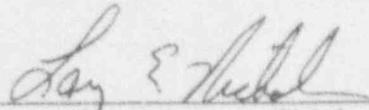


U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

Report Nos.: 50-317/92-02; 50-318/92-02  
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: January 5, 1992 through February 15, 1992  
Inspectors: Peter R. Wilson, Senior Resident Inspector  
Allen G. Howe, Resident Inspector  
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Approved by:

  
Larry B. Nicholson, Chief

Reactor Projects Section No. 1A  
Division of Reactor Projects

3/12/92  
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

#### Combined Inspection Report Nos. 50-317/92-02 and 50-318/92-02

**Plant Operations:** (Operational Safety Inspection Module 71707; Prompt Onsite Response to Events at Operating Power Reactors Module 93702) Overall, the facility was operated safely. There were no noteworthy operational events during the period. The inspectors identified a non-cited violation regarding the inadvertent deletion of procedural steps to perform pre-release checks of the radioactive monitoring instrumentation. The initial BG&E review of this issue was found to be limited in scope.

**Radiological Protection:** (Module 71707) The inspectors concluded, based on selected reviews, that the radiological controls program and implementation was acceptable.

**Maintenance and Surveillance:** (Maintenance Observations Module 62703; Surveillance Observations Module 61726) Selected observed maintenance activities were performed well and in accordance with procedures and requirements. However, the inspectors identified minor weaknesses in preventative maintenance procedures, tagging and temporary modification procedures, and scaffolding controls. Valve stroke times in the alert range, following an in-service surveillance test of the No. 12 main steam isolation valve, were not recognized in a timely manner and required BG&E to request code relief for the degraded condition.

**Emergency Preparedness:** (Module 71707) The inspectors' review of facilities and personnel found an acceptable level of emergency preparedness.

**Security:** (Module 71707) The inspectors determined that security program implementation was acceptable.

**Engineering and Technical Support:** (Module 71707) BG&E's response to a Unit 2 overstressed service water pipe support and a leak in the Unit 2 refueling water tank was prompt. Particularly noteworthy was the timeliness of BG&E's operability determination which recognized the potential safety significance of the problems. This was considered to be a strength.

**Safety Assessment/Quality Verification:** (Module 71707) A violation was identified concerning the lack of a required operating procedure for the containment emergency air lock. The inspectors found that the lack of an operating procedure contributed to improper operation of the Unit 1 emergency air lock and resultant loss of required containment integrity on December 24, 1991. In addition, the inspectors found that BG&E's initial root cause evaluation of the event was weak, in that it did not consider human performance aspects.

## DETAILS

### 1.0 SUMMARY OF FACILITY ACTIVITIES

Both Units 1 and 2 operated at power throughout the inspection 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, temporary modifications log, and the jumper and lifted lead book. 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 portions backshifts (evening shifts) and deep backshifts (weekend and midnight shifts). Extended coverage was provided for 35 hours during backshifts and 40 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 above inspection tours except where noted below.

Housekeeping in safety related areas was found to be mixed. The cleanliness of safety related areas in the auxiliary building was adequate. However, housekeeping in the emergency diesel generator rooms and service water pump rooms was weak. Excessive dirt and debris were observed on horizontal surfaces. There was a significant buildup of diesel generator fuel oil around several diesel piston fuel injectors. Also, a mixture of lubricating and fuel oil in significant quantities was observed under the diesel engines (most had been captured by drip pans). The inspectors' housekeeping concerns were discussed with BG&E's Superintendent of Nuclear Maintenance and by the end of the period significant improvements in the above areas were noted.

Inadequately restrained transient equipment was observed in safety related areas. This included carts, ladders, pressurized fire extinguishers, 55 gallon drums, industrial vacuum cleaners and a large mobile gantry. The inspectors expressed concern that this equipment had the potential to damage installed safety related equipment during a seismic event. BG&E promptly responded to the concerns by either securing or removing the equipment. However, the inspectors continued to identify additional examples of unrestrained equipment. It was not evident that BG&E management policy for transient equipment in safety related areas had been effectively communicated to plant personnel.

## 2.2 Followup of Events Occurring During Inspection Period

During the inspection period, there were no noteworthy operational events.

## 2.3 Radiation Monitoring Instruments Operability Checks

In NRC Inspection Report 50-317 & 50-318/91-21, the inspectors raised concerns regarding the lack of procedure steps and operator procedure adherence during operability checks of radiation monitoring instruments conducted prior to waste discharges. Also, the inspectors were concerned with the limited scope of BG&E's root cause analysis which did not initially address the adequacy of operator actions. These concerns were unresolved (UNR 50-317 & 50-318/91-21-01) pending further BG&E evaluation and NRC review.

The inspectors reviewed the BG&E investigation report regarding the problem and a response to a quality assurance audit finding. The inspectors discussed the audit response and investigation findings with the General Supervisor of Nuclear Operations Support (GS-NOS).

The investigation report was thorough and it concluded that operability checks had been performed and that the checks were within the expected abilities of a licensed operator. The report also concluded that the operators were not sufficiently attentive to recognize and correct these minor procedural deficiencies. The inspectors independently sampled operator knowledge on the instrument checks and concluded that the operators were able to adequately complete these checks.

