May 30, 2000

Lewis Sumner, Vice President
Hatch Project Support
Southern Nuclear Operating Company
40 Inverness Parkway
Post Office Box 1295
Birmingham, AL 35201

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION RELATED TO THE STAFF'S REVIEW OF SEVERE ACCIDENT MITIGATION ALTERNATIVES FOR THE EDWIN I. HATCH NUCLEAR PLANT, UNITS 1 AND 2 (TAC NOS. MA8096 AND MA8098)

Dear Mr. Sumner:

The NRC staff has reviewed Southern Nuclear Operating Company's analysis of severe accident mitigation alternatives (SAMAs), submitted as part of the application for license renewal for the Edwin I. Hatch, Units 1 and 2. The staff has identified areas where additional information is needed to complete its review. Enclosed are the staff's requests for additional information (RAIs).

As discussed with your staff, we request that you provide your responses to these RAIs within 60 days of the date of this letter in order to support an accelerated review schedule. If you have any questions, please contact me at (301) 415-1108.

Sincerely,

/RA/

James H. Wilson, Senior Project Manager
Generic Issues, Environmental, Financial, and Rulemaking Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation.

Enclosure: As stated

cc w/encl: See next page

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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 THE EDWIN I. HATCH NUCLEAR PLANT,
UNITS 1 AND 2 (TAC NOS. MA8096 AND MA8098)

1. The original individual plant examination (IPE), as well as the upgrades to address the 1998 power uprate, were based on the RISKMAN "Large event tree, small fault tree" model. The severe accident mitigation alternative (SAMA) analysis is based on a subsequent conversion of the RISKMAN model to a cutset and fault tree analysis (CAFTA) "linked fault tree" model that also included other modeling changes. The risk profile in this updated model appears to be different than that in the IPE (the core damage frequency has decreased, while the frequencies of the five release classes/sequences reported in Section 2.0 of the SAMA submittal are about a factor of 2 to 6 higher than reported in the IPE). To support using the updated risk model in the SAMA identification and evaluation processes, please provide the following:

   a. A specific reference for the probabilistic risk assessment (PRA) study, and a description of the internal and external peer review of the Level 1, 2, and 3 portions of the study.

   b. A description of the Level 1 and Level 2 risk profiles, results, and insights in terms of the major contributors (hardware and human failures) to the core damage frequency (CDF) and release frequencies.

   c. A listing of the dominant Level 1 accident sequences including the sequence logic in terms of event tree top events, and a mapping of these sequences to the Level 2 release categories. Provide sufficient supporting material to allow an outside PRA reviewer to understand the sequences and mappings.

   d. A characterization of the major differences in the core damage frequency and large release frequency contributors from those reported in the IPE, and the reasons for these differences.

   e. A list of key equipment failures and human actions that dominate CDF and large release frequency, and the results of any supporting importance analyses (e.g., using Fussell-Vesely and/or Risk Reduction importance measures) indicating those equipment failures and human actions having greatest potential worth for reducing risk at Hatch.

2. Studies at other commercial nuclear power plants have shown that external events can be the dominating contributors to the overall core damage frequency and overall risk to the public. However, only two SAMA candidates for Hatch appear to involve external events and two other candidates address internal flooding concerns. Please discuss how plant-specific external event insights were considered in the SAMA identification process. Also, for those SAMAs intended primarily for internal events, describe how any added benefits in external events were considered in developing risk reduction estimates.

3. It is not apparent that insights from the plant-specific risk study have been used to identify potential means of further reducing the risk at Hatch. For example, based on the IPE, battery depletion and main steam isolation valve closure events are important contributors to loss of high-pressure injection, yet neither of these contributors are addressed by SAMAs. There appear to be numerous other plant-specific insights that were not addressed in the SAMA submittal. In this regard, please provide:

   a. A discussion of the extent that the above plant-specific risk insights were used to identify potential SAMAs. If plant-specific insights were not considered, justify how the SAMA analysis can be considered to have identified "those SAMA candidates that have the most potential for reducing CDF and person-rem risk" at Hatch, as stated in Section 1 of Attachment F to Appendix D of the Environmental Report.

   b. A description of potential design enhancements identified through the IPE and follow-on studies and the disposition/status of these items. For those that have not been implemented, provide an assessment of them within the context of SAMAs.

4. The offsite risk estimate for Hatch appears to be based on only five of the 15 release classes/sequences in the updated Level 2 PRA. Although the five sequences appear to include the large early release sequences, several additional sequences have either substantially larger release frequencies or only slightly lower release fractions (e.g., Sequence 12). The risk associated with the other 10 sequences should also be included in order to provide a complete picture of risk. Please provide the frequency and consequences (person-rem and economic) for all 15 sequences. If these additional sequences impact the results by more than about 10 percent, please revise the SAMA benefit evaluations.

5. Please provide a breakdown of leading contributors to dose consequences (e.g., containment bypass, early containment failure, late containment failure, intact containment). Results may be presented in either a table or figure that provides general risk insights-percent contributions to the population dose.

6. It is our understanding that release fractions as determined in a report by FAI, Inc. entitled, "Level II Process Plant Hatch," (FAI/98088, March 1999) were used in this submittal. That report states that release fractions were estimated using modular accident analysis program (MAAP) calculations for representative events in each containment event tree endstate. Please clarify what version of MAAP was used for these calculations. Please provide release fractions for radionuclide groups (not only noble gases, but also I, Cs, Te, Sr, Ru, La, Ba, and Ce) so that results can be compared with values predicted in NUREG-1150 for the Peach Bottom plant (also a BWR-4 in a Mark I containment).

7. Because it is a dominant contributor to plant risk, please discuss differences in the MAAP results presented in the IPE station blackout (SBO) sequence (Sequence 2 in Tables 4.7-9 and 4.7-10) and the SBO sequence from the fail as is (FAI) report. Differences include timing of key events and release fractions. Also, please clarify why the differences (timing and frequencies) for Unit 1 and Unit 2 in the IPE don't exist in the FAI report. Finally, clarify why the source term bin 2 is release category D in the IPE, but release Category C in the current submittal.

8. The Hatch model assumes that drywell venting would only be used if the wetwell vent is unavailable, and indicates that the frequency of drywell venting would be 9E-10/year (Sequence 15). This assumption is more restrictive than the generic guidance provided in the BWROG Emergency Procedure and Severe Accident Guidelines, which permits the use of the drywell vent for pressure and hydrogen control, independent of the wetwell vent. The model also does not appear to account for drywell venting to facilitate containment flooding and reactor pressure vessel injection, in accordance with RC/F-1 through -6 of the severe accident guidelines. Thus, the Hatch model may understate the offsite risk associated with drywell venting. Please describe the basis for the drywell venting assumption and justify that the assumption is consistent with the plant-specific guidance on containment venting at Hatch. Also, describe the risk associated with drywell venting to facilitate containment flooding and reactor pressure vessel injection, and how it is reflected in the Hatch model. If the PRA models/assumptions are not consistent with plant-specific procedures and guidance, please provide a revised estimate of the risk posed by drywell venting, and a value/impact analysis of modifying the procedures/guidance to further limit drywell venting.

9. The SAMA submittal indicates that the population growth rate used in the projection out to 2030 was assumed to be the same as that projected between 1990 and 2000. Please provide this assumed growth rate. The second paragraph on Page F-3 indicates that Reference 2 (NUREG-1150) lists 1990 population data by county and projected county population growth rates. This reference citation appears incorrect. Please provide the correct reference.

10. Please provide an explanation of: (1) how the risk would change if population projections were based on the end of the renewal period (2034 and 2038 for Units 1 and 2) rather than 2030; and (2) what, if any, transient population considerations were factored into the risk determination.

11. The SAMA submittal does not provide sufficient detail about the release sequences to readily determine if the times specified for declaring a general emergency are appropriate. Please provide this information.

12. Justify why evacuation times based on the current evacuation study would remain valid for the end of the renewal period (2034 and 2038), given the projected increase in population.

13. Please provide a discussion of why 1997 meteorological data were used and justify why this can be considered a representative year.

14. Discuss how the risk reduction benefits and costs associated with implementing each SAMA were estimated. Please include the following:

    a. An indication of the source (reference) for each SAMA.

    b. The bases for the preliminary cost estimates for each of the SAMA candidates for which a cost estimate was made, and the bases for the final cost estimates for the nine SAMAs in Table 7 of the SAMA submittal.

    c. Estimates of the ΔCDF and Δperson-rem for each of the 43 unique Hatch SAMA candidates. Also provide the calculations showing how these values were obtained.

15. Uncertainties in the core damage frequency, public risk, risk reduction estimates and cost estimates all contribute to uncertainties in the value-impact analyses for each SAMA. Factors of three to five are common in the Level 1 PRA alone. Please justify why uncertainties were not considered in the value-impact analysis. Explain the influence that uncertainties could have on the results of the SAMA analysis, including SAMA screening and dispositioning, if the impact of uncertainties were explicitly accounted for in the analysis.

16. For SAMA 2-8, "Use Fire Protection as a Back-up to Diesel Generator Cooling," the description indicates that Diesel Generator 1B already has an alternate cooling water supply. This would seem to imply that the scope and cost of implementing this SAMA would differ for Unit 1 and Unit 2. However, only one implementation cost and one risk reduction benefit are listed. Please identify the diesel generators on which this SAMA would be implemented, and confirm whether the cost and risk reduction estimates are for Unit 1, Unit 2, or both units.

17. Section 4 indicates that an initial list of 115 SAMAs was reduced to 43 unique, applicable SAMAs, and subsequently reduced to 16 SAMAs for further analysis. However, it appears that only 114 SAMAs are accounted for in Table 6 and when the screening is performed there would be 42 unique SAMAs and 15 candidates for further analysis. Please address this inconsistency. Also, clarify why SAMA 41 is designated as an "E", but is still assigned Phase II number "2-16".

18. In general, the candidate SAMAs focus on hardware changes that tend to be expensive to implement. While hardware changes may often provide the greatest risk reduction, consideration should be given to other options that provide marginally smaller risk reductions but with much smaller implementation costs. For example, instead of adding another service water (SW) pump to improve SW reliability, risk could be reduced by determining the causes for failures in the existing SW pumps and adjusting the preventive maintenance program or procedures to address the dominant failure modes. Please justify why these type of options were not considered as alternative SAMAs to address the major risk contributors at Hatch.