the failure to follow TS 4.9.12.e. and subsequently TS 3.9.12 Action b, is not being cited because the criteria specified in Section V.G. of the NRC Enforcement Policy, 10 CFR 2, Appendix C, were satisfied. This determination was based on the fact that the violation was licensee-identified, the safety significance was minimal, it was reported, corrective actions were taken, and it was not willful. The inspectors determined that no further review is necessary.

## **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. The resident inspectors had no noteworthy findings in this area.

## **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

The inspector reviewed selected design changes and modifications made to the facility which the licensee determined were not unreviewed safety questions and did not require prior NRC approval as described by 10 CFR 50.59. Particular attention was given to safety evaluations, Plant Operations Review Committee approval, procedural controls, post-modification testing, procedure changes resulting from this modification, operator training, and UPSAR and drawing revisions. The following activities were reviewed:

### 7.1 Containment Pressure Instrument Lines

In February 1991, the inspectors identified a concern involving the seismic qualification of the containment pressure instrument lines. The inspectors had found that the lines were rigidly supported on both the auxiliary building wall and the outside containment wall without provisions for movement during a seismic event. BG&E subsequently modified the tubing supports and performed an engineering evaluation which determined the modified instrument lines were operable. The issue was initially documented in IR 50-317 and 50/318/91-03 and was considered an unresolved item pending NRC review of BG&E's engineering evaluation.

The NRC staff found that the methodology utilized in BG&E's evaluation to analyze the instrument line modifications was unacceptable because alternate damping values were used. The methodology used in the evaluation did not conform to the methodology described in the Updated Final Safety Analysis Report. In response to the NRC staff finding, BG&E, in a letter dated February 3, 1992, committed to perform a re-evaluation of the instrument line installation and to make any necessary modifications. The letter stated that any modifications would be completed during the next outage of sufficient duration after August 1, 1992, or before this date if the potential modifications could be implemented during power operations.

In a letter dated March 5, 1992, the NRC staff found the BG&E proposed resolution to the concern to be acceptable. The March 5, 1992, letter also requested that any alternative approaches other than those already approved by the NRC as detailed in the USFAR be reviewed and approved by NRC prior to use on future design changes or modifications. The inspectors determined that no further review of the issue was necessary.

### 7.2 Post LOCI Core Flush Flow Concerns

On March 18, 1992, BG&E determined that emergency operating procedure, EOP-5, did not specify adequate flow for core flushing needed to prevent boric acid precipitation following certain loss of coolant incident (LOCI) conditions. EOP-5 directed operators to perform the hot leg core flush via the chemical and volume control system (CVCS) and the pressurizer auxiliary spray line as the preferred method. The alternate method directed operators to perform hot leg flush via the shutdown cooling suction line. The acceptance criteria for injection flow in all cases was 40 gpm.

The flow rate concern was found during technical reviews of other auxiliary spray system issues prompted by questions from the Offsite Safety Review Committee. BG&E engineers confirmed with Combustion Engineering (CE) that 40 gpm needed to pass through the reactor vessel and out the postulated break. Adequate flow through the reactor vessel was required to prevent precipitation of boric acid in the reactor vessel. The 40 gpm criteria had apparently been misinterpreted by BG&E to mean total injection flow rather than flow through the reactor vessel at the time the EOP-5 acceptance criteria was established. To account for losses and boil-off and assure a 40 gpm flow out of the core, a greater hot leg injection flow is needed. BG&E preliminary estimates showed that a hot leg injection flow of 150 gpm was required. This would assure at least 40 gpm flow through the core and out of the postulated break.

BG&E also found that the preferred auxiliary spray method was apparently incapable of providing sufficient flow to perform adequate hot leg flushing. Due to the position of a throttle valve (CVC-188) in a parallel flow path, preliminary best estimates for the maximum flow into the hot leg using the auxiliary spray line were about 120 gpm.

This issue has potential safety significance. Boric acid precipitation following certain LOCI's could have an adverse impact on long term decay heat removal capability. BG&E continued evaluation of this issue as the inspection period closed. The following issues requiring further NRC review are:

1. The 40 gpm acceptance criteria in EOP-5 for all core flush methods was insufficient to assure adequate core flushing. BG&E has not finalized their assessment of the safety significance of this issue. Also, final calculations of the actual minimum required hot leg flush flow rate were not complete.
2. The acceptance criteria for hot leg injection flow was established as a part of the EOP development process. The inspectors were concerned with the adequacy of the procedure that established and reviewed this acceptance criteria. Also, the scope of later reviews of boric acid precipitation may have been inadequate.

