U.S.NUCLEAR REGULATORY COMMISSION
REGION I

License Nos.	DPR-53/DPR-69
Report Nos.	50-317/97-01; 50-318/97-01
Licensee:	Baltimore Gas and Electric Company Post Office Box 1475 Baltimore, Maryland 21203
Facility:	Calvert Cliffs Nuclear Power Plant Units 1 and 2
Location:	Lusby, Maryland
Dates:	January 19, 1997 through March 1, 1997
Inspectors:	J. Scott Stewart, Senior Resident Inspector Fred L. Bower III, Resident Inspector Henry K. Lathrop, Resident Inspector
Approved by:	Lawrence T. Doerflein, Chief Projects Branch 1 Division of Reactor Projects

EXECUTIVE SUMMARY

Calvert Cliffs Nuclear Power Plant, Units 1 and 2
Inspection Report Nos. 50-317/97-01 and 50-318/97-01

This integrated inspection report includes aspects of BGE operations, maintenance, engineering, and plant support. The report covers a seven week period of resident inspection.

Plant Operations

- Control room operators received a fire alarm for the intake structure and identified that a fire had started in the exciter for the 21 circulating water pump. The inspectors monitored control room and field personnel during the event and observed very good actions to ensure that the fire was stopped and the reactor plant was not affected. Maintenance to restore the circulating pump to operation was prompt and effective.

- During maintenance on the Unit 1 service water heat exchangers, the exhaust ventilation for the service water room was secured and the watertight door to the service water room was opened as a compensatory measure. Opening the watertight door required entry into a 24 hour technical specification action statement requiring unit shutdown. To comply with the action statement time allowance, operators briefly shut and reopened the door to start a new technical specification action period. After questioning by the inspectors, the door was shut and the practice was discontinued. In total, the door was shut 6 minutes in a 49 hour period while the work was conducted. The inspectors considered the BGE practice of short time exit of a technical specification action statement to reset the limiting condition time clock to be a poor practice that revealed a low regard for the technical specification requirement.

- Plant operations were poorly conducted during a tagout for circulating bay maintenance when a saltwater pump supply gate was incorrectly placed in the shut position. This action made the 11 saltwater header inoperable for about one hour. A red tag placed on the gate was incorrectly verified and stated that the gate was open. The discrepancy was identified during a pre-job walkdown by involved maintenance personnel. Following discovery, plant operators failed to promptly document the occurrence as an issue report.

- Unit 1 reactor power was reduced to approximately eight percent to investigate a small steam leak in the containment. A packing leak was isolated by shutting the affected valve. Also, at approximately nine percent power, the main turbine was manually tripped when high vibration was observed on the number 6 turbine bearing. The high vibration was corrected by balancing the turbine rotor. The inspectors found these operations to be properly conducted with an excellent focus on safety.

Maintenance

- Due to a lack of attention to detail and a poorly written procedure, instrument mechanics left four temporary test gauges unisolated after installation. During

subsequent high pressure safety injection (HPSI) pump operation, the gauges were over-ranged. BGE identified the occurrence and took prompt action to identify and correct the deficiencies.

Engineering

- During on-line maintenance on the 2A emergency diesel generator a check valve was removed and re-installed backwards preventing lube oil flow. The problem was identified and corrected prior to start of the engine. The cause was an incorrect schematic BGE engineering provided with the work package.

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Report Details

Summary of Plant Status

Unit 1 began the inspection report period at full power. On January 25, power was reduced to 85 percent for approximately 12 hours to complete main turbine valve testing and for some minor corrective maintenance on the plant computer. On February 14, reactor power was reduced to approximately 2 percent to diagnose and isolate a leak on a reactor coolant pump instrument valve. Full power was restored on February 17. The unit operated at full power for the remainder of the report period.

Unit 2 operated between 95 and 100 percent power due to two failed cooling pumps on the main generator transformer. On February 22, Unit 2 began an end-of-core-life, power coastdown. A refueling outage was scheduled to start on March 14.

I. Operations

O1 Conduct of Operations [1]

O1.1 General Comments (71707)[2]

Overall plant operations were conducted safely with a proper focus on continued nuclear safety. On January 25, 1997, during quarterly main turbine control valve testing on Unit 1, the operator attempted to increase load from 732 to 740 MWe using "load set". The load unexpectedly increased rapidly to 790 MWe. The operator correctly stopped the transient by decreasing "load set" and putting "load limit" in control of turbine load. Further control valve testing was suspended and BGE plant engineering initiated action to determine the cause of the load transient. BGE classified the event as a reactivity management near miss and initiated a root cause evaluation. BGE informed the inspectors that a similar event had occurred in October 1996. The "load set" method for changing turbine load was normally only used during initial startup and turbine control valve testing. No problems were experienced during normal operations using "load limit" control.

On February 4, Units 1 and 2 experienced unexpected reactive load transients, when without any operator action, Unit 1 changed from 140 million volt amperes reactive (MVAR) to 460 MVAR lag and Unit 2 changed from 0 MVAR to 180 MVAR lead. Three similar excursions occurred during this inspection period. The voltage regulators for both units were normally operated in the automatic mode with limiting devices in place to prevent exceeding over and/or under excitation trips. Discussions with BGE personnel indicated that these limiting devices were designed to prevent damage to the generators or the electric system. BGE personnel

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[1]Topical headings such as O1, M1, etc., are used in accordance with the NRC standardized reactor inspection report outline found in MC 0610. Individual reports are not expected to address all outline topics.

[2] The NRC inspection manual procedure or temporary instruction that was used as inspection guidance is listed for each applicable report section.

suspected that the Unit 2 voltage regulator was not as responsive to electric system changes as the Unit 1 regulator. Therefore, the Unit 2 regulator did not quickly respond to control reactive load until the Unit 1 voltage regulator had responded. BGE changed the operation of the voltage regulators so that reactive load was matched between the units as a starting point. BGE also initiated an issue report in their corrective action system and developed a troubleshooting plan to determine and correct the cause of the unexpected MVAR excursions.

On February 9, the inspectors accompanied non-licensed plant operators during a selected portion of their turbine building rounds that included the Unit 1 switchgear and cable spreading rooms. The operators adhered to the administrative controls for the conduct of operations that covered plant tours. The inspectors concluded that the plant operators identified plant deficiencies and used appropriate self-checking, peer checking, and three-way communications techniques.

On February 13, control room operators received a fire alarm for the intake structure. Fire response personnel were dispatched to investigate and found that a fire had started in the exciter for the 21 circulating water pump. After double verification by control room personnel and the fire technician at the scene that the affected pump had been identified, control room operators stopped the pump and opened the appropriate power supply breaker. Within 10 minutes of the alarm, the BGE fire brigade responded and extinguished the fire using portable fire extinguishers. Subsequently, the exciter was removed for refurbishment and the system was restored to service on February 22. A root cause investigation was in progress at the end of the inspection period. The inspectors monitored control room and field personnel during the event and observed very good actions to ensure that the fire was stopped and that the reactor was not affected. Maintenance to restore the system to operation was prompt and effective.

On February 14, Unit 1 reactor power was reduced to approximately eight percent to allow personnel access to the 11A reactor coolant pump bay to investigate a steam leak in the area. Plant personnel had identified the leak during an investigation of increased reactor coolant system leakrate. The leakrate had increased from 0.14 gallons per minute (gpm) to 0.27 gpm in the week prior to the investigation. The source of the leak was determined to be a small packing leak on an instrument root valve. The leak was isolated by shutting the affected valve, which removed a reactor coolant pump differential pressure instrument from service. The instrument was used during reactor coolant pump testing and was not needed during plant operation. Also, at approximately nine percent power, the main turbine was manually tripped when high vibration was observed on the number 6 turbine bearing. The high vibration was corrected by a balancing the turbine rotor prior to restart. Full power was restored on February 17. The inspectors observed portions of the plant startup and found operations to be properly conducted with a focus on safety. The inspectors considered the shutdown to identify and correct the small leak to be proactive with a noteworthy safety focus.

On February 24, BGE initiated work to remove insulation and lead paint from the Unit 1 service water heat exchangers. On February 24, at 9:00 a.m., the exhaust

ventilation for the service water room was secured and the watertight door to the service water room was opened as a compensatory measure. Opening the watertight door included entry into technical specification action statement 3.7.10, which required that the door be shut within 24 hours or the unit be shutdown. To comply with the action statement, operators shut the door at 8:30 a.m. on February 25 and reopened the door at 8:35 a.m., starting a new technical specification action period. The door was shut again at 5:20 p.m. on February 25 and reopened at 5:21 p.m. The door was shut again on February 26 at 10:00 a.m., after questioning by the inspectors concerning the appropriate control of the watertight doors for compliance with the action statement. In total, the door was shut 6 minutes in a 49 hour period. Asbestos removal was conducted during day shift only but the door remained open around the clock to provide the exhaust for ventilation of the area. After identification by the inspectors, BGE management halted the practice. At the end of the inspection period, BGE intended to request a technical specification change to allow more flexible door control during maintenance. The inspectors considered the BGE practice of short time exit of a technical specification action statement expressly to reset the limiting condition time clock to be a poor practice that revealed a low regard for the technical specification requirement.

O1.2 Saltwater System Operations

a. Inspection Scope

The inspectors reviewed the circumstances associated with the mispositioning of a saltwater system component.

b. Findings and Observations

On January 25, 1997, a tagout of circulating water and salt water components was authorized to provide personnel and equipment protection during an inspection of the 11 circulating water pump bay. In preparation for the tagout, the 11 saltwater header was supplied using the 13 saltwater pump, but the 11 saltwater pump remained operable and would start on the emergency bus sequencer. To support the diver in the circulating water bay, the 11 slide gate (1HVSW-101) was red-tagged shut. The redundant water supply gate to the 11 saltwater pump, (1HVSW-102) was intended to be red-tagged open to allow flow to the 11 saltwater pump suction, if needed.

Although the gates had been placed in the required positions by the prior operations shift, a plant operator improperly shut supply gate 1-HVSW-102, and a second operator improperly red-tagged the gate. The "Do Not Operate" tag incorrectly stated that the gate was open. The tagout control sheet was signed by both operators, the second operator for tagging the gate and the first operator for verifying the tag. The verification, which was improperly completed, was to ensure that the correct component was tagged in the correct position.

In the as-left configuration, had the normal power source to the 11 safety bus become deenergized, 11 saltwater pump would have started on the emergency sequencer, but the pump would have quickly lost suction. The 13 pump would have been removed from the electric bus in the load shed. Emergency core cooling system (ECCS) pump room cooling and containment fan coil units would have been affected. The opposite (12) header was not affected.

The mechanical workers assigned the circulating bay work conducted a tagging walkdown prior to beginning work and identified that the tagged gate was shut although the tag specified open. The control room supervisor was contacted and 1HVSW-102 was repositioned open by a third non-licensed operator. The operator removed the red tag, opened the gate, and reposted the tag. The improper lineup was in effect for approximately one hour. The method for correction of an improperly placed tagout was not specifically addressed by the safety tagging procedure.

BGE operations management became aware of the issue on January 30 when the maintenance group questioned why the gate mispositioning was not reviewed for root cause and corrective actions. BGE management initiated a review on January 31 and determined the event to be an operations significant event. Subsequently, BGE completed a formal causal evaluation and a number of procedure non-compliances were identified. The root cause determination was in progress at the end of the inspection period. A number of interim corrective actions were taken during the causal evaluation, including discussions of the event with each operating crew.

One issue identified by BGE was an apparent failure to perform an independent verification of the tagged component prior to signing the tagout control sheet. As of the end of the inspection period, the BGE corrective action for this failure included removal of the individual from plant operating license activities.

A second issue identified by BGE was the failure to promptly document the occurrence after discovery, as an issue report. Documentation was necessary for trending and evaluation of operations performance by station management as well as assurance of adequate corrective actions. The inspectors were informed by BGE management that the individual intended to document the occurrence; however, a reactor downpower was in progress at the time of discovery and the operator was distracted. The corrective actions specified by BGE for this oversight included suspension of a shift senior reactor operator from licensed duties until a remediation program was completed.

The inspectors reviewed the event including the extensive BGE causal evaluation and corrective actions. The failure of the event participants to follow station procedures for verifying the tagout and after discovery, to promptly document the occurrence with an issue report were violations of NRC requirements specified in 10 CFR 50, Appendix B, Criteria V and XVI. However, the event was identified by BGE, and the inspectors invoked enforcement discretion in accordance with NUREG-1600, NRC Enforcement Policy, Section VII,B,1.

c. Conclusions

Plant operations were poorly conducted during a tagout for circulating bay maintenance when a saltwater supply gate was incorrectly placed in the shut position. A tagout verification failed to promptly identify the discrepancy. The inspectors considered the discovery to be the result of an sound work practice, that being a pre-work walkdown by involved maintenance personnel. Following discovery of the mispositioned supply gate, plant operators failed to promptly document the occurrence as an issue report. BGE conducted an extensive evaluation of the event and took corrective actions to prevent recurrence.

O2 Operational Status of Facilities and Equipment

The inspectors reviewed the following safety tagging clearances to verify that the tagouts had proper authorization and to ensure that the tagged components were in the required positions with the appropriate tags in place:

1199601666	14 Access Control HVAC
2199700128	21 Instrument Air Compressor
2199700016	1 & 2 MOV 5524, 5527, and 5528

The following safety tagging clearances that were no longer in effect were inspected to verify that equipment was properly restored or returned to service and that the tags were removed:

1199601516	1A EDG Fuel Oil Storage Tank Level Switch
1199700103	CR HVAC 11 Outside Air
2199700131	Replace 21 HPSI Pump Discharge Pressure Switch

No discrepancies with any of the safety tagouts was identified.

O5 Operator Training and Qualification

On January 30, the inspectors observed an operating crew complete training on the plant simulator. The training included a scenario that started at full power but developed into a reactor trip and safety injection actuation due to a steam generator tube leak that rapidly escalated into a tube rupture. During the training, the crew implemented plant operating, abnormal, and emergency operating procedures and successfully stabilized the reactor. The inspectors were told by the training group that two critical tasks would be required to complete the scenario. The tasks were isolation of the affected steam generator and control of steam generator level to prevent challenge to the steam generator safety valves. The first task had been completed and the second task was near completion when the scenario was ended. The inspectors observed the crew appropriately follow plant procedures and maintain safe control of the simulated reactor plant. The inspectors considered the training to be an appropriate demonstration of knowledge and ability in safely conducting abnormal and emergency operations.

II. Maintenance

M1 Conduct of Maintenance

M1.1 Routine Maintenance Observations (62707)

The inspectors observed the conduct of maintenance and surveillance testing on systems and components important to safety. The inspectors also reviewed selected maintenance activities to assure that the work was performed safely and in accordance with proper procedures. The inspectors noted that an appropriate level of supervisory attention was given to the work depending on its priority and difficulty. Maintenance activities reviewed included:

MO2199505423	Install New Cable from Breaker 52-2423 to New 21 Plant Air Compressor
MO0199601679	New Fuel Element Inspection Pre-Inspection Checklist Preventive Maintenance
MO0199600051	Repair Weld on 4" HC2-1368 Pipe Line
MO1199603870	Bullet #12 Saltwater/Service Water Heat Exchanger
MO0199503074	Core Component Receipt Inspection
MO0199501349	12 Spent Fuel Pool Cooling Pump Overhaul and Motor Replacement

M1.2 Routine Surveillance Observations (61726)

The inspectors witnessed or reviewed selected surveillance tests to determine whether approved procedures were in use, details were adequate, test instrumentation was properly calibrated and used, technical specifications were satisfied, testing was performed by qualified personnel, and test results satisfied acceptance criteria or were properly dispositioned. The inspectors noted that an appropriate level of supervisory attention was given to the testing depending on its sensitivity. Surveillance testing activities that were reviewed are listed below:

STP-O-5A-1	Auxiliary Feedwater System Quarterly Surveillance Test
STP-O-65D-1	Miscellaneous Containment Isolation Valves Quarterly
STP-M-510BL-2	RPS Reactor Coolant Flow Loop Calibration Check
STP-O-9-1	AFAS Monthly Logic Test

M1.3 Temporary Test Gauge Overpressurization

a. Inspection Scope (61726)

The inspectors reviewed a surveillance test that, when performed, inadvertently resulted in four 0-300 psi test gauges being over-ranged.

b. Observations and Findings

On February 25, BGE initiated actions to perform surveillance O-65J-1, "Safety Injection Check Valve Quarterly Operability Test." One part of the test verified closure of the high pressure safety injection (HPSI) header check valves using temporary 0-300 psi gauges. The gauges were normally left in place until satisfactory completion of the second part of the test, which verified opening of the same check valves by running the HPSI pumps and observing flow through the valves. To ensure that HPSI pump pressure (about 1300 psi) was not placed on the gauges, isolation valves supplied with the gauges were shut. Discussion with BGE personnel identified that on February 25, instrument mechanics failed to isolate the test gauges after installation. Gauge isolation was specified in a note in the procedure. Subsequently, the procedure was revised and the requirement to isolate the test gauges was included as a procedure step with verification required.

A second check by operations personnel to verify isolation of the gauges prior to operating the pumps was also not specified as a step in the procedure. This precaution was presented as a procedure note rather than a procedure step. Operations personnel did not verify gauge isolation, and a second prerequisite that required placing a temporary tag on the HPSI pump handswitches stating "ensure test pressure gauges are isolated prior to starting to prevent gauge damage" was not done.

With the 0-300 psi test gauges unisolated, operators performed the second portion of the test that verified partial stroking of the ECCS check valves using HPSI pump flow and over-ranged the test gauges. Subsequently during review of the test, BGE identified that the gauges were unisolated and had been overranged when the HPSI pump had operated.

Immediate corrective actions included replacing the test gauges, satisfactorily completing the test, and removing the test equipment. An issue report was written and the occurrence was discussed by BGE management with BGE instrument maintenance and operations personnel. Some procedure improvements to preclude recurrence of this event were developed and incorporated into the test. An analysis by BGE engineering personnel determined that the integrity of the gauges was not challenged because the design pressure rating of the test gauge boundaries, including valves and tubing, was greater than the shutoff head of the HPSI pumps. BGE analysis also concluded that the seismic loads from a design basis earthquake would not have caused the temporary tubing to fail. The cause of the problem was an inadequate procedure and poor compliance with parts of the procedure. This licensee-identified and corrected violation was treated as a Non-Cited Violation, consistent with Section VII.B.1 of the NRC Enforcement Policy.

c. Conclusions

As a result of a lack of attention to detail and a poorly written procedure, instrument mechanics did not isolate test gauges after installation. The inspectors concluded that the operations surveillance test procedure was inadequate to ensure

that temporary test gauges were isolated and temporary caution notes were placed at the HPSI pump controls to preclude overrange of the installed test gauges. When identified by BGE, a thorough review was conducted and appropriate corrective actions were taken.

M8 Miscellaneous Maintenance Issues

M8.1 <u>(Closed) LER 50-318/96-06 Inoperable Emergency Diesel Generator</u>

The Licensee Event Report (LER) described emergency diesel generator inoperability due to an improperly landed fuse holder at the end of a maintenance activity. The affected diesel output breaker was tested satisfactorily at the completion of the maintenance on December 4, 1996. Following a second satisfactory surveillance test on December 10, BGE operators identified the issue when a breaker open light went out on a control room panel, signaling a problem with the diesel output breaker control power. The inspector verified the corrective actions stated in the LER including verification that the occurrence was isolated and training of appropriate personnel to prevent recurrence. The LER was closed as a Non-Cited Violation in accordance with Section VII.B.1 of NUREG 1600, NRC Enforcement Policy.

