October 20, 2004

Mr. James A. Spina
Vice President Nine Mile Point
Nine Mile Point Nuclear Station, LLC
P.O. Box 63
Lycoming, NY 13093

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING SEVERE ACCIDENT MITIGATION ALTERNATIVES FOR THE NINE MILE POINT NUCLEAR STATION, UNITS 1 AND 2 (TAC NOS. MC3274 AND MC3275)

Dear Mr. Spina:

The staff has reviewed the analyses of severe accident mitigation alternatives (SAMAs) submitted by Constellation Energy Group, Inc., (Constellation) in support of its application for license renewal for Nine Mile Point Nuclear Station, Units 1 and 2, and has identified areas where additional information is needed to complete its review. Enclosed are the staff's requests for additional information, one set of RAIs for each unit.

As discussed with your staff, we request that you provide your responses to these RAIs within 45 days of the date of this letter. If you have any questions, please contact me at 301-415-1186 or via email at lcf@nrc.gov.

Sincerely,

/RA/

Leslie C. Fields, Project Manager
Environmental Section
License Renewal and Environmental Impacts Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-220 and 50-410

Enclosures: As stated

cc w/encl: See next page

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Request for Additional Information Regarding the Analysis of Severe Accident Mitigation Alternatives (SAMAs) for Nine Mile Point Units 1 and 2

1. The SAMA analysis is based on the most recent version of the Nine Mile Point (NMP) Units 1 and 2 Probabilistic Risk Assessments (PRAs), i.e., U1PRA01B and U2PRA01B, which are modified, consolidated versions of the Individual Plant Examination (IPE) and the IPE for External Events (IPEEE) studies. Provide the following information regarding these PRA models (for both units, unless otherwise specified):

   a. Briefly discuss the overall findings of the most recent peer review. Include the date of the review and the version of the PRA reviewed. For any element rated low (e.g., rated less than a 3 on a scale of 1 to 4 or rated a conditional 3) or any A and B Facts and Observations that have not yet been addressed in PRA Version PRA01B, briefly discuss the potential impact of the unresolved finding on the results of the SAMA analysis, including SAMA identification and screening.

   b. Provide a more detailed and specific breakdown of the contributors to CDF and LERF than provided in the figures and text of Sections F.1.3 and F.1.4. Include for example, the various initiating event contributors to the "Loss of Injection" function sequences, the support system failures contributing to the "Support System Failure" core damage frequency (CDF) and large early release frequency (LERF), the major sequences contributing to the fire CDF (Unit 1), and the specific sequences contributing to the seismic LERF (Unit 1). Also, confirm that the reported CDF and LERF values are mean values.

   c. The IPEEE utilized a seismic margins method to identify possible seismic vulnerabilities. Although such methods do not typically provide enough information to determine CDF and LERF, quantitative frequency estimates are reported for NMP. Provide more information on the development, assumptions, and results of the current seismic model in the NMP PRA.

   4. It is stated that no major changes were made to the Level 2 evaluations of the IPE. For the models used for the SAMA analysis, please provide a summary of the core damage accident subclass frequencies (similar to Table 4.6-3 of the IPEs) and a summary of the releases versus accident subclass (similar to Table 4.6-5 of the IPEs).

   5. Tables F.2-5 and F.2-6 in the Environmental Report (ER) provide the off-site consequences by release category. Describe the criteria used to classify the releases in terms of timing (early, intermediate and late) and magnitude (high, medium, low, no). Identify which release categories are assumed to contribute to LERF.

   6. The Unit 1 IPE technical evaluation report indicates that it is assumed that the core spray pumps can survive up to over 300°F with a 0.5 probability. Clarify whether this assumption is still used, and if so, please explain.