The safety significance of performing the operability checks without procedures was minimal because the operability checks were simple, they were performed and documented in the discharge permits, and the releases were within TS limits as verified by chemistry sampling. The inadvertent deletion of procedure controls for the operability checks was administrative in nature.

The inspectors determined that the initial problem identification and corrective actions were weak. This conclusion was based on the fact that the procedure discrepancies were identified by a quality assurance audit and not by the operators who had performed the discharges. Additionally, in the case of the liquid waste discharges, operators had obtained appropriate guidance on the checks from another section of the procedure. When the audit finding was identified, operations personnel focused on the procedure change aspects of the problem and did not initially include the operator performance aspects in the audit response. The licensing department of BG&E had apparently questioned operator performance when the audit finding was made and communicated this concern to an operations shift supervisor. However, no documentation of this concern was generated and it was not followed up by operations personnel.

The corrective actions in the investigation and the quality assurance audit included a briefing of the shift supervisor on the event, a briefing of the operating crews on the necessity of procedural adherence and management expectations on procedure use, and enhancements to the procedure development process to ensure that changes to one procedure will not impact others. The inspectors concluded that these actions were appropriate.

Procedure controls for the surveillance checks are required by TS 6.8.1.a as referenced in Regulatory Guide 1.33, Revision 2, February 1978, Appendix A, paragraph 8.b. The absence of controls is a violation of this requirement. This licensee-identified violation will not be cited because the criteria for enforcement discretion, 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 not reportable, corrective actions were taken, and it was not willful. Based on BG&E's response to this issue, the inspectors determined that no further NRC review is needed and that this issue is considered closed.

### 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 radiologic 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 inspectors observed maintenance activities, interviewed personnel, and reviewed records to verify that work was conducted in accordance with approved procedures, technical specifications, and applicable industry codes and standards. The inspectors also verified that: redundant components were operable, administrative controls were followed, tagouts were adequate, personnel were qualified, correct replacement parts were used, radiological controls were proper, fire protection was adequate, quality control hold points were adequate and observed, adequate post-maintenance testing was performed, and independent verification requirements were implemented. The inspectors independently verified that selected equipment was properly returned to service.

Outstanding work requests were reviewed to ensure that the licensee assigned appropriate priority to safety-related maintenance. The inspectors observed/reviewed portions of the following maintenance activities.

##### a. Investigate Trip of No. 11 Charging Pump

On January 10, 1992, the No. 11 charging pump tripped unexpectedly. Operators shifted to an alternate pump and initiated a maintenance request to investigate the cause of the trip. The inspectors observed electrical maintenance (EM) personnel performing troubleshooting. The workers determined that the trip was caused by the low suction pressure trip function. This troubleshooting was properly performed. Some process concerns observed while reviewing this issue are discussed in section 4.2.a.

##### b. Disassemble and Inspect No. 11 Emergency Diesel Generator Air Start Valves

Preventative maintenance (PM) procedure 1-24-M-A-4 to clean and inspect the emergency diesel generator (EDG) air start valves was performed on January 15, 1992, as a part of the quarterly system schedule for planned maintenance. Work was performed in accordance with approved procedures. The inspectors checked the tagging and found adequate isolation for the work. The inspectors questioned the mechanic and the system engineer regarding the absence of procedure guidance for torque values on the valve studs to ensure adequate gasket compression. The valve is installed between two flanges and Flexitalic gaskets are used to seal the valve to flange interfaces. BG&E changed the procedure to specify a torque value. Further discussion of this issue is contained in section 4.2.b.

c. Troubleshoot Temperature Indication for No. 11 Emergency Diesel Generator Bearing

This maintenance was performed to correct invalid temperature indication on the No. 11 emergency diesel generator bearing. The inspectors observed portions of the work, reviewed the documentation, and discussed the work with maintenance personnel. Properly calibrated equipment was in use and work practices were appropriate.

d. Investigate and Correct Low Air Flow on the Wide Range Noble Gas Monitor

The Unit 1 wide range noble gas monitor exhibited low flow conditions causing the pump to trip. Operators declared the system inoperable and entered TS 3.3.3.1.b action (30). Instrument and Control (I&C) technicians identified that the air pump had severe leakage and replaced the pump. The inspectors observed selected portions of the work, reviewed the documentation, and discussed the work with maintenance personnel. The inspectors noted that safety related replacement parts were used and that the work was appropriately performed.

e. No. 11 and No. 12 Service Water Heat Exchangers Tube Bulleting

The inspectors observed the routine quarterly tube bulleting of No. 11 and No. 12 service water heat exchangers on January 15 and 22, respectively. The inspectors observed portions of the work and discussed the condition of the heat exchanger with the work discipline supervisor and maintenance personnel. Appropriate foreign material controls were in place and the work was adequately performed.

f. Diesel Generator Room Temperature Indicator Calibration Check

On January 22, 1992, the inspectors observed technicians performing preventive maintenance (PM) procedure 1-24-I-RP2-11. The purpose of the PM was to verify the proper calibration of the No. 12 diesel generator room temperature indicator. The inspectors found that the technicians were properly following the PM. The measuring and test equipment utilized for the calibration check were all found to be within the required calibration frequency. The inspectors assessed that the PM was properly performed.

g. Replacement of Manual Operator on 1-CC-266

On January 23, 1992, inspectors observed replacement of the manual operator on 1-CC-266, the No. 12 shutdown cooling heat exchanger component cooling inlet valve. The work was done under maintenance order 19105100 and involved the replacement of a Pratt MDT 3 operator with a Pratt MDT 3S operator. Inspectors reviewed the work package and foreign materials controls, and they discussed the maintenance with the mechanics. When the mechanics removed the operator from the shaft, the packing was forced out and water began to rapidly drip onto the floor. The mechanics immediately replaced the operator to stop the leak and contacted their supervisor.

