

December 20, 2001

Mr. Michael P. Gallagher
Director - Licensing
Exelon Corporation
200 Exelon Way
Kennett Square, PA 19348

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RELATED TO THE STAFF'S REVIEW OF SEVERE ACCIDENT MITIGATION ALTERNATIVES FOR THE PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3 (TAC NOS: MB2011 AND MB2012)

Dear Mr. Gallagher:

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed Exelon Generation Corporation's (Exelon's) analysis of severe accident mitigation alternatives, submitted as part of the application for license renewal for the Peach Bottom Atomic Power Station, Units 2 and 3. As discussed with your staff in telephone conference calls on December 10 and 17, 2001, the staff has identified areas where additional information is needed to complete its review. The questions had been provided to Exelon for review prior to the conference calls. Enclosed are the staff's requests for additional information (RAIs). To ensure a complete public record of this action, the enclosure reflects the questions provided to Exelon prior to the conference calls and updated in redline/strikeout format to reflect changes agreed upon during the conference calls (applies to Questions 3 and 8 only).

We request that you provide your responses to these RAIs by February 22, 2002, in order to support the current review schedule. Mindful that your responses may contain potentially sensitive information, we request that your reply be addressed to the U.S. Nuclear Regulatory Commission, ATTN: L. Wheeler - Mail Stop O11-F1, Washington D.C. 20555. This is a departure from the normal practice of addressing correspondence to the attention of the Document Control Desk. The staff is available for a conference call to discuss any questions you may have during the development of your reply. If you have any questions, please contact me at (301) 415-1444.

Sincerely,

Original Signed By: LLWheeler

Louis L. Wheeler, Senior Project Manager
Risk Informed Initiatives, Environmental,
Decommissioning, and Rulemaking Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation.

Docket Nos. 50-277 and 50-278

Enclosure: As stated

cc w/encl: See next page

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cc w/encl: See next page

*See previous concurrence

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ACCESSION NO. ML013540507

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ENCLOSURE 1

OFFICE OF NUCLEAR REACTOR REGULATION
REQUEST FOR ADDITIONAL INFORMATION
RELATED TO THE STAFF'S REVIEW OF
SEVERE ACCIDENT MITIGATION ALTERNATIVES
RELATED TO LICENSE RENEWAL FOR
PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3
(TAC NOS. MB2011, AND MB2012)

OFFICE OF NUCLEAR REACTOR REGULATION
REQUEST FOR ADDITIONAL INFORMATION
RELATED TO THE STAFF'S REVIEW OF
SEVERE ACCIDENT MITIGATION ALTERNATIVES
RELATED TO LICENSE RENEWAL FOR
PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3
(TAC NOS. MB2011, AND MB2012)

1. Please provide the following information related to the Peach Bottom Unit 2 PSA (PB99, Rev. 1) that forms the basis for the Severe Accident Mitigation Alternative (SAMA) analysis:
 - a. A description of the major differences from the level 1 and 2 Individual Plant Examination (IPE) previously reviewed by the staff, and the respective impacts of these changes on core damage frequency (CDF) and release frequency. Specifically address the reasons for a factor of 2 reduction in the internal events CDF in the SAMA submittal (total CDF of about 2.3×10^{-6} per reactor-year) as compared with the IPE (total CDF of about 5.5×10^{-6} per reactor-year),
 - b. A description of the internal and external peer review process used for the updated risk study,
 - c. A breakdown in the contributions of various accident types to the CDF. Based on the information provided for the various plant damage states, the following breakdown is inferred: LOCAs, 1.0×10^{-7} ; transients, 1.3×10^{-7} ; station blackout, 1.02×10^{-6} ; ATWS, 1.10×10^{-6} . Please confirm and/or provide the correct breakdown, and
 4. The core damage frequency and large release frequency for Peach Bottom Unit 3, and the major reasons why these values are lower than for Unit 2.
2. Based on the discussion in Section 4.20.2.2, it appears that the site specific economic and agricultural characteristics (e.g., land values) used in the SAMA analysis were assumed to be a factor of four greater than used in NUREG/CR-4551. Please confirm this.
3. In assessing the costs associated with core damage events at Peach Bottom, neither the impact of uncertainties nor the contribution of external initiators (e.g., seismic, fires, etc.) have been considered. In this regard, please provide the following:
 - a. An ~~estimate~~ **assessment** of the uncertainties associated with the calculated core damage frequency (e.g., the mean and median CDF estimates and the 5th and 95th percentile values of the uncertainty distribution), and the ~~rationale for not explicitly considering the upper end of the uncertainty distribution in the SAMA evaluation process~~ **impact on SAMA identification and screening results if risk reduction estimates were based on the upper end of the distribution rather than the mean value,**