ENCLOSURE

2. Section 4.16.3 indicates that an initial list of 207 candidate SAMAs was identified from generic sources and 16 additional SAMAs were identified based on the plant-specific risk profiles for Units 1 and 2. Of this total 13 alternatives for Unit 1 and 20 alternatives for Unit 2 were subjected to cost-benefit analysis. Provide the following information regarding the identification of candidate SAMAs:

    a. Section 4.16.3 of the ER indicates that sequences that contribute more than 1% to CDF or LERF were reviewed in the process of identifying candidate SAMAs. Section F.1.5 describes SAMA candidates based on contributions of 5% or more to CDF (10% for fires). To ensure that the set of SAMAs evaluated address the major risk contributors, provide a list of risk reduction worth (RRW) or Fussel-Vesely (FV) CDF and LERF importance values for systems, functions and operator actions. Discuss SAMAs for sequences that contribute between 1% and 5% of CDF (between 1% and 10% for fires) and whether they could be cost beneficial.

    2. Section F.1.5.2 indicates that containment isolation during station blackout (SBO) has the highest rank LERF RRW (for Unit 2), yet it does not appear to be addressed by a SAMA. Please clarify and/or justify.

    3. Since large early releases account for only about 10% of the total offsite population dose, the review of sequences that are important to LERF (described in Section 4.16.3 of the ER) could have overlooked SAMAs that are important to population dose. Address whether any additional candidate SAMAs would be identified if the SAMA identification process considered sequences important to population dose rather than LERF. Provide a further evaluation of any such SAMAs.

    4. The ER identifies and provides estimated benefit and cost information for only those SAMAs that remained after the initial screening. Also, for most of the plant-specific SAMAs, cost benefit information is provided for only one of the units. Provide the complete list of the plant-specific candidate SAMAs considered for Units 1 and 2, and the cost benefit information for each of these SAMAs for both units, unless a SAMA is not applicable to the other unit.

    5. The process used to screen the initial list of 207 SAMAs is described only briefly in Section 4.16.3. Describe the screening process in more detail, the screening criteria used, and for each criterion, the number of SAMAs eliminated.

    6. In the NMP IPEs, several potential improvements/enhancements were identified. The current status of these improvements is not clear. Some, but not all, of these appear to be addressed by SAMAs. Discuss the implementation status of each of the potential improvements identified in the IPE. Justify the disposition of those that were not implemented and are not addressed by a SAMA.

7. Indicate whether the external event related improvements identified for NMP in NUREG-1742 or the NMP IPEEEs have been implemented or are addressed by candidate SAMAs. Discuss the implementation status of each of the potential improvements. Justify the disposition of those that were not implemented and are not addressed by a SAMA.

8. The discussion in Section F.1.5.2 dismisses the need to consider any reactor core isolation cooling (RCIC) related SAMAs even though the RRW for RCIC is the second highest. Please consider further and provide additional justification.

9. Emergency depressurization is a highly ranked operator action in both units. Please evaluate the costs and benefits of a change to the emergency operating procedures (EOPs) that would permit the actuation of the automatic depressurization system (ADS), rather than the current EOP strategy of inhibiting actuation of ADS in non-ATWS sequences.

3. Please provide the following information concerning the offsite consequence portion of the SAMA evaluation:

   a. The MACCS2 analysis for both units uses a core inventory scaled by power level from a reference BWR core inventory at end-of-cycle calculated using ORIGEN. The ORIGEN calculations were based on a 3-year fuel cycle (12 month reload) with an average power density for the assemby groups ranging from 24 to 30 MW/MTU. Current BWR fuel management practices use longer fuel cycles (time between refueling) and result in significantly higher fuel burnups. The use of the reference BWR core instead of a plant specific cycle could significantly underestimate the inventory of long-lived radionuclides important to population dose (such as Sr-90, Cs-134 and Cs-137), and thus impact the SAMA evaluation. Justify the adequacy of the SAMA screening and dispositioning given the fuel enrichment and burnup and expected at NMP during the renewal period.

   b. Provide the release fractions, release time and duration, warning time, release height and release energy used in the MACCS2 analysis for each of the release categories and the source and/or basis for these values.