The inspectors determined that, although, the work area had been isolated by safety tagout, the piping had been only partially drained. The static pressure of the water in the pipe leg was still present on the packing. The piping would normally have been drained to the miscellaneous waste receiver tank, but the tank had been full. Rather than wait until the tank had been pumped in order to drain the pipe, maintenance and safety tagging supervisors had decided to risk using the packing as a boundary to the static water pressure. Subsequent to the leak, maintenance and safety tagging supervisors decided to reinstall the original operator and postpone the replacement until a later date.

The mechanics had been briefed on the possibility of the packing leaking and on the actions to be taken in that case. The inspectors determined that there were no personnel or equipment hazards as a result of the packing leak. They discussed the decision to attempt the replacement under the existing plant conditions with the supervisors who agreed that better preparation would have prevented postponement of maintenance. The inspectors consider the safety significance of this activity to be low due to the system condition and completeness of the job pre-brief, but it is an instance of weak maintenance preparation. The inspectors had no further concerns.

#### 4.2 Review of Maintenance Process Issues

During observations of maintenance activities and tours of the plant, the inspectors identified selected activities where process weaknesses were observed. In each of the examples below, the safety significance of the specific issue was minor.

##### a. Trip of No. 11 Charging Pump

On January 10, 1992, the No. 11 charging pump tripped unexpectedly. After finding that the cause of the trip was the low pressure trip feature, the EM personnel found that the gage face and contacts were removed from the suction pressure gage. In addition, the gage was isolated via a tagged closed valve. The electrical portion of the low suction pressure trip function was not disabled. The contacts were free to move in this condition and the EM personnel surmised that somehow the contacts closed and tripped the pump. The gage face was restored on January 10, 1992. An issue report was initiated to document the problem and the General Supervisor of Electrical and Controls (GS-E&C) initiated a review of the problem.

The low suction pressure trip protects the pump from loss of suction pressure during normal operation and is bypassed on a safety injection actuation signal. The trip controller is a set of contacts installed in the suction pressure gage face. The contacts close to trip an operating charging pump when the suction pressure indicator needle moves to the low pressure trip setpoint. This gage face and contacts can be removed without breaking the pressure boundary.

A modification to install seismic supports for the charging pump suction pressure gages had been initiated per maintenance order (MO) 19103047. For this work, the gage had been isolated and danger-tagged on January 2, 1992. In addition, a caution tag was placed on the control switch for the pump which stated that the position was "PTL\* [pull to lock] \*Operate as necessary by operations (suction pressure switch isolated)." Operators started the pump on January 6, 1992, in the course of reactor coolant system leak rate evaluations, and subsequently left the pump in operation. Due to interference with the work in progress, the suction pressure gage face and contacts were removed on January 7, 1992. The instructions to remove the gage face were added to the work package and discussed with tagging and operations personnel before removal.

The inspectors independently reviewed the circumstances regarding this maintenance via discussions with personnel, review of documents, and walkdowns. The inspectors were specifically concerned with the process controls that allowed: (1) the charging pump to be started with the gage isolated; and (2) later allowed gage disassembly while the charging pump remained in service. The inspectors drew the following conclusions from this review:

1. Communications regarding the status of the No. 11 charging pump were weak. The operators had varied interpretations of the purpose of the caution tag on the No. 11 charging pump hand switch. There was no information in the turnover checklist or the operator logs regarding the status of the suction pressure gage or any operational considerations.

The disassembly of the gage was not understood by the safety tagger who discussed the MO change with instrument and controls (I&C) personnel. Additionally, other shifts were not informed of the condition of the gage as evidenced by the fact that operations personnel on shift when the pump tripped did not know that the gage was disassembled nor did they understand that the pump had the potential to trip.

2. Operators placed the No. 11 charging pump in normal operation while the low suction pressure trip was isolated. There was a strong desire by operators to keep all charging pumps available to support operational needs, so the pump was caution tagged vice danger tagged. A concern that work in the area could cause the pump to trip was in the tagout record; however, this record was not maintained in the control room. There was no evidence that compensatory measures or operational restrictions for the No. 11 charging pump were clearly communicated to the operators. Calvert Cliffs Instruction (CCI) 112 "Safety Tagging" states that the Shift Supervisor is responsible for "identifying and implementing any compensatory measures needed to support plant operation for equipment affected by tagout boundaries." However, the procedure is not clear regarding the impact of tagging on components. Subsequently, no controls were implemented.

3. The disassembly of the gage changed the sensitivity of the contacts to vibration. This work was not considered a temporary modification because it was thought to be within a tagout boundary, thus exempt from temporary modification control. The boundary in the case of the charging pump was the caution tag on the pump handswitch. However, screening guidance in CCI-117 "Temporary Modification Control," Attachment 1, question 10, is subject to interpretation regarding equipment "tagged out of service." In this case, the caution tag did not effectively tag the component out of service.