ENCLOSURE 1

- b. An assessment of the impact of including the risk from external events in the SAMA identification and screening process. It is recognized that the methods used for the Peach Bottom IPEEE do not provide numerical estimates of the CDF contributions from seismic and fire initiators; however, quantitative estimates for CDF and risk for external events at Peach Bottom are available in NUREG/CR-4551, and can be used to account for the impact of external events in the SAMA analysis. This impact can be substantial since the risk associated with external events in NUREG/CR-4551 (e.g., 57 person-rem per reactor year for fires) is much greater than the total risk estimate used in the SAMA analysis (14.7 person-rem per reactor year),
 - c. ~~Justification why~~ **Explanation of whether** low cost SAMAs screened out in the analysis (e.g., Phase II SAMA numbers 1, 13, 21 in Table G.4-2) would ~~not~~ become cost beneficial if the screening were conservatively based on the upper bound of the benefit (i.e., considering the uncertainties in risk estimates and the contribution from external events), and
 - d. Clarification whether the implementation costs and net values reported in Section 4.20.6 and Table G.4-2 reflect the value for Unit 2 or the combined values for both units, and confirmation that this is consistent with the baseline costs of a severe accident (\$2.04 million) as used in the screening process (which is based on two units).
4. On page E.4-41, the submittal states that the Peach Bottom generating capacity has increased from 3293 to 3458 MW(t), i.e., by 5 percent. It is recognized that the effect of the power uprate on the level 1 PSA success criteria has been considered, and that the impact on the initial core radiological inventory used in the SAMA analysis has not been taken into consideration. However, the submittal does not provide any information on the effect of power uprate on accident progression as modeled in the level 2 PSA, e.g., the impact on the timing and depressurization capability of containment venting. Please indicate if the impact of the power uprate on containment failure/release times, and the magnitude of radiological releases to the environment has been considered. If this is not the case, please provide justification for neglecting this impact.
5. Based on information provided in Section 4.20.5, the SAMA candidates for Peach Bottom were developed from lists of SAMAs considered at other plants, NRC documents, and documents related to the advanced boiling water reactor. No mention is made of whether/how the plant-specific risk study was used to identify candidate SAMAs, such as performing a systematic examination of the top cutsets and leading contributors to large release, or conducting basic event importance analyses/rankings to identify candidate SAMAs. In this regard:
 - a. Please provide a description of how the plant-specific risk study was used to identify candidate SAMAs,
 - b. If a systematic examination or importance analysis based on the plant-specific PSA was not performed, please justify why the approach utilized in the submittal is sufficient to identify all potentially cost-beneficial SAMAs aimed at reducing CDF and risk dominant releases, and

- c. Provide a copy of the "PBAPS Report on Accident Management Insights" referred to in Note 14 to Table G.4-1.
6. Table G.4-1 states that there are procedures in place at Peach Bottom which allow containment flooding (see Phase I SAMA numbers 41 and 51). Please provide the following information:
 - a. A description of the version of the BWROG Emergency Procedure and Severe Accident Guidelines (EP/SAG) that are currently in place at Peach Bottom, and that are credited in the PSA,
 - b. A discussion of how containment flooding would be accomplished at Peach Bottom during SBO events,
 - c. A description of how the impact of containment flooding been considered in the Level 2 PSA (e.g., its impact on liner melt-through, wetwell vent submergence, and containment venting). If flooding is accounted for in the PSA, please explain why collapsed bins #3 and #4 that are primarily due to "drywell shell melt-through" account for a major portion of the population risk in Table G.2-3, and
 - d. Additional justification for dispositioning Phase II SAMA number 6 in Table G.4-2 (which states that "the drywell spray initiation limit defined by the EOPs prevents its use in the cases where it would potentially provide benefit"), given that Revision 2 of the EP/SAG has relaxed the drywell spray initiation limit to permit the use of drywell sprays under a broader set of conditions.
7. In Table G.2-3, the population dose risk at 50 miles (last column) shows the total risk as 14.72 person-rem per reactor year. However, based on the values listed in the table, the total should be 2.10 person-rem per reactor year. It appears that the population dose for collapsed bin #4 is incorrectly shown as 1.28E-1 rather than 1.28E+1. Please confirm the correct population dose risk.
8. According to the Regulatory Analysis Guidelines (~~NUREG/BR-0184~~) (NUREG/BR-0058, Revision 2), sensitivity studies should be performed to assess the value of SAMAs over ~~the remainder of the current operating license and~~ the license renewal period. **The guidelines indicate that an alternative analysis using a 3 percent real discount rate should be prepared for sensitivity analysis purposes, and, as a general principle, additional sensitivity or uncertainty analyses, or both, should be performed whenever the values of key attributes can vary widely. Such attributes could include core damage frequency, population and meteorology data, and evacuation assumptions.** It is not apparent that such sensitivity studies were conducted. Please indicate if any sensitivity studies were conducted, and if so, what were the results of such studies.
9. In NUREG/CR-4551, Volume 3, Sections 6.4 and 7.2, one modification to reduce CDF was identified whereby the impact could be large while still being within the range of reasonable cost. The modification is procedural in nature and deals with reducing the probability of a common-mode dc power failure. This potential candidate was not identified within the 207 SAMAs considered by the analysis, and no indication was given

as to whether this modification has already been implemented at Peach Bottom. Please indicate if this modification has been considered, and if so, what the results of the analysis are.

Peach Bottom Atomic Power Station
Units 2 and 3
License Renewal Environmental Review
cc:

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Units 2 and 3
License Renewal Environmental Review
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