



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

July 16, 2012

Mr. Kevin Walsh  
Site Vice President  
c/o Mr. Michael O'Keefe  
NextEra Energy Seabrook, LLC  
P.O. Box 300  
Seabrook, NH 03874

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE  
SEABROOK STATION LICENSE RENEWAL APPLICATION ENVIRONMENTAL  
REVIEW – SAMA REVIEW (TAC NO. ME3959)

Dear Mr. Walsh:

By letter dated May 25, 2010, NextEra Energy Seabrook, LLC (NextEra) submitted an application and associated environmental report pursuant to Title 10 of the *Code of Federal Regulations* 10 CFR Part 51 and 10 CFR Part 54, to renew Operating License NPF-86 for Seabrook Station Unit 1 (Seabrook). In August 2011, the U.S. Nuclear Regulatory Commission (NRC or the staff) issued its draft plant-specific Supplement 46 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (SEIS), regarding the environmental impacts of renewing the Seabrook operating license for an additional 20 years.

Subsequent to the issuance of the draft SEIS, by letter dated March 19, 2012, NextEra submitted a supplement to its environmental report that identified changes that were made to the severe accident mitigation alternatives analysis (SAMA) related to the Seabrook license renewal application. The staff is reviewing the information contained in the supplement, and has identified, in the enclosure, areas where additional information is needed to complete the SAMA review. Further requests for additional information may be issued in the future.

Items in the enclosure were discussed with Mr. Rick Cliche of your staff and a mutually agreeable date for the response is within 60 days from the date of this letter. If you have any questions, please contact me at 301-415-6459 or by e-mail at [michael.wentzel@nrc.gov](mailto:michael.wentzel@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read "Michael Wentzel", is positioned above the typed name.

Michael Wentzel, Project Manager  
Projects Branch 2  
Division of License Renewal  
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosure: As stated

cc w/encl: Listserv

**Request for Additional Information**  
**Regarding the Analysis of Severe Accident Mitigation Alternatives**  
**For the Seabrook Station License Renewal Review**

- 1) Please provide the following information regarding the Level 1 Probabilistic Risk Assessment (PRA) used for the Severe Accident Mitigation Alternatives (SAMA) analysis:
  - a. The Initiating Event Contribution to core damage frequency (CDF) Table in Section 3.1.1 of the Supplement presents initiating event contributors down to 2.5 percent of the total combined (i.e., internal and external) CDF. Please provide initiating event contributors down to 1.0 percent of the total CDF. If this addition includes contributors that did not previously appear, other than for the new flooding analysis, please discuss their new presence.
  - b. Section 3.1 states on pages 4-5 that an installation of a flow orifice in fire protection piping in the control building is credited in the SB2011 probabilistic risk assessment (PRA) model update and is undergoing final acceptance testing. Please clarify when this design change will be implemented and whether it has passed final acceptance testing. In addition please verify that the as-built design change supports the PRA SAMA assumptions.
  - c. The CDF for Station Blackout (SBO) and Anticipated Transient Without Scram (ATWS) is not presented, and it is not clear whether these values have changed from the original 2009 submittal. Please provide CDF values for SBO and ATWS.
  - d. Previously, the contribution from internal events and internal floods together was 1.1E-5/yr. This has dropped to 7.1E-6/yr (see p. 16 of 96). The severe weather contribution, which is not insignificant at 10.0%, was not previously provided. Please explain all these differences, at least qualitatively.
  - e. Among the basic event contributors to CDF and large early release frequency (LERF) (see pp. 17 and 19 of 96) are several that differ from those in the January 13, 2011, RAI response. Please explain the increase in the RRW values for HH.XOEFW1.FA, HH.XIONES3.FA, and HH.OTSI3.FA and decrease in RRW value for FWP37A.FR for the LERF importance listing. Also, explain the basic events removed from and added to the LERF and CDF listings.
- 2) Please provide the following information relative to the Level 2 analysis:
  - a. The discussion for source term group Small/Early Containment Penetration Failure to Isolate and Large/Late Containment Basemat Failure (SELL) identifies that SELL uses the source term from release category LL5a and frequency from release category SELL5a. The Table on page 6 identifies that LL5a is a contributor to source term group LL5. The discussion for LL5 identifies that MAAP Case #106f was used to provide a representative source term while the discussion for SELL identifies that MAAP Case #106g was used for this source group. Please clarify this apparent discrepancy.

ENCLOSURE

- b. The dose risk and Off-site Economic Cost Risk (OECR) results are different for the SB2006 and SB2011 PRA model results. The reason for these differences is not clear in every case. Using Table F.3.2.1-1 and requests for additional information (RAIs) 2g and 4a associated with the SB2006 environmental report (ER), and release category results from the SB2011 submittal, please discuss the modeling basis that caused the following observations:
    - i. LE1 – The CDF for this release category decreased from  $1.1\text{E-}7/\text{yr}$  to  $5.2\text{E-}8/\text{yr}$ , and the SB2011 release fractions for the noble gases, iodine (I) and cesium (Cs), are significantly delayed compared to their timing in the SB2006 model.
    - ii. LE2 – The CDF for this release category increased from  $4.0\text{E-}9/\text{yr}$  to  $1.8\text{E-}8/\text{yr}$ . The SB2011 noble gas release fraction is similar to the SB2006 model, but the I and Cs release fractions are reduced by half.
    - iii. SE3 – The dose risk and OECR for this release category decreased by a factor of about three. The new SELL source term group appears to be a sub-part of the original small early containment isolation failure source term group (i.e., SE3).
  - c. The dose risk and OECR results for release category LL5 changed significantly between SB2006 and SB2011 (greater than a factor of 100). The text on page 33 indicates that the increase in SAMA case "MAB" is due to higher release category source terms (apparently referring to LL5). The CDF for LL5 increased from  $3.2\text{E-}7/\text{yr}$  to  $3.1\text{E-}6/\text{yr}$ , the SB2011 noble gas release fraction is similar to the SB2006 model, however the I and Cs release fractions are larger, and the release timing is significantly earlier. Please discuss the modeling basis that caused these changes.
  - d. Please provide a general explanation of the differences in the release start times and durations from MAAP presented in the Table on page 12 from the release start times and durations presented in the Tables on pages 20-26 for MACCS. For example, for LE1, on page 12 the first puff release starts at 3.2 hr (~11,520 s) and the second puff starts at 39.3 hr (~141,800 s). However, on page 20 the first plume starts at 9328 s (~2.6 hr) and the fourth plume starts at 172,800 s (48 hr).
- 3) Please provide the following with regard to the SAMA identification and screening process:
- a. Two Tables in Section 3.1.1, Top 15 Basic Events Contributing to CDF and Top 15 Basic Events Contributing to LERF, provide the Risk Reduction Worth (RRW) for CDF and LERF down to a value of 1.02. IN Section 4.1 the Top 15 Basic Events Contributing to CDF, LERF, and release category (RC) contributing to 90 percent of the Public Risk provides the top 15 basic events for each of the following: CDF, LERF (which includes LE1, LE2, LE3, and LE4), and RCs LL-5, SE-3, and SELL. The RRW values for basic events importance to LL-5, SE-3, and SELL are not provided. In an RAI response dated January 13, 2011, the top 15 basic events were provided along with their corresponding RRW values for the risk dominant (i.e., contributing to 90 percent of the population dose) release categories (i.e., SE3, LL3, LE1, SE1, and LL4). From RAI responses it could be determined that the maximum benefit that might be calculated from eliminating the 15<sup>th</sup> most important basic event resulted in benefits less than a simple hardware implementation cost of (i.e., \$100K). