



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D. C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 198 TO FACILITY OPERATING LICENSE NO. DPR-53  
AND AMENDMENT NO. 175 TO FACILITY OPERATING LICENSE NO. DPR-69  
BALTIMORE GAS AND ELECTRIC COMPANY  
CALVERT CLIFFS NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2  
DOCKET NOS. 50-317 AND 50-318

1.0 INTRODUCTION

By letter dated November 2, 1993, as supplemented June 22, 1994, the Baltimore Gas and Electric Company (BG&E) submitted a request for changes to the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2, Technical Specifications (TSs). The requested changes would revise the TSs regarding surveillance requirements associated with the emergency diesel generators (EDGs) which include the following: 1) the surveillance interval is extended from 18 months to 24 months which is the current refueling cycle; 2) removes the requirement to verify the EDGs speed; 3) exempts sequencer testing in Modes 5 and 6; 4) deletes the reference to the specific 2000 hour rating of the EDGs; and 5) allows the EDGs to be prelubricated prior to being started in accordance with the vendors recommendation. The June 22, 1994, letter provided clarifying information that did not change the initial proposed no significant hazards consideration determination.

2.0 BACKGROUND

Calvert Cliffs has three 4160 Volt, 3 phase, 60 Hz EDGs with a continuous rating of 2500 kW. Each EDG is physically separated and electrically isolated from the others.

Normally, one EDG is dedicated to each unit and supplies power to one of the unit's 4160 Volt Engineered Safety Features (ESF) busses. The third "swing" EDG is capable of being aligned to either unit to supply power to the second ESF bus. Should a loss of voltage to an ESF bus be sensed, the EDGs will start and a sequencer will load appropriate accident or shutdown equipment onto the EDG. If accident conditions are present concurrent with the loss of voltage, the loss-of-coolant-incident sequencer will load ESF components on to the EDGs aligned to that unit.

The EDGs are maintained in reliable condition by performing monthly surveillance testing, minimizing the number of performance-degrading starts, and by maintaining a comprehensive Preventive Maintenance Program including periodically performing a complete maintenance inspection.

### 3.0 EVALUATION

As previously noted, BG&E has requested five specific changes to the surveillance requirements necessary to assure the operability of the EDGs.

The following provides the NRC staff's evaluation of the requested changes:

1. Proposed TS 4.8.1.1.2.d would extend the maintenance inspection and tests interval from 18 months to the current refueling interval of 24 months.

The maintenance inspection involves all major EDG components and is performed in accordance with procedures prepared in conjunction with the vendor's recommendations. Examples of components inspected include the bearings, injection nozzles, timing chain, vertical drive assembly, exhaust manifold, crankshaft, and blower.

Inspection results to date indicate there is very little wear on these components. Repetitive repair or replacement of parts has not been required and minimal signs of degradation have been observed that can be associated with the duration of the surveillance interval. In addition, supporting the TS required maintenance inspection of the EDGs at the Calvert Cliffs site is a comprehensive preventive and predictive maintenance program that detects and prevents EDG problems. This program involves inspections, collection of oil samples, and analysis of operational data. Collected information is used to determine the overall condition of the EDGs to ensure that a high level of performance is maintained.

Performance and reliability has been improved through a concentrated effort to reduce EDG fast cold starts. In response to Generic Letter (GL) 84-15, "Proposed Staff Actions to Implement and Maintain Diesel Generator Reliability," BG&E implemented recommendations that reduced the average starts for each EDG from approximately 100 to 43 per year. The reliability of the EDGs, as measured by the Institute of Nuclear Power Operations (INPO), has been 100 percent over the past 4 quarters.

BG&E indicated that the vendor of the EDGs, Fairbanks Morse (FM), has provided the following recommendations:

FM recommended that BG&E could extend the maintenance interval to 24 months and temporarily collect additional information on the effect of the extended interval. FM stated that the following information would be sufficient to determine the overall condition of the EDGs:

- A. BG&E should submit the following operating data to FM for review: engine parameters, lube oil analysis, corrective maintenance, and preventive maintenance. FM would review the data and prepare a report indicating any abnormalities which may require special attention.

- B. BG&E should perform a mid-cycle inspection under the supervision of a FM representative. This inspection should include the following:
1. Check the main and connecting rod bearings.
  2. Check the side clearance measurement between the upper connecting rod floating bushing and the piston insert bushing.
  3. Visually inspect the camshaft bearings and cams.
  4. Check the jacket cooling water for treatment.
  5. Check the fuel linkage for freedom of movement and the condition of the governor link and linkage pins.
  6. Visually inspect the blower lobes and measure the lobe clearance with feeler gauges.
  7. Check the vertical drive coupling and gears and measure the bearing end float.
  8. Operate the engine under the observation of a FM technical representative and submit the collected data to FM for review.

To have further confidence that the operation of the EDGs with a 24-month maintenance interval will not adversely affect the performance of the EDGs, BG&E committed to temporarily perform a mid-cycle inspection in accordance with FM recommendations. However, BG&E is differing from the FM recommendations in two areas.

First, BG&E is not committing to use FM for the routine analysis of EDG performance data or for observation of the mid-cycle inspections. BG&E has considerable experience with the FM EDGs and has an established program for evaluating the overall condition of the EDGs. BG&E may consult with FM concerning specific EDG conditions, but BG&E believes that their presence is not required to successfully perform the routine inspections and evaluations.

Secondly, during the mid-cycle inspection, BG&E will perform all of the inspections recommended by FM. However, the side clearance measurement between the upper connecting rod floating bushing and piston insert bushing will not be performed immediately. This inspection is not currently included in the recommended inspections for EDGs at nuclear power plants. As such, BG&E has not performed this inspection in the past and does not have a baseline for future inspections. BG&E is currently upgrading the electrical capacity of each of the EDGs and will perform a baseline measurement during this upgrade and perform follow-on inspections of this parameter in future mid-cycle inspections as special tools and inspection techniques are developed.

The results from the mid-cycle inspections will be reviewed, along with other surveillance and preventive maintenance data, to ensure that the performance and availability of the EDGs remains high. The maintenance inspections conducted during refueling outages, coupled with the mid-cycle maintenance inspections, will provide sufficient opportunity to detect any EDG degradation. Depending on inspection results, BG&E indicates that the mid-cycle inspections may be discontinued in the future.

Inspections which measure objective values (i.e., clearances, water chemistry, etc.) will be compared to recommendations in the FM technical manuals or values obtained from the FM. The subjective inspections (e.g., visual inspections) are performed by engineers and mechanics with extensive experience with the EDGs. All of BG&E's EDG-qualified mechanics have attended training given by FM. If questions are raised during the inspections, FM would be contacted for recommendations. In addition to their in-house expertise, BG&E has, at its disposal, EDG consultants and the other members of the FM owners group. Therefore, BG&E would rely on in-house expertise, FM manuals and recommendations, and on industry experience to evaluate any abnormal inspection results and to determine an appropriate course of action.

BG&E anticipates that six mid-cycle EDG inspections (two per engine) will be sufficient to evaluate the extended maintenance interval. The first report on each engine will allow FM to evaluate the condition of the engine and recommend any additional inspections. The second inspection will confirm the results of the first inspection and provide the results of any additional inspections warranted by the first inspection. If additional inspections are necessary to assure the 24-month maintenance interval is appropriate, BG&E will continue the inspections.

In addition to the current maintenance inspections, EDG tests are presently performed every 18 months which include the EDGs' ability to start and load ESF components under simulated accident conditions. There has been no evidence to suggest that time dependent problems are associated with these tests or that extending the interval for these tests would reduce EDG reliability or performance.

Reliability statistics and results from the 18-month EDG maintenance inspections and tests demonstrate the EDGs have not been subjected to significant wear and tear. The EDGs have been found to be in excellent condition after 18 months and the surveillance results indicate similar conditions would be observed for longer surveillance intervals, such as the proposed 24 month interval.

The staff determined that an increase in the inspection and surveillance testing interval from 18 months to the current refueling interval of 24 months is acceptable and, therefore, the wording of TS 4.8.1.1.2.d, "At least once per refueling interval" instead of, "At least once per 18 months" is acceptable.

2. Proposed TS 4.8.1.1.2.a.4 removes the requirement to verify the specific EDG speed of 900 rpm. The present TSs require the EDGs to start and accelerate to a speed at least of 900 rpm with a generator voltage and frequency of  $4160 \pm 420$  Volts and  $60 \pm 1.2$  Hz, respectively.

Since the generator frequency and the engine speed are directly related, these surveillance parameters are redundant. Frequency and voltage are the critical parameters for EDG performance that must be verified in this particular surveillance, not acceleration and speed.

This determination is consistent with guidance on EDG testing provided in Regulatory Guide 1.9, Revision 3, and with NUREG-1432. The proposed wording of TS 4.8.1.1.2.a.4, "Verifying the diesel starts and achieves a generator voltage and frequency of  $4160 \pm 420$  Volts and  $60 \pm 1.2$  Hz, respectively" instead of, "Verifying the diesel starts and accelerates to at least 900 rpm with generator voltage and frequency of  $4160 \pm 420$  Volts and  $60 \pm 1.2$  Hz, respectively" is, therefore, acceptable.

3. Proposed TS 4.8.1.1.2.c and TS 4.8.1.1.2.d.3.b would allow the EDGs to be prelubricated prior to being started as recommended by FM.

GL 84-15 was issued to improve EDG reliability. The GL acknowledged the potential for inducing undue wear and stress on EDGs through cold fast starts. It was recognized that manufacturer recommended preparatory actions such as prelubrication of all moving parts would help to reduce engine wear, extend life, and improve availability. Therefore, the following insert to TS 4.8.1.1.2.c and TS 4.8.1.1.2.d.3.b is acceptable:

"All engine starts for the purpose of this surveillance requirement may be preceded by an engine pre-lube period recommended by the manufacturer so that mechanical wear and stress on the diesel engine is minimized."

4. Proposed TS 4.8.1.1.2.d.5 eliminates the specific numerical reference (2700 kW) associated with the 2000 hour rating of the EDG being tested, but will continue to ensure the 2000 hour capacity of the EDG being tested is not exceeded.

The EDGs at Calvert Cliffs have rated capacities that ensure each EDG is capable of supplying power to accident loads over extended periods of time. The margin between capacity of the EDGs and the required accident loads has decreased over the years due to the addition of new accident loads through plant modifications. Although this decrease in margin does not represent a decline in the ability of the EDGs to currently perform their safety function, BG&E intends to restore the margin of safety. To improve this margin, each EDG will be upgraded during future outages to increase its capacity from 2700 kW to approximately 3300 kW for the 2000 hour rating.

The new wording of TS 4.8.1.1.2.d.5, "Verifying that the auto-connected loads to each diesel generator do not exceed the 2000 hour rating of each diesel generator" is, therefore, acceptable.

5. Proposed TS 4.8.1.2 adds the EDG surveillances (4.8.1.1.2.a.7, 4.8.1.1.2.d.3, and 4.8.1.1.2.d.5) dealing with sequencer testing to the list of those surveillances that can be exempted in Modes 5 and 6.

The surveillances for testing the EDGs in Modes 5 and 6 are identical to the surveillances required in Modes 1 and 4 with the exception of Surveillance 4.8.1.1.2.a.5. Surveillances 4.8.1.1.2.a.7, 4.8.1.1.2.d.3, and 4.8.1.1.2.d.5 verify that the EDG's automatic load sequencer is operable and performs properly.

Sequencer initiation occurs when a loss of offsite power is sensed by undervoltage instrumentation and a safety injection actuation system signal is present. This undervoltage instrumentation is only required to be operable in Modes 1-3, and most of the safety injection actuation system loads are only required in Modes 1-4. The sequencer, with required loads, is verified to be operable prior to exiting Mode 5 and entering Mode 4. However, BG&E did not explicitly state that the sequencer is not required to be operable in Modes 5 and 6. This was clarified during a telephone conference call on September 7, 1994. BG&E confirmed that the Calvert Cliffs design basis analysis for events which could occur in Modes 5 & 6 take no credit for the sequencer being operable because the safety-related equipment which would be actuated by the sequencer is not required to be operable in Modes 5 & 6. In addition, since the sequencer is not required to be operable, the proposed change would eliminate unnecessary testing.

Therefore, the proposed inclusion of surveillances 4.8.1.1.2.a.7, 4.8.1.1.2.d.3, and 4.8.1.1.2.d.5 in TS 4.8.1.2, which will exclude sequencer testing in Modes 5 and 6, is acceptable.

#### 4.0 SUMMARY

Based on the above evaluation, the staff has concluded that the proposed TS changes related to the testing of the EDGs and extending the maintenance interval from 18 months to 24 months, which is the current refueling interval, is acceptable.

#### 5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Maryland State official was notified of the proposed issuance of the amendments. The State official had no comments.

## 6.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (58 FR 64599). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

## 7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: S. Saba

Date: September 27, 1994

September 27, 1994

Mr. Robert E. Denton  
Vice President - Nuclear Energy  
Baltimore Gas and Electric Company  
Calvert Cliffs Nuclear Power Plant  
1650 Calvert Cliffs Parkway  
Lusby, MD 20657-4702

SUBJECT: ISSUANCE OF AMENDMENTS FOR CALVERT CLIFFS NUCLEAR POWER PLANT,  
UNIT NO. 1 (TAC NO. M88168) AND UNIT NO. 2 (TAC NO. M88169)

Dear Mr. Denton:

The Commission has issued the enclosed Amendment No. 198 to Facility Operating License No. DPR-53 and Amendment No. 175 to Facility Operating License No. DPR-69 for the Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2, respectively. The amendments consist of changes to the Technical Specifications (TSs) in response to your application transmitted by letter dated November 2, 1993, as supplemented on June 22, 1994.

The amendments revise the TSs regarding surveillance requirements associated with the emergency diesel generators (EDGs) which include the following:  
1) the surveillance interval is extended from 18 months to 24 months which is the current refueling cycle; 2) removes the requirement to verify the EDGs speed; 3) exempts sequencer testing in Modes 5 and 6; 4) deletes the reference to the specific 2000 hour rating of the EDGs; and 5) allows the EDGs to be pre-lubricated prior to being started in accordance with the vendors recommendation.

A copy of the related Safety Evaluation is enclosed. A Notice of Issuance will be included in the Commission's next regular biweekly Federal Register notice.

Sincerely,

Original signed by:  
Daniel G. McDonald, Senior Project Manager  
Project Directorate I-1  
Division of Reactor Projects - I/II  
Office of Nuclear Reactor Regulation

Docket Nos. 50-317  
and 50-318

- Enclosures: 1. Amendment No. 198 to DPR-53  
2. Amendment No. 175 to DPR-69  
3. Safety Evaluation

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