III. Engineering

E2 Engineering Support of Facilities and Equipment (37551)

E2.1 <u>Incorrect Emergency Diesel Drawing</u>

On February 12, on-line maintenance on the 2A emergency diesel generator was started. The maintenance which included 13 individual tasks, each controlled by maintenance work orders, was scheduled to be completed in 36 hours, half of the 72 hour limiting condition of operation specified by technical specifications. One task replaced the engine lubricating oil temperature switch and required re-routing of lube oil piping to accommodate the new switch. When the work was initially completed the lube oil pump was started as a post maintenance test, but no flow was detected. Investigation by the work group identified that a check valve removed and re-installed during the maintenance was backwards, preventing lube oil flow. The cause was found to be an incorrect schematic BGE engineering provided with the work package. The schematic, Drawing Change Notice 1231094-1002, showed the check valve in the reverse orientation as the operations drawing. The problem caused about an eight hour delay. Following completion of the work, BGE wrote an issue report to document the occurrence and took action to correct the schematic. Additionally, a maintenance and engineering review of on-line diesel maintenance was initiated to determine the root cause and identify any additional corrective actions for any problems that delay the completion of diesel maintenance during work periods. The use of an incorrect drawing during online emergency diesel generator maintenance was a violation of NRC requirements specified in 10 CFR 50, Appendix B, Criterion V. However, enforcement discretion was applied consistent with NUREG-1600, NRC Enforcement Policy, Part VII,B,1.

IV. Plant Support (71750)

R2 Status of Radiological Protection and Chemistry (RP&C) Facilities and Equipment (71750)

The inspectors routinely monitored activities in the areas of radiation protection, emergency preparedness, security, fire protection, and general housekeeping. This monitoring was largely accomplished by tours of plant areas and discussions with personnel. No significant issues were identified in these areas during the inspection period.

V. Management Meetings

X1 Exit Meeting Summary

During this inspection, periodic meetings were held with station management to discuss inspection observations and findings. On March 19, 1997, an exit meeting was held to summarize the conclusions of the inspection. BGE management in attendance acknowledged the findings presented.

X3 Management Meeting Summary

On February 6, a meeting between BGE and NRC management was held in the NRC Region I office. The meeting was to discuss the results of a BGE self-assessment of compliance with 10 CFR 50, Appendix R, Fire Protection. At the meeting, NRC officials stated that BGE had conducted a detailed assessment and that a number of issues requiring further attention were identified. A meeting summary was issued by the NRC in a letter to BGE dated February 27, 1997.

ATTACHMENT 1

PARTIAL LIST OF PERSONS CONTACTED

BGE

P. Katz, Plant General Manager
K. Cellers, Superintendent, Nuclear Maintenance
K. Neitmann, Superintendent, Nuclear Operations
P. Chabot, Manager, Nuclear Engineering
T. Camilleri, Director, Nuclear Regulatory Matters
B. Watson, General Supervisor, Radiation Safety
C. Earls, General Supervisor, Chemistry
L. Gibbs, Director, Nuclear Security
T. Sydnor, General Supervisor, Plant Engineering

INSPECTION PROCEDURES USED

IP 62707: Maintenance Observation
IP 71707: Plant Operations
IP 61726: Surveillance Observations
IP 37551: Onsite Engineering
IP 71750: Plant Support Activities
IP 92700: Onsite Followup of Written Reports of Nonroutine Events at Power Reactor Facilities
IP 92902: Followup - Engineering

ITEMS OPENED, CLOSED, AND DISCUSSED

Closed

50-318/96006	LER	Inoperable Emergency Diesel

LIST OF ACRONYMS USED

AFAS	Auxiliary Feedwater Actuating System
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
HPSI	High Pressure Safety Injection
HVAC	Heating, Ventilating and Air-Conditioning
LER	License Event Report
MOV	Motor Operated Valve
MVAR	Mega-Volt Amps Reactive
MWe	Mega-Watts Electric
RP&C	Radiological Protection & Control
RPS	Reactor Protection System
STP	Surveillance Test Procedure