4. In Section F.1.6 it is stated that "although an uncertainty distribution has not been created for the NMP CDF and LERF, uncertainty is considered in the model development and risk applications," and that a "comparison between the 95 percent values of the quantified models is not expected to affect the conclusion unless a major change aimed at reducing uncertainty is proposed." Given that the 95th percentile values are typically about a factor of two to three higher than mean values, identify and provide a further evaluation of those SAMAs that are within a factor of two to three of being cost-beneficial. This evaluation can be based on more realistic estimates of risk reduction and implementation costs, and deterministic considerations, including potential negative implications of candidate SAMAs.

5. Please provide the following additional information concerning the SAMA assessments described in Section F.3 of the ER:

    1. For SAMA U1-208, eliminating all drywell failure modes results in only a 0.06% (0.013 person-rem/year) reduction in population dose. This appears to be counter-intuitive since releases via the drywell (which are unscrubbed) would be expected to have greater consequences than releases via the wetwell (which would be scrubbed.) Also, Figure 4.6-17 of the Unit 1 IPE indicates that shell and drywell head failures make up 41% of the total releases. A similar situation exists for SAMA U2-208. Please explain why the eliminating all drywell failure modes results in such a small risk reduction for both units.

    2. For SAMA U1-222, rather than assuming complete elimination of the associated operator action (and in turn, assuming that a hardware modification would be needed to achieve this risk reduction) it appears that an improvement to the existing procedures and training that provides just a factor of two reduction in the human error probability (HEP) would be cost beneficial. Provide further justification that improved procedures and training alone would not be cost-beneficial.

    3. For SAMA U2-21, the evaluation indicates that there is no reduction in CDF because of the dependency of residual heat removal (RHR) pump room cooling on service water. However, this dependency would be eliminated if SAMA U2-23a (separately determined to be cost beneficial) is implemented. Please provide a re-assessment of SAMA U2-21 under this condition.

    4. SAMA U2-73 considers the use of firewater as a backup for emergency diesel generator cooling. As indicated in the benefit assessment for SAMA U2-56, the high pressure core spray (HPCS) emergency diesel generator (EDG) is dependent on the other EDGs to provide support for service water. Provide an assessment of the cost and benefit associated with providing firewater backup for the HPCS generator alone.

    5. The discussion in Section 4.16.5.2 indicates that the implementation of SAMAs U2-23a, b and c and U2-213 should be considered as a combination since loss of service water (addressed by SAMA U2-213) is an important contributor and cause of room cooling failure (addressed by SAMA U2-23). Please clarify the relationship between SAMA U2-213 and SAMAs U2-23a, b and c. Would SAMA U2-213 be implemented in addition to SAMA U2-23a, b or c, or might only one of these SAMAs be implemented (e.g., SAMA U2-213 or one of the variants of SAMA U2-23)?

    6. For SAMA U2-223, the evaluation is based on both procedural and structural modifications. Please provide an evaluation of the costs and benefits of this SAMA considering only the lower cost procedural modifications.

6. Licensees for other BWR plants identified the following procedural-related SAMAs as potentially cost-beneficial:

   - Provide a means for alternate safe shutdown makeup pump room (or equivalent room) cooling, either via the use of the fire protection system, or procedures to open doors and use portable fans.

   - Provide procedures for (a) bypassing major DC buses; (b) locally starting equipment.

   - Develop procedures to control feedwater flow without 125 VDC to prevent tripping feedwater on high/low level.

   - Develop procedures to terminate reactor depressurization at a pressure at which RCIC remains operable.

   - Develop or enhance procedures to control containment venting within a narrow band of pressure to avoid adverse impacts on ECCS injection.

   - Develop procedures to use a cross connect to the other unit's containment cooling service water as an alternate containment spray source.

   - Develop procedures to align LPCI or core spray to the condensate storage tank on loss of suppression pool cooling.

   Based on the information provided in the ER, it is not clear whether these SAMAs or equivalents were addressed in the SAMA analysis for NMP. Provide an assessment of the applicability/feasibility of these SAMAs for NMP.

cc:

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