September 9, 1998

Mr. Charles H. Cruse, Vice President
Nuclear Energy Division
Baltimore Gas and Electric
1650 Calvert Cliffs Parkway
Lusby, MD 20657-4702

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE CALVERT CLIFFS NUCLEAR POWER PLANT (CCNPP) UNIT NOS. 1 & 2, LICENSE RENEWAL APPLICATION, SEVERE ACCIDENT MITIGATION ALTERNATIVES (TAC NOs. MA1524 and MA1525)

Dear Mr. Cruse:

By letter dated April 8, 1998, the Baltimore Gas and Electric Company (BGE) submitted its application for renewal of the CCNPP, Units 1 and 2. As part of the application, BGE submitted an environmental report (ER) prepared in accordance with 10 CFR Part 51. The staff is continuing its review of ER. Based on the review of the information regarding severe accident mitigation alternatives (SAMA) submitted under 10 CFR 51.53(c)(3)(ii)(L), the staff has identified areas where additional information would support the staff's SAMA analysis. These are contained in the enclosure.

Please provide a schedule by letter or telephone for submittal of your response within 30 days of receipt of this letter. Additionally, the staff is willing to meet with BGE prior to submittal of the response to provide clarification of the staff's request for additional information.

Sincerely,

Original Signed By

Claudia M. Craig, Senior Project Manager
Generic Issues and Environmental
Projects Branch
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Enclosure: As stated

Docket Nos. 50-317, 50-318

DF01/1

cc: See attached list

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NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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Nuclear Energy Division
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Request for Additional Information
Calvert Cliffs Nuclear Power Plant (CCNPP) License Renewal Application
Severe Accident Mitigation Alternatives (SAMA) Analysis

1. The Calvert Cliffs Probabilistic Risk Assessment (CCPRA) model on which the SAMA analysis is based is said to be far more advanced than the Individual Plant Examination (IPE) submitted to NRC in December 1993 and slightly more advanced than the Individual Plant Examination of External Events (IPEEE) submitted in August 1997.

   (a) Provide a description of the major differences in models/assumptions between the CCPRA model used for SAMA and that submitted to and reviewed by the NRC, and the impact of these changes on the risk profile. Include a discussion regarding development of the CCNPP Level 3 model.

   (b) Confirm whether any of these changes were made in the Level 2 analysis, since the discussion and references in Section F.3.2 seem to indicate that the NUCAP+ model is based directly on the IPE Level 2 model.

   (c) Describe the independent peer reviews performed on the CCPRA model used for SAMA. Explain the significant results and overall conclusions of those peer reviews and describe how the results were incorporated in the CCPRA on which the SAMA analysis is based.

   (d) Discuss how the risk information from the external event analyses is incorporated within the NUCAP+ model for CCNPP.

2. Explain how the potential for reactor coolant pump (RCP) seal loss of coolant accident (LOCA) was modeled in the CCPRA used for the SAMA analysis. Describe and justify the major assumptions associated with the RCP seal LOCA model.

3. The IPE indicated that the anticipated transient without scram (ATWS) contribution was a significant risk contributor. Provide a discussion on the modeling of ATWS in the CCPRA used for the SAMA analysis. Explain and justify major assumptions associated with the ATWS model, e.g., the fraction of time during power operation with unfavorable moderator temperature coefficient.

4. The potential core damage risk during some shutdown plant operating states can also be as significant as the at-power risk. Provide a discussion on how the shutdown risk is considered in your SAMA analysis.

5. The discussion in Section 4.1.17.2 regarding offsite exposure cost states that the annual offsite exposure risk is 68.63 person-rem, however, a value of 54.2 person-rem is reported in Table F.1-4. Please explain this apparent discrepancy.

Enclosure

6. Section F.1.2.6 identifies numerous offsite costs that were evaluated using MACCS and summed to arrive at the economic impact of an accident, but model input and assumptions are not identified. Please provide the following: (a) a description of the major input/ assumptions for modeling economic impacts, (b) a discussion of the treatment of the economic impacts of fission product fallout into the Chesapeake Bay, and (c) a listing of the MACCS input file for CCNPP (excluding weather data).

7. BGE did not include several factors in the treatment of onsite economic costs. First, the onsite property damage costs associated with cleanup and decontamination were not included on the basis that such costs are covered by property damage insurance. The NRC's regulatory analysis guidelines, NUREG/BR-0058, Revision 2, consider a societal perspective in the performance of these analyses and call for the inclusion of these onsite impacts. The insurance payments are transfer payments and should not be considered as an impact because the insurance payments do not involve consumptive use of real resources. Second, BGE did not include replacement power costs as an onsite economic cost on the basis that such costs are unlikely to be incurred in a deregulated energy market. The NRC guidelines state that replacement power costs be included as impacts, albeit the guidance does not consider the implications of deregulation. In the evaluation of SAMAs, the staff will rely on cost estimates developed in a manner consistent with current regulatory guidance. Accordingly, please provide an estimate of the averted onsite costs for each affected SAMA and an updated maximum theoretical benefit based on inclusion of the above costs, and update the net value analyses and SAMA screening accordingly.