The inspectors expressed concern to the General Supervisor of Nuclear Operations Support (GS-NOS) and the GS-E&C regarding weak communications and the operation of the pump without effectively implementing compensatory actions while the low suction pressure trip was disabled. The inspectors also noted that the temporary modification procedure, CCI-117, and the tagging procedure, CCI-112, were subject to interpretation regarding this issue.

The inspectors determined that the safety significance of the charging pump trip and availability of the charging pumps while the suction pressure gage was isolated was minimal because there were two operable charging pumps at the time as required by TS 3.1.2.4. Also, the low suction pressure trip would have been bypassed on a safety injection actuation signal. BG&E review of the event concluded that the root cause of this issue was poor communications. The recommended corrective actions include awareness training for operations and maintenance personnel and an evaluation of the elimination of the charging pump pressure controllers. Additionally, due to the differing possible interpretations of CCI-112 and CCI-117, these procedure controls will be reviewed to determine any necessary changes. The inspectors concluded that BG&E response to this issue was appropriate.

b. Review of Gasket Torquing

The inspectors performed a review of the practices for assembling flanged connections using Flexitalic gaskets. The Flexitalic Gasket Technical Manual, No. 15-524-01, clearly specified that proper gasket compression was needed to assure an adequate seal. The manual further describes methods such as bolt stressing or torquing as appropriate methods to assure proper gasket compression. The inspectors expressed concern to the General Supervisor of Mechanical Maintenance (GS-MM) regarding the lack of instructions in the air start valve procedure and questioned if any other procedures needed revision to include torque specifications.

On January 22, 1992, the inspectors observed the performance of preventative maintenance (PM) No. 1-24-M-A-3 on the No. 12 emergency diesel generator (EDG) air start valves. This PM is essentially identical to the PM for the No. 11 EDG. The inspectors noted that this PM did not have torque specifications for the valve studs and questioned the workers regarding the need for a change. This procedure was subsequently revised and the valve studs were properly torqued. A quality verification inspector initiated an issue report (IRO-008-620) to document the problem.

The inspectors questioned why the PM change for the No. 11 EDG was not transferred to the PM for the No. 12 EDG air start valves and discussed the process for changing PMs with the PM coordinator in accordance with the PM procedure, CCI-211. There was no process identified to ensure similar changes were incorporated into other affected PMs prior to field use, and in a timely manner.

The GS-MM reviewed the inspectors concerns and concluded that the PM procedures were the only area where improvements were needed to incorporate torque values for Flexitalic gaskets. The inspectors independently reviewed selected maintenance procedures and also concluded that the PM procedures were the only area that needed general improvement regarding torque values.

BG&E determined that the compression applied using good maintenance practice was adequate. The inspectors reviewed BG&E's evaluation and agreed that adequate compression could be achieved via good bolting practices. The inspectors noted, however, that variation could occur without consistent application of torque values.

The safety significance of this issue is minor because the application of good bolting practice was generally adequate. Also, post maintenance testing was performed to verify that the flanges did not leak.

In response to the inspectors' concerns, the GS-MM initiated action items to review and implement measures to assure timely implementation of PM changes, to correct PMs that do not have adequate bolting instructions, and to ensure PMs are reviewed for technical adequacy prior to field implementation. The inspectors concluded that these actions were appropriate.

c. Inadvertent Charging Pump Start

While performing a routine calibration of the Unit 1 pressurizer level and pressure recorders, the standby charging pumps were inadvertently started. The start was caused when technicians lifted a lead to the pressurizer level setpoint recorder to facilitate the installation of calibration equipment. When the lead was lifted, a false error signal was generated and the charging pumps started. Operators and technicians immediately restored the systems to normal and BG&E initiated an investigation of the event.

BG&E determined that the root cause was personnel error. The technician performing the calibration apparently disregarded verbal and written instructions to remove the pressurizer level recorder and perform a bench calibration. The technician had reviewed circuit prints and had mistakenly determined that there would be no effect from lifting the lead.

Weak procedural guidance contributed to this event. In this case, a note in the master calibration data sheet (MCDS) stated that the recorder should be removed for calibration. However, no reason was given. Also, the location of the note was far removed from the procedure the technician was performing.

BG&E developed corrective actions to revise the applicable preventative maintenance procedures and review other procedures for similar weaknesses. Planned PM procedure upgrades will also be revised to capture these changes. Additionally, training will be revised to include qualification on this calibration procedure.

The inspectors found that this investigation was thorough and that the corrective actions addressed the appropriate concerns. The safety significance is minor; however, this error did result in a slight pressurizer level increase.

d. Scaffolding Observations

The inspectors observed a large number of scaffolds erected in safety related areas in both units. BG&E utilized scaffolding to provide access to plant components for maintenance and testing activities. Because scaffolds could potentially damage safety related equipment in a seismic event, the inspectors walked down selected scaffolds and reviewed BG&E's scaffolding program.

