ROBERT E. DENTON
Vice President
Nuclear Energy

Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, Maryland 20657
410 586-2200 Ext. 4455 Local
410 260-4455 Baltimore

BGE

June 5, 1995

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
Response to NRC Request for Review and Comment on "Review of Preliminary Accident Precursor Analysis of Trip, Loss of 13.8 kv Bus, and Short-Term Saltwater Cooling System Unavailability, Calvert Cliffs Nuclear Power Plant, Unit No. 2"

REFERENCES:

(a) Letter from Mr. D. G. McDonald, Jr. (NRC) to Mr. R. E. Denton (BGE), dated May 3, 1995, "Review of Preliminary Accident Precursor analysis of Trip, Loss of 13.8 kv Bus, and Short-Term Saltwater Cooling System Unavailability, Calvert Cliffs Nuclear Power Plant, Unit No. 2"

(b) CEOG Task 742, Reactor Coolant Pump Seal Failure Probability Given a Loss of Seal Cooling, dated November 1992

(c) Calvert Cliffs Nuclear Power Plant Individual Plant Examination Summary Report, dated December 1993

In Reference (a), you requested that Baltimore Gas and Electric Company (BGE) review and provide comment on the preliminary Accident Sequence Precursor (ASP) analysis of the subject event which was reported in Licensee Event Report (LER) No. 318/94-001, Revision 1. We appreciate the opportunity to comment on the preliminary ASP analysis. When the BGE comments are incorporated, we believe the calculated conditional core damage probability will be at least an order of magnitude less than 8.5×10^{-5}.

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You requested that BGE provide written comments on the analysis and address the following three specific questions.

1. *Does the "Event Description" section accurately describe the event as it occurred?*

   Response:

   The BGE staff has reviewed the preliminary evaluation and concluded that the event is accurately described in the "Event Description" section. Please note that Figures A.1.2 and A.1.3 are mislabeled.

2. *Does the "Additional Event-Related Information" section provide accurate additional information concerning the configuration of the plant and the operation of and procedures associated with relevant systems?*

   Response:

   The BGE staff has reviewed the "Additional Event-Related Information" section and concluded that it provides accurate additional information. We recommend using "SRW" as the acronym for the service water system and "SW" for the saltwater system. In the third and fifth paragraphs of this section, "SRW" should be used instead of "SW".

   This section would be improved by including additional information regarding saltwater pump configurations and power supplies. Saltwater Pump 11 supplies Header 11. Saltwater Pump 12 supplies Header 12. Saltwater Pump 13 is normally mechanically aligned to Header 12 and is normally electrically aligned to 4 kv Bus 11. However, Saltwater Pump 13 can be electrically aligned to either 4 kv Bus 11 or 14 and mechanically aligned to either Header 11 or Header 12. As discussed in 3.b below, flexibility of power supplies for Saltwater Pump 13 reduces the calculated 8.5×10^{-5} conditional core damage probability.

3. *Does the "Modeling Assumptions" section accurately describe the modeling done for the event? Is the modeling of the event appropriate for the events that occurred or that had the potential to occur under the event conditions? This also includes assumptions regarding the likelihood of equipment recovery.*

   Response:

   a. Modeling Description

      The BGE staff has reviewed the "Modeling Assumptions" section and understands the modeling description as follows:

Two sequences are identified as contributing 96% of the Unit 1 calculated 8.5×10^{-5} conditional core damage probability. These sequences are:

(1) Given the initiating event of the loss of saltwater cooling, Bus 14 is not recovered due to hardware failures which results in a Loss of Coolant Accident (LOCA) due to failure of a Reactor Coolant Pump (RCP) Seal and leads to core damage (56%).

(6) Given the initiating event of the loss of saltwater cooling, the operator fails to recover Bus 14 within 70 minutes, an RCP seal LOCA occurs, the operator fails to recover Bus 14 after the seal LOCA and core damage is the result (40%).

The Saltwater System is lost in both cases due to Header 11 being in planned maintenance and Header 12 being unavailable due to the lack of 4 kv power. The Saltwater (SW) System cools the Component Cooling Water (CCW) system which cools the RCP pump seals. Although power was recovered in the actual event, the NRC analysis considers the likelihood that recovery fails due to either hardware failure or operator action failure. A probability of RCP seal failure is assumed in both of these sequences. Sequence (1) has a higher likelihood of seal failure since no short-term hardware recovery is assumed. Sequence (6) has a reduced likelihood of seal failure since it considers that Bus 14 can be recovered at some time in the future. In both cases, the result is core damage assuming that the High Pressure Safety Injection (HPSI) pumps will be unavailable due to the lack of saltwater and assuming that saltwater has no chance for recovery.

b. Appropriateness of Modeling including Equipment Recovery Assumptions

Modeling of the event will be complete and appropriate when the following information is incorporated. The conditional core damage probability of sequences (1) and (6) could be reduced by considering, in addition to the recovery of 4 kv Bus 14, the recovery of SW Header 12 by simply starting SW Pump 13, which can be powered from Bus 11 or 14 (as described in 2. above), and by crediting the increased reliability of the four stage RCP seals used at CCNPP. In addition, CCW (even without a SW heat sink) would still be circulating and removing heat from both the RCP seals and the HPSI pump seals until an equilibrium temperature is reached. This circulation is expected to reduce the heat-up rate of these components and allow additional time for recovery. With these added considerations, the event has considerably lower risk significance.

Saltwater Recovery

In the January 12, 1994 event, SW Header 12 was lost due to the loss of 4 kv Bus 14. In this event, Unit 1 control room operators closed alternate feeder breaker 152-1401, which re-energized Bus 14. However, SW Pump 13 was also available (via Bus 11) and could have been started from the control room to immediately restore Header 12. This alternate action is described in Abnormal Operating Procedure 7A, "Loss of Saltwater Cooling," in Section V.C.2. It is estimated that the failure probability for the operator to start the standby pump within 1 hour is 1×10^{-3} and the likelihood the pump will fail to start and

run for 24 hours is estimated at 2×10^{-3}. The result yields a recovery failure likelihood of 3×10^{-3} for Header 12.

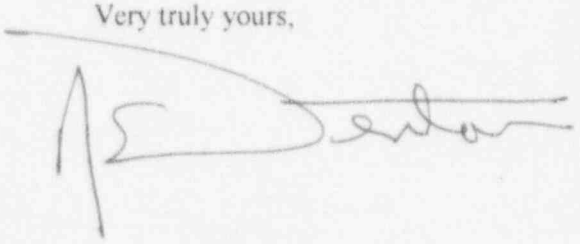
RCP Seal Failure Probability

The RCP seal failure probability used assumed the RCP seal LOCA failure probability was zero up to one hour after the trip and was assumed to increase linearly to 0.34 at 1.5 hours. After 1.5 hours, no additional seal failures were assumed to occur.

Calvert Cliff's RCP seals are designed with four stages, in series, each able to hold the full primary pressure. Reference (b) was used as the bases for Calvert Cliff's seal failure probability. This analysis calculates the conditional failure probability of a single stage failure given a loss of cooling and is based on seal performance data. It then calculates the probability of having all four stages in a single seal fail. This included common cause failure of the stages. The value for seal failure of one pump is 3.7×10^{-4} per demand (loss of CCW) or 1.5×10^{-3} per demand for all four pumps. The value of 1.7×10^{-3} per demand used in Reference (c) includes the failure of the operator to stop the RCPs. The value used in the precursor analysis is very conservative.

Should you have questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,



RED/JMO/bjd

cc: D. A. Brune, Esquire
J. E. Silberg, Esquire
L. B. Marsh, NRC
D. G. McDonald, Jr., NRC
T. T. Martin, NRC
P. R. Wilson, NRC
R. I. McLean, DNR
J. H. Walter, PSC