



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

ENCLOSURE 1

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

STATION BLACKOUT SUPPLEMENTAL SAFETY EVALUATION

BALTIMORE GAS AND ELECTRIC COMPANY

CALVERT CLIFFS NUCLEAR POWER PLANT

DOCKET NOS. 50-317/318

1.0 INTRODUCTION:

The NRC staff's Safety Evaluation (SE) pertaining to the licensee's initial responses to the Station Blackout (SBO) Rule, 10 CFR 50.63, was transmitted to the licensee by letter dated October 10, 1990. The staff found the licensee's proposed method of coping with an SBO to be acceptable, subject to the satisfactory resolution of several recommendations which were itemized in the staff's SE. The licensee responded to staff's SE, and specifically to the recommendations, by letters from G. C. Creel, Baltimore Gas and Electric, to the Document Control Desk, U. S. Nuclear Regulatory Commission, dated November 13, 1990 and December 13, 1990.

2.0 EVALUATION:

The licensee's responses to each of the staff's recommendations are evaluated below.

2.1 Station Blackout Duration

SE Recommendation: The licensee should reevaluate the plant's ability to cope with a Station Blackout (SBO) based on an 8-hour coping duration and include these analyses with the other documentation supporting the SBO submittal. If the licensee desires reconsideration of the coping category, sufficient justification with appropriate analysis should be provided for staff review which demonstrates the rationale for the July 23,

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1987 loss of offsite power (LOOP) not being considered symptomatic of a grid related LOOP.

Licensee Response: The licensee presented a description of the LOOP event and the changes made to prevent a reoccurrence of the event to justify that the event was plant centered and was not symptomatic of a grid related LOOP. The licensee stated the LOOP was initiated by a ground fault that occurred on one of the two 500 kV lines connecting the plant to the Baltimore Gas and Electric (BG&E) grid. The ground fault was caused by a tree that had been identified during previous surveys as one which needed to be cut. However, due to lack of resources, the tree was not cut down immediately. The licensee stated that corrective actions have been taken by increasing expenditures for right of way clearing, cutting down all identified trees and increasing patrols to detect early tree growth.

The line to ground fault correctly resulted in the opening of both breakers at the ends of the faulted line. However, due to a defective transistor on a logic circuit card, the fault incorrectly caused the opening of the breakers on the Calvert Cliffs end of a second 500 kV line, resulting in the isolation and tripping of the Calvert Cliffs Plant. The licensee notes that the grid was still intact and that the July 1987 event did not cause, nor was it caused, by a loss of the BG&E grid.

The licensee stated that the faulty logic card is a component of one of many relays used throughout BG&E's 500/230 kV system. The cards used in the protective relay circuits are tested every 18-24 months, failures in these cards have not occurred anywhere else at BG&E generating stations, and the protective relays have provided reliable service since they were first installed in 1968. The failed transistor is one of nine identical transistors on the timing circuit card. Although some of the other transistors on the card are more electrically exposed than the failed transistor, they did not fail. For the above reasons, the licensee classifies

this failure as a random equipment failure and not a grid related event or the result of inadequate surge protection at the plant.

Based on the above, we accept the licensee's justification that the July 1987 LOOP event was not symptomatic of grid instability, and that appropriate actions have been taken to provide reasonable assurance that such an event will not occur again. Therefore, we agree with the licensee's determination that the plant has an offsite power design characteristic group of "P2," rather than "P3," with a required coping duration of 4-hours rather than 8-hours.

2.2 Proposed AAC Power Source

SE Recommendations:

1. The licensee should submit separately for staff review the overall design information on the proposed EDG modifications and installation of the additional EDGs. This information should include the modifications to the EDGs' busses, cables and associated systems. The licensee should also include information on the EDG (spare) when used as an AAC source and when substituted for a dedicated EDG when it is out for maintenance and repair. LCO and TS changes on the dedicated EDGs and the proposed AAC source should also be provided. In addition, this information should also be included in the documentation supporting the SBO submittal maintained by the licensee.
2. The licensee should demonstrate that the AAC source is available for supplying the SBO loads within one hour of the onset of the SBO event by conducting the appropriate testing in accordance with the guidance of NUMARC 87-00, Appendix B, Item B.12.