BG&E's scaffolding program was contained in two documents. The first document was Calvert Cliffs Industrial Safety Manual No. 17, "Scaffolding." This document described methods of building scaffolds to meet current industrial safety standards. The second document was an engineering memorandum to the GS-MM, dated June 26, 1991, which contained specific requirements for scaffolds erected in safety related areas. This memorandum provided minimum clearances from safety related equipment, scaffold bracing requirements, maximum height/width ratios, and allowable scaffold attachment points. The inspectors noted that the program did not contain any time constraints on the length of time a scaffold could remain erected in safety related areas; however, the program did contain requirements for monthly inspections of erected scaffolds to ensure the scaffolds continued to meet program requirements.

During walkdowns of scaffolds in safety related areas, the inspectors found that the majority of scaffolds were properly constructed and met the requirements specified in the above engineering memorandum. However, inspectors identified five scaffolds which did not appear to meet either the minimum clearance or the bracing requirements. The inspectors also identified that one of these scaffolds had not been inspected for over 60 days. BG&E promptly responded to the inspectors' concerns by either modifying or removing the scaffolds.

BG&E also initiated a scaffolding program review to assess where the program could be strengthened. This review included program controls and examinations of existing scaffolds. Scaffolds no longer in use were scheduled for removal. BG&E scaffold program review was still in progress at the end of the period.

The inspectors concluded that most of the scaffolds erected in safety related areas were adequately constructed. However, the inspectors did find several scaffolds which had the potential to damage safety related equipment. The inspectors concluded that further management attention in this area was required. BG&E's response to the inspectors' concerns was adequate.

#### 4.3 Surveillance Observation

The inspectors witnessed selected surveillance tests to determine whether properly approved procedures were in use, technical specification frequency and action statement requirements were satisfied, necessary equipment tagging was performed, test instrumentation was in calibration and properly used, testing was performed by qualified personnel, and test results satisfied acceptance criteria or were properly dispositioned. Portions of the following activities and surveillance test procedures (STP) were reviewed.

##### a. No. 11 Emergency Diesel Generator Post Maintenance Testing

The inspectors reviewed the work scope of selected maintenance performed on the No. 11 emergency diesel generator (EDG) and the associated post maintenance testing. The post maintenance test involved the performance of surveillance test procedure 0-8-0 which started and loaded the diesel generator. Various inspections were performed while the EDG was in operation. The inspectors determined that the testing was appropriate for the scope of the maintenance performed. Additionally, testing was properly performed.

##### b. STP 0-8B-1, "12 Emergency Diesel Generator and 4KV Bus 14 LOCI Sequencer Test"

The inspectors observed portions of this test including the operation of the No. 12 emergency diesel generator. The inspectors found that the test personnel were properly following the test procedure and were knowledgeable of equipment operation. An acceptable level of performance was observed.

#### 4.4 Main Steam Isolation Valve Stroke Timing

The inspectors performed a detailed review of an occurrence where certain BG&E inservice testing requirements were apparently not met. Specifically, during the most recent Unit 1 shutdown, required corrective maintenance was not performed on a main steam isolation valve following the performance of a surveillance test which indicated the valve full stroke time had almost doubled. BG&E inservice test (IST) program required that corrective measures be taken prior to escalating operating modes. The inspectors also reviewed BG&E's interpretation of the

ASME valve IST requirements and subsequent ASME code relief request. The inspectors' review included personnel interviews and examination of several applicable documents including Plant Operations and Safety Review Committee minutes, procedures and problem reports. The inspectors' findings are discussed below.

On December 23, 1991, while Unit 1 was in Hot Shutdown (Mode 4), the full stroke time of the two main steam isolation valves (MSIVs) was measured in accordance with Surveillance Test Procedure (STP) 0-1-1, "MSIV Full Stroke Test," Revision 11. The No. 11 MSIV closed in 2.55 seconds and the No. 12 MSIV closed in 4.05 seconds. The acceptance criteria for the full stroke time was closure in less than or equal to 5.2 seconds (TS requirement 4.7.1.5). The operators performing the test signed off the STP as satisfactory and forwarded the test to the appropriate Functional Surveillance Test Coordinator (FSTC) for further review as required.

On December 30, 1991, the FSTC determined that the full stroke time for the No. 12 MSIV had increased to ASME Chapter XI IST alert range. ASME Section XI, Section IWV (1983), describes the alert range as an increase in valve stroke time of 50 percent or more for power operated valves with stroke times less than or equal to 10 seconds. The No. 12 MSIV stroke time was found to have increased by 33 percent from the previous measured stroke time.

Calvert Cliffs Instruction (CCI) 104, "Surveillance Test Program," Revision 1. Step 6.9.B.2.d, requires that corrective action be performed for valves stroked on a cold shutdown frequency (MSIV cannot be full stroke tested during power operations) which are found to be in the alert range prior to leaving Cold Shutdown (Mode 5). However, on December 29, Unit 1 was restarted and returned to power operations where plant conditions did not permit further valve testing and/or corrective measures. An issue report was subsequently initiated describing this deficiency.