8. The meteorological data used for the MACCS calculations was based on measurements taken from January 1, 1993 to December 31, 1993. Explain why 1993 data was used, and justify that the data for 1993 is representative, e.g., by comparing 1993 with data collected over a longer period.

9. Describe the source of the population data for the year 2030 provided in Table F.1-3. Confirm that this data is based on the latest growth projection, and that geographic areas where major growth is anticipated are accounted for in the input file.

10. Explain why evacuation times based on the current population and infrastructure are considered to be representative of conditions during the renewal period. Provide an assessment of the impact that longer evacuation times could have on risk results and SAMA findings.

11. Provide a breakdown of the consequence measures calculated for each release category, including person-rem doses, and costs associated with each economic impact identified in Section F.1.3.2.

12. The latest CCNPP risk study provides the most relevant information regarding plant-specific contributors to core damage frequency and risk, and should be used as the primary tool for identifying potential SAMAs. The information provided in Section 4.0 and Appendix F.2 does not indicate extensive use of the CCNPP risk study to identify potential SAMAs. The following additional information should be provided in this regard:

    (a) corrected references for each SAMA, if needed. Several SAMAs which appear to be highly focussed on plant-specific systems or risk contributors (and which seem to derive from the CCNPP IPE submittal) may be erroneously attributed to an Oak Ridge study (Reference 18 in Appendix F.2).

    (b) a characterization of the leading contributors to core damage frequency (from dominant sequences or sequence groups), large release frequency (from each containment failure mode or accident progression bin), and dose consequences (from each release class) based on the latest risk study. This information should be structured to provide a framework for subsequently demonstrating that SAMAs addressing each of the major contributors have been identified and evaluated.

    (c) a listing of the SAMAs identified to address each of the major risk contributors identified in (a), with emphasis on those SAMAs that were identified based on the CCNPP risk study.

13. Based on Tables F.2-1 and F.2-2, it appears that 24 rather than 25 SAMAs were combined into 9 "new" SAMAs, and 97 rather than 96 of the original SAMAs were designated for further analysis. Several SAMAs are multiple-part and effectively add 8 more SAMAs, bringing the total number of SAMAs subjected to further study to 105. The discussion in Section 4.1.17.3 should be modified to be consistent with the information provided in the tables, if needed.

14. BGE estimated the net value for each SAMA, and eliminated SAMAs with a negative net value from further consideration. All remaining SAMAs were ultimately eliminated using this criteria. Although a sensitivity analysis was performed to determine the effect of a lower discount rate on the study findings, the impact of uncertainties and incompleteness in other areas of the analysis were not addressed, i.e., uncertainties in core damage frequency (CDF), offsite consequences, and cost analyses, and the impact of differences in CDF between Unit 1 and Unit 2, as discussed in Section 4.1.17.1. In previous evaluations, the staff "screened-in" any design alternative estimated to be within a factor of 10 of being cost beneficial in order to account for uncertainties and incompleteness in the analysis, and subjected those alternatives to further evaluation based on deterministic and engineering considerations. In this regard, please provide the following: (a) an assessment of the impact that uncertainties and Unit 1/Unit 2 CDF differences could have on the identification of cost-beneficial SAMAs, (b) a listing of SAMAs that could become cost beneficial when these factors are taken into account, and (c) an engineering argument supporting BGE's implementation decision for each SAMA identified in item b.

15. In general, where values for "Maximum Benefit" and/or "Cost of Enhancement" are provided in Table F.2-2, the basis for those values is described in Appendix F.4. However, this information is missing for many SAMAs (e.g., the bases for the Maximum Benefit estimates for SAMAs 2, 4, and 10, and the bases for the Cost of Enhancement estimates for SAMAs 3, 6, and 9). The basis for all numerical values should be provided in order to clarify the screening that was performed based on the numerical values. Also, wherever a cost estimate is taken from another source, the applicability of the estimate to CCNPP should be addressed. For example, the cost to create a reactor cavity flooding system was estimated at over 8 million dollars based on a TVA estimate for Watts Bar. The applicability of such cost estimates to CCNPP should be addressed since the CCNPP reactor cavity is easily flooded relative to the Watts Bar cavity due to differences in containment layout.

16. Provide the results or a schedule for the results of BGE's evaluation of the three SAMAs that were still being reviewed at the time of the license renewal application submittal (SAMA numbers 49, 66b, and 96).

Mr. Charles H. Cruse
Baltimore Gas & Electric Company

Calvert Cliffs Nuclear Power Plant

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