Licensee Response: The licensee committed to supply information concerning the overall design of the additional diesel generators as a part of the licensing process once vendors and a final design are selected. Use of the spare (alternate AC source/Class 1E backup) diesel will be described, and technical specifications will be submitted to include the new diesel arrangement in the Limiting Conditions of Operation and Surveillance Requirements. The spare diesel will be tested on a one-time basis to ensure it can meet its AAC function in accordance with the guidance of NUMARC 87-00, Appendix B, Item B.12. A description of the diesel generator modifications and installation will also be maintained with the other SBO documentation.

We find the above described licensee's commitments to be acceptable. It is understood that (1) the modifications associated with the existing EDG as well as the new EDGs will be submitted for staff review and (2) that the documentation associated with the testing of the AAC source will be maintained with the other SBO documentation.

2.3 Condensate Inventory For Decay Heat Removal

SE Recommendation: The licensee should confirm that there is sufficient inventory to remove the decay heat from both units and also provide for cooldown in the non-black-out (NBO) unit and include this confirmation in the documentation supporting the SBO submittal maintained by the licensee.

Licensee Response: The licensee stated that the condensate inventory calculations have been reviewed and that sufficient inventory exists to support both the blacked-out and the non-black-out unit in Hot Standby during the four-hour SBO event. Further, this calculation is included with the other SBO documentation.

We find this to be acceptable.

2.4 Compressed Air

SE Recommendation: The licensee should establish procedures and simulate appropriate action and provide operator training to assure that the decay heat removal can be adequately maintained during the first hour of an SBO event.

Licensee Response: The licensee states that Emergency Operating Procedure (EOP-7) has been established which describes operator actions during an SBO event, and that operator training, as well as simulator training, has taken place to ensure that the operators can adequately respond to an SBO event.

The licensee notes that the atmospheric dump valves (ADV), not the power operated relief valves (PORVs), are used to remove heat from the steam generators. The PORVs, on the pressurizer, and the PORV block valves, will be provided with DC power to control pressure and to block leakage on the reactor coolant system.

We find that the licensee has adequately addressed the staff's concerns pertaining to the EOP and training for the decay heat removal function during an SBO. We also accept licensee's clarification pertaining to the ADVs and PORVs.

2.5 Effects of Loss of Ventilation

SE Recommendation: The licensee should reanalyze the heatup analyses for areas of concern based on a one-hour duration, including information to demonstrate the acceptability of the methodology, assumptions, and initial conditions used in the calculations. This assumes HVAC for dominant areas of concern will be powered by the AAC source after one hour. Also, the licensee should document additional justification as to why it is not necessary to open cabinet doors in the control room within one-half hour

after the onset of an SBO event. The licensee should include the above analyses and results in the documentation supporting the SBO submittal maintained by the licensee.

Licensee Response: The licensee presented a tabulation, showing the temperature conditions after 4-hours following the onset of an SBO, for nine rooms containing SBO equipment. The calculations were based on the NUMARC 87-00 Section 7.2.4 methodology where applicable, and on other methodology where the NUMARC method was not considered to be applicable due to plant specific characteristics. The licensee presented a description of the plant specific methodology used for the various rooms, and the assumptions used for these calculations. The 4-hour calculations were considered bounding for those rooms that will have HVAC powered by the AAC source after one hour. The values for the control and data acquisition system (DAS) rooms were based on a modified ceiling configuration opened to allow better air circulation. The emergency operating procedures are to be revised to ensure that the front of the control room panels are to be opened within 30 minutes of the onset of an SBO.

The licensee stated that three of the nine rooms analyzed (Main Steam Piping Penetration Room, East Piping Penetration Room, and AFW Pump Room) have fire protection systems that actuate at high temperatures, but the temperatures in these rooms will be well below the setpoints at which fire protection would be actuated.

We have reviewed the methodology and assumptions used for calculating the temperature values in the nine areas containing SBO equipment and find them to be acceptable. It is understood, based on the licensee's original April 14, 1989 submittal, that there is reasonable assurance of the operability of SBO response equipment in these areas for the calculated temperature values expected based on the licensee's assessment.