BG&E performed an evaluation to determine a possible root cause for the degradation in the valve full stroke time; however, a root cause could not be found. The inspectors reviewed the evaluation and found that it was detailed and comprehensive. BG&E's analysis included design review, test result comparisons, maintenance history, and vendor consultations. The analysis concluded that the most probable cause was MSIV hydraulic dump valve solenoid - poppet - seal mechanical friction (each MSIV has two parallel hydraulic dump valve solenoids). The closure time of 4.05 seconds was found to be indicative of single dump valve solenoid operation based on plant and industry experience. The valve vendor informed BG&E that the poppet seal, if not exercised frequently, sometimes becomes tacky, resulting in slow poppet shifting. A partial stroke test of the No. 12 MSIV was performed on December 30 where both solenoid dump valves were observed to operate properly. Based on the most probable root cause, BG&E concluded that valve performance would not further degrade. The inspectors did not identify any deficiencies with the BG&E's root cause analysis.

The inspectors performed an independent review of BG&E's process for ensuring that the above CCI 104 requirement was met prior to operating mode escalation. The inspectors found several weaknesses in BG&E's program for valve stroke testing. Alert range values were not included in STPs utilized to measure valve stroke times. Valve stroke time degradations into the alert range were not evaluated until the completed STP was reviewed by the responsible FSTC. CCI 104 permitted a delay of up to 14 days for the required FSTC review. The inspectors found that this process did not provide for the timely identification of degrading valve performance. In addition, the inspectors found that STPs for cold shutdown valves could be strengthened by the addition of the CCI 104 step 6.9.B.2.d requirement to alert plant operators that corrective measures were required before operating mode escalation.

A contributing cause of the occurrence was that STP 0-1-1 had not been originally scheduled during the outage (cold shutdown was never entered). The FSTC responsible for reviewing all required STPs for startup was not aware that STP 0-1-1 had been performed until after plant startup had occurred. The inspectors found that, had the FSTC reviewed the STP prior to plant startup, the failure to implement the CCI 104 requirement might have been avoided.

As a corrective action to prevent recurrence, the inspectors were informed that all STPs which measure cold shutdown valve stroke times would be revised to require FSTC review prior to shift supervisor final approval. In addition, an evaluation was to be conducted by BG&E to determine the practicality of including alert ranges in valve STPs. The proposed corrective actions appeared adequate.

As a compensatory measure, BG&E increased the frequency of partial stroke testing of the No. 12 MSIV from once every three months to every month. In addition, BG&E requested and was subsequently granted relief from the ASME Section XI requirements in IWV-3417(a) on January 30, 1992.

The inspectors found that the failure to perform additional testing and/or corrective maintenance on the No. 12 MSIV before escalating operating modes, as required by CCI 104, was of minor safety significance. The 4.05 second MSIV closing time was within the 5.2 second TS requirement and within the six second time assumed in BG&E accident analysis for main steam line break. However, TS 6.8.1.C requires that written procedures for surveillance activities of safety related equipment be implemented. Therefore, the failure to follow CCI 104 is a violation but is not being cited because the criteria specified in Section V.G of the Enforcement Policy were satisfied. The criteria were as follows: The violation was licensee identified; the safety significance was minor; it was not reportable; corrective actions appeared adequate; and the violation was not willful. The inspectors determined that no further review was 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.

On January 15, the inspectors were given an informational presentation by the Supervisor of Emergency Planning and members of his staff on the current status of BG&E off-site emergency planning support to the State of Maryland. Support presently consists of one emergency planning analyst permanently assigned to the Maryland Emergency Management Agency in Pikesville and another analyst and an assistant permanently assigned to the Maryland Department of the Environment in Dundalk. These BG&E personnel are primarily responsible for assisting the state and counties in revising plans and procedures and for training state, county, and medical emergency response personnel. The presentation included a list of the significant training provided by BG&E to off-site emergency organizations during 1991.

## 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 inspectors 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 UFSAR and drawing revisions. The following activities were reviewed:

### 7.1 Overhead Pipe Support in Service Water System

On January 16, while conducting a system walkdown prior to implementing a field change to remove the internals of Unit 2 check valve SRW-321, the 21 diesel generator service water (SRW) return, maintenance personnel discovered that the installed valve did not correspond to the field change drawing. The installed valve was a Velan check valve with a weight of 405 lbs. The valve required by the drawing was a Powell check valve with a weight of 150 lbs. While either valve is acceptable for the purpose of SRW-321, Plant Engineering and Plant Design Support personnel investigating the issue also found that one of the installed SRW pipe supports

upstream of the valve did not correspond to the plant drawings. The support configuration on the drawing did not match the installed configuration, and the stress calculation for the support was in error. As a result of the heavier Velan check valve, BG&E determined that the pipe support was overloaded. The pipe support in question was on the inside of the Unit 2 degassifier room where the SRW piping penetrates the wall. The pipe support on the corridor side of the wall also did not match its plant drawing. BG&E determined that it was not overloaded.

The overloaded support called into question the ability of the SRW piping to withstand a seismic event. BG&E promptly performed and documented an operability assessment of the SRW system as recommended by NRC Generic Letter 91-18. BG&E concluded that the system was operable based on a system walkdown and on preliminary calculations by BG&E which determined that the stresses on the pipe were acceptable.

A temporary alteration was promptly prepared to strengthen the overloaded pipe support. Following review and approval by POSRC on January 17, it was installed to correct the deficient condition.

The inspectors discussed the issue and the corrective action with Plant Engineering and Plant Design Support personnel, reviewed the plant drawings in question, attended the POSRC meeting, and observed the installation of the temporary alteration.

BG&E initiated an investigation into the event by the Operating Experience Review (OER) Section. The investigation scope included why the Velan check valve was installed instead of Powell check valve, why the plant drawings did not correspond to the installed pipe supports, why the stress calculation errors were made, the extent of the problem to other pipe supports, and the generic implications of the issue. The inspectors discussed the preliminary results with the General Supervisor of OER and were satisfied with the scope and thoroughness of the investigation.

Preliminary investigation into the plant drawing/pipe support discrepancy indicated that a 1979 field change was done on the pipe supports and that the different labeling schemes were in use on the supports. Preliminary investigation indicated that the heavier Velan check valve was installed as a result of a purchase order error made during plant construction. A "comparable" Velan valve was substituted for the requested Powell valve and the valve mark number did not annotate the heavier weight. This appeared to be an anomaly. BG&E had not completed the investigation into these and the other aspects of the issue as the period ended.

BG&E's response to the problem was prompt. Particularly noteworthy was BG&E's operability determination which recognized the potential safety significance of the identified pipe support deficiency. This is considered a strength of BG&E Plant Engineering and Plant Design Support. The inspectors determined that no further review was necessary.

## 7.2 Unit 2 Refueling Water Tank Leak

On February 5, 1992, while Unit 2 was operating at full power, BG&E operator observed crystallized boric acid and wetness in a telltale hole located on the Unit 2 Refueling Water Tank (RWT). The operator reported no active leakage. The telltale hole was located in a reinforcing plate surrounding the nozzle for the "A" train safety injection suction line. Based on the above observation, BG&E concluded that the penetration weld between the RWT and the suction line was flawed. BG&E performed and documented an initial operability determination which concluded the RWT was operable. A subsequent engineering analysis was performed which supported the operability determination. Since the RWT was an ASME Class 2 component, BG&E appropriately entered Unit 2 TS 3.4.10 "Structural Integrity of ASME Code Class 1, 2 and 3 Components". BG&E established a once per shift inspection of the affected area in order to detect any increased leakage.

The inspectors reviewed BG&E's actions in response to the leak. The inspectors conducted personnel interviews and reviewed several documents including the initial operability determination, the subsequent engineering analysis, and design drawings.

BG&E engineers promptly examined the leak area and made an initial operability determination. The engineers concluded the tank remained operable based on the following: (1) the leakage from the tank was immeasurably small which provided reasonable assurance that the weld was not seriously degraded; and (2) the physical construction of the nozzle, the tank, the reinforcing plate and the associated welds provided assurance that the safety injection suction line connection to the RWT remained structurally sound. Non-destructive examination of the affected weld area found no detectable indications.

BG&E subsequently performed an engineering analysis to further evaluate the safety significance of the leak. It was found that under worse case conditions, the total stress in the RWT nozzle area was significantly below the allowable limit. The analysis concluded that the suction line would remain fully capable of performing its design function under all analyzed conditions even if there were further degradation of the weld.

Based on past problems with similar welds on the RWTs, BG&E concluded that the probable cause of the leak was slag inclusions in the affected weld. Dissolution of entrained slag in the weld resulted in the creation of a leakage path.

In order to perform an ASME code repair of the affected weld, BG&E concluded that the RWT would require complete drainage. Unit 2 TS 3.4.5 requires the RWT to be operable in Modes 1 through 4. Based on the above operability determination and engineering analysis, BG&E requested relief from the applicable ASME code to delay the weld repair until the next refueling outage (Spring 1993). The relief request was under NRC staff review at the end of the inspection period.

The inspectors found that BG&E took appropriate actions in response to the RWT leak. The initial operability determination was made promptly with due regard for the potential safety significance of the problem. The inspectors found that BG&E's engineering analysis was conservative, thorough, and considered BG&E's response to the leak to be a strength.

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

### 8.2 Technical Adequacy Review Project Status

On January 13, the inspectors were given an informational presentation by the Superintendent of Technical Support and members of his staff on the status of the surveillance test procedure Technical Adequacy Review Project (TARP). The TARP is part of the upgrade of the surveillance test program included in the Calvert Cliffs Performance Improvement Plan. As of November 30, 1991, all surveillance requirement implementing procedures had been reviewed by the TARP for technical adequacy. Corrective actions for identified deficiencies are being tracked by the on-site action item tracking system. The project will present its final report and turn over its files to the functional surveillance test coordinators in February, 1992. The TARP will then be completed and cease to exist.

### 8.3 Emergency Air Lock Interlock Failure

The inspectors continued investigation of a failure of the Unit 1 emergency air lock (EAL) interlock that occurred on December 24, 1991. While no TS action statements were violated, as independently determined by the inspectors, containment integrity was violated for approximately one minute. This resulted in a four-hour emergency notification being made to the NRC by BG&E. The event is documented in NRC Inspection Report 50-317 and 50-318/91-30. NRC and BG&E review of the event was not complete at the end of the last inspection period, however. As a result, an unresolved item (UNR 50-317 and 50-318/91-30-01) was identified concerning the potentially serious consequences that could result following a failure of both mechanical and administrative barriers that maintain containment integrity at the EAL.

Inspectors discussed the issue with operations management, mechanical maintenance personnel, and nuclear training personnel. Inspectors also reviewed the near miss reports, the issue reports,

the air lock technical manual, and the BG&E training material on the air lock. The inspectors attended the POSRC meeting on January 21, 1992, at which the event was presented, and they reviewed the final licensee event report (LER). The event is documented as LER 91-007. In addition, inspectors interviewed the personnel who were operating the EAL at the time of the failure and inspected the outer EAL and personnel air lock doors.

Two groups of workers were entering the containment when the EAL interlock failed. The group of welders was waiting for a group of scaffolders to complete containment entry. After waiting several minutes, the welders noted that the inner door indicated closed. They assumed the scaffolders had completed transiting the EAL and commenced opening the outer door. Actually, the last scaffolder was going through the EAL inner door. The welders could not verify the inner door was shut as there is no viewing port in either door. As the outer door operating handwheel was turned, the rush of air through the air lock equalizing valve was heard by the welders. This should have indicated to the welders that the pressure was not yet equal across the door. They continued to turn the handwheel, and as the outer door came off its latch, it flew open due to the slight vacuum in the containment. The sudden inrush of air alerted both groups that containment integrity had been breached. They hurriedly shut both EAL doors. The control room and radiological controls personnel were notified and the shift supervisor stationed an interlock watch at the EAL. The inspectors found that there was no procedure posted or in use to transit the air lock and that there was no caution posted to warn against opening the door until the differential pressure was equalized.

As documented in the previous inspection report, the mechanical interlock was repaired and the door position indicators were realigned.

BG&E attributed the cause of the event to mechanical malfunction, including the slipped operating chain and the misaligned locking plate in the interlock mechanism, and an inaccurate interior door position indication. Testing to confirm the cause has been postponed until plant conditions allow during the March 1992 refueling outage. The inspectors were concerned that BG&E's initial investigation into the event focused solely on the mechanical malfunction and neglected human performance causal factors. Following discussion between the inspectors and BG&E management, BG&E included a human factors evaluation in their investigation. BG&E determined that an additional causal factor was maintenance personnel's not having verified that the pressure across the door had equalized prior to opening it. The audible, continued inleakage of air through the equalizing valve would have provided additional indication that the interior door was still open.

Additionally, inspectors determined that there was no procedure available to the workers for operating the EAL. There was also no procedure available for operating the personnel air lock (PAL). There was a procedure available in the technical manual which stated that, if a differential pressure across the lock doors exists, personnel should wait until the rush of air ceases to come through the equalizing valve before continuing handwheel operation.

Inspectors also determined that a lack of training may have been a contributing factor to the event. While basic systems training was given to maintenance personnel on the containment system that generally describes the operation of the air locks, there was no training concerning the need to allow the pressure differential to equalize or discussions describing the consequences of failing to do so.

Preliminary corrective actions taken by BG&E to date to prevent recurrence included awareness training of maintenance, operations, engineering, chemistry, and radiological controls personnel on the event. The special work permits governing containment entry have also been modified to include a caution concerning pressure equalization across the doors and awareness training on LER 91-07. Additionally, appropriate signs were placed by BG&E on the EAL outer doors of both units that include a caution to personnel to wait for pressure to equalize before opening the doors. The final investigation and corrective actions are being tracked by POSRC and by the issue report system, which also documents the failure to consider human factors in the initial investigation.

Notwithstanding the actions taken by BG&E, the potentially serious safety consequences to the public health and safety of a violation of containment integrity are unacceptable. TS 6.8.1.a requires that written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in Appendix A of Regulatory Guide 1.33, Revision 2. Regulatory Guide 1.33 requires administrative procedures for access to containment and operating instructions to maintain containment integrity. The failure to control containment entry by proper procedure is a violation of TS 6.8.1.a (50-317 & 50-318/92-02-01).

## 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 that 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 Emergency Air Lock Interlock Failure

This issue was identified as unresolved (UNR 50-317 and 50-318/91-30-01) and involved a concern with a breach of containment integrity due to a failure of the Unit 1 EAL interlock. The issue was inspected as documented in section 8.3 and is closed.

## 9.2 Radiation Monitoring Instruments Operability Checks

This issue was identified as unresolved (UNR 50-317 and 50-318/91-21-01) and involved concerns regarding the lack of procedure steps and operator procedure adherence during operability checks of radiation monitoring instruments prior to waste discharges. Also, the inspectors were concerned with the limited scope of BG&E's root cause analysis which did not initially address the adequacy of operator actions. This issue was inspected as documented in section 2.4 and is closed.

## 10. MANAGEMENT MEETINGS

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

One violation was identified concerning the lack of operating procedures for the containment emergency air locks (Violation 50-317 and 50-318/92-02-01). Two non-cited violations were identified during the period. One concerned the lack of procedural steps to perform radiation monitor operability checks prior to waste discharges. The other concerned the failure to take corrective measures following the degradation of performance of a main steam isolation valve.

### 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>
1/10/1992	Health Physics	50-317/92-01 50-318/92-01	J. Furia
1/17/1992	Physical Security	50-317/92-03 50-318/92-03	R. Albert
1/31/1992	Fire Protection	50-317/92-04 50-318/92-04	F. Bower
2/14/1992	Cable Separation	50-317/92-05 50-318/92-05	L. Kay