BG&E initial actions in response to this issue have been good. However, due to the safety significance, these concerns remain unresolved pending BG&E's completion of analysis of the minimum required flows and review of the causes of the issue (UNR 50-317 and 318-/92-07-02).

### 7.3 Unit 1 Salt Water Pipe Leak

On February 14, 1992, BG&E discovered a small leak in the weld between the discharge piping from the No. 11 saltwater (SW) pump and a half coupling for a pressure tap. The SW piping in the affected area was an ASME Class 3 component. Plant operators subsequently isolated the pump in accordance with T.S. 3.4.10, "Structural Integrity." BG&E estimated that the weld repair would take approximately seven days (required draining affected a portion of the system). BG&E elected to postpone the work until the current Unit 1 refueling outage to keep the No.

11 SW pump available in case the performance of the other two SW pumps degraded. TS 3.7.5 required at least two operable SW pumps. BG&E performed an engineering evaluation which determined that No. 11 SW pump could deliver the required flow if the weld completely failed.

The inspectors reviewed BG&E's engineering evaluation. The evaluation analyzed the worst case condition where a total failure of the half coupling was assumed. The maximum leakage from the failed weld was found to be approximately 250 gpm. BG&E found that the No. 11 SW pump provided a reserve capacity of 990 gpm. Therefore, evaluation concluded that, if needed, the No. 11 SW pump could provide design flow to the various heat loads. The evaluation also found that the maximum leak rate would not exceed maximum analyzed flooding rate for the intake structure of 447 gpm. The location of the weld was also considered for possible impact of water spray on other plant equipment. No adverse effects were found.

Following the engineering evaluation, BG&E concluded that the No. 11 SW pump and its associated discharge piping were operable with the exception of the small leak from the half coupling weld. BG&E submitted a request for temporary relief from the ASME code on February 25, 1992. The relief request was still under NRC review at the start of the Unit 1 refueling outage. Due to the outage, the temporary code relief was found to be unnecessary.

The inspectors assessed BG&E's response to the leak. Operator actions upon identification of the leak were appropriate. The engineering evaluation which analyzed the worst case condition was thorough and comprehensive. BG&E's decision to keep the No. 11 SW pump available until the current Unit 1 refueling outage demonstrated a strong safety perspective. The inspectors determined that no further review on this issue was required.

## **8.0 SAFETY ASSESSMENT AND QUALITY VERIFICATION**

### **8.1 Plant Operations and Safety Review Committee**

The inspector 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 was adequate in fulfilling the POSRC responsibilities. No unacceptable conditions were identified.

## 8.2 Installation of Temporary Alterations Without POSRC Approval

On March 20, 1992, BG&E elected to install temporary alterations (TAs) (Nos. 1-92-052 and 2-92-009) that disabled the automatic initiation of the containment spray actuation system (CSAS) and the containment isolation system (CIS) on both Units 1 and 2. The units were shut down due to concerns with emergency diesel generator (EDG) loading for certain accident scenarios and were in hot shutdown (mode 4) when the TAs were installed. BG&E had concluded that exigent conditions existed and that automatic initiation of CSAS and CIS was not required in mode 4.

The TAs were installed without review by the Plant Operations Safety Review Committee (POSRC) and without performance of a 10 CFR 50.59 evaluation. The Shift Supervisor (SS), with the concurrence of the General Supervisor - Nuclear Plant Operations (GSNPO), authorized the installation of the TAs in accordance with the provisions of Calvert Cliffs Instruction (CCI) 117, "Temporary Modification Control," Revision J. CCI-117 paragraph 6.4 stated, in part, that the "procedure is not intended to prevent or delay the Shift Supervisor's ability to immediately approve the implementation of temporary modifications required by an emergency or exigent operational condition." No definition or explanation of an emergency or exigent condition was provided in CCI-117. The inspectors could not locate training information that defined an emergency or exigent operational condition.

The inspectors reviewed the SS's log entry authorizing the installation of the TAs and discussed the issue with the GSNPO. The SS and the GSNPO took actions in accordance with the direction provided in CCI-117 and determined that an "exigent" condition existed. The primary factors in the determination of an "exigent" condition were the concerns with the EDG's and the impetus to restore them to operability, the need to keep the containment cooling system in operation, and the desire to maintain the units in mode 4 while reducing the gas concentration in the reactor coolant systems. Additionally, the SS based his determination on memorandums from engineering that reviewed the technical specification requirements and concluded that the CSAS and the CIS were not required to be operable in mode 4. The GSNPO did not consider the situation warranted a departure from technical specification requirements as authorized per 10 CFR 50.54(x).

The POSRC subsequently reviewed the TAs as installed and discussed the need for implementation of the TAs without POSRC review. The issue was not resolved at the POSRC meeting, but an issue report was initiated to document the concern. After considering the concern in the issue report, BG&E determined that paragraph 6.4 of CCI-117 was not consistent with the technical specifications. A procedure change restricted the SS from implementing TA's except in conditions authorized by 10 CFR 50.54 (x) was implemented before the inspection period closed.

BG&E's concerns with diesel generator operability were commendable. The inspectors independently reviewed the technical specifications and concluded that CSAS and CIS were not required to be operable in mode 4. However, the inspectors were concerned with the provision in CCI-117 used to install the TAs without POSRC review of the proposed modification and 10 CFR 50.59 evaluation. A similar concern regarding POSRC review of modifications was recently identified during the NRC Integrated Performance Assessment Team inspection (NRC Inspection Report 50-317 and 318/92-82). In response to that concern, the Plant General Manager issued direction to plant staff that all proposed modifications that affected nuclear safety be reviewed by POSRC.

TS 6.5.1.7 requires POSRC review of all proposed changes or modifications to plant systems or equipment that affect nuclear safety and the supporting 50.59 evaluations. The implementation of the TAs on the CSAS and CIS logic circuits without POSRC review as required by CCI-117 paragraph 6.4 is a violation of TS 6.5.1.7 (50-317 and 50-318/92-07-03).

## 8.2 Operations Self-Assessment

The inspectors received a briefing on March 10 from the Superintendent of Nuclear Operations (SNO) and his general supervisors on the ongoing self-assessment being done by the operations department. The first internal assessment team conducted its review of operations during January 6-10. The team consisted of management representatives from operations, maintenance, and technical support. Their recommendations and actions taken as a result of their findings were discussed with the inspectors. The SNO also discussed improvements made as a result of the operations supervisory observation program.

## 9.0 FOLLOWUP OF PREVIOUS INSPECTION FINDINGS

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

### 9.1 (Closed) Violation 50-317/91-13-01; 50-318/91-13-01; Inadequate Implementation of Cleanliness and Foreign Material Controls.

This item involved a failure to implement adequate cleanliness controls which resulted in the intrusion of foreign material into several safety related systems. This issue was inspected as documented in Section 4.3.

9.2 (Closed) Unresolved Item (50-317/91-03-01; 50-318/91-03-01): Seismic Qualification of Containment Pressure Instrument Tubing.

This item concerned the seismic qualification of the containment pressure instrument lines at the interface between the containment and auxiliary buildings. This item is discussed in Section 7.1.

### 10.1 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.

#### 10.1 Preliminary Inspection Findings

A violation was identified concerning ineffective actions to correct concerns with the improper storage of transient equipment in safety related areas (50-317 and 50-318/92-07-01). A non cited violation regarding the failure to perform required surveillance testing on the spent fuel pool ventilation system was identified. An unresolved item was identified regarding concerns with the adequacy of hot leg flushing following a loss of coolant accident (50-317 and 50-318/92-07-02). The implementation of temporary alterations on the containment spray actuation system and the containment isolation system logic circuits without Plant Operations Safety Review Committee review was a violation of NRC requirements (50-317 and 50-318/92-07-03).

#### 10.2 Attendance at Management Meetings Conducted by Region Based Inspectors

<u>Date</u>	<u>Subject</u>	<u>Inspection Report No.</u>	<u>Reporting Inspector</u>
2/27/92	Radwaste Transport	50-317/92-08 50-318/92-08	J. Furia
3/6/92	EALs	50-317/92-06 50-318/92-06	C. Gordon
3/13/92	Maintenance	7/92-09 50-318/92-09	A. Lohmeier