2.6 Reactor Coolant Inventory

SE Recommendation: The licensee should perform the necessary analyses to show that a reactor coolant inventory loss of 112 gpm does not result in core uncover during an eight-hour SBO event. The licensee should include these analyses and results in the documentation supporting the SBO submittal maintained by the licensee.

Licensee Response: The licensee stated, based on a leakage of 25 gpm per reactor coolant pump, 10 gpm identified leakage, 10 gpm miscellaneous leakage, and an additional letdown flow of 128 gpm for the first 30 minutes of the event, that no core uncover would occur during a four hour SBO event. The licensee stated that the assumptions and results of the analysis are maintained as part of the SBO documentation.

We find the licensee's response to be consistent with the staff's recommendation.

2.7 Proposed Modifications

SE Recommendation: The licensee should provide a full description including the nature and objectives of the required modifications identified above in the documentation supporting the SBO submittal that is to be maintained by the licensee. It should be noted that the modifications relating to the reconfiguration of the existing EDGs and the addition of two others have not been reviewed under the SBO review and should be submitted separately for staff review as indicated in the recommendations in Section 2.2.

Licensee Response: The licensee stated that a full description of each proposed modification (except the additional EDGs) and the objectives of the modification will be included in the documentation. The description of the additional EDGs are to be provided to the NRC for review as a

separate package. The modifications are to be completed during the next Unit 1 and Unit 2 refueling outages. The EDGs are expected to become operational in February 1995.

We find the licensee's response to be consistent with the staff's recommendation, with the understanding that the modifications associated with the existing EDG as well as the new EDGs will be included for staff review.

2.8 Quality Assurance and Technical Specifications

SE Recommendation: The licensee should implement a quality assurance program that meets as a minimum the guidance of RG 1.155, Appendix A, for any equipment not presently covered by an equivalent QA program.

Licensee Response: The licensee stated that a QA program that meets the guidance of Regulatory Guide 1.155, Appendix A, is being developed to cover equipment needed for an SBO and not presently covered by an existing QA program. The licensee expects the program to be implemented by the end of 1991.

We find the licensee's response to be consistent with the staff's recommendation and therefore to be acceptable.

2.9 EDG Reliability Program

SE Recommendation: The licensee should verify that a program that meets the guidance of RG 1.155, Section 1.2, is in place and include this verification in the documentation supporting the SBO submittal that is to be maintained by the licensee.

Licensee Response: The licensee stated that they have committed to a reliability of 0.975, that the program will meet the guidance of RG 1.155,

Section 1.2, and that the reliability program will be fully implemented by September 30, 1991.

We find the licensee's commitment to be acceptable.

3.0 SUMMARY AND CONCLUSION

The NRC staff's Safety Evaluation (SE) pertaining to the licensee's initial responses to the Station Blackout (SBO) Rule, 10 CFR 50.63, was transmitted to the licensee by letter dated October 10, 1990. The staff found the licensee's proposed method of coping with an SBO to be acceptable, subject to the satisfactory resolution of several recommendations which were itemized in the staff's SE. The licensee's responses to each of the staff's recommendations have been evaluated in this Supplemental Safety Evaluation (SSE) and found to be acceptable. However, the staff has stated some "understandings" in this SSE which the licensee should review and respond to, if their understanding is different than the staff's. These understandings are that (1) the modifications associated with the existing EDG (as well as the new EDGs) will be submitted for staff review, (2) that the documentation associated with the testing of the AAC source will be maintained with the other SBO documentation, and (3) for the calculated temperature values expected in the nine areas containing SBO equipment, that reasonable assurance has been assessed of the operability of SBO response equipment. Also the reactor coolant inventory evaluation discussed in the staff's October 10, 1990, SE was based on the guidance provided in NUMARC 87-00 of 25 gpm per reactor coolant pump (RCP) seal leakage for pressurized water reactors. The 25 gpm value was agreed to between NUMARC and the staff pending resolution of Generic Issue (GI) 23. If the final resolution of GI-23 dictates higher RCP leakage rates than assumed for this evaluation, the licensee should be aware of the potential impact of this resolution on their analyses and actions addressing conformance to the SBO rule.

Principal Contributor:

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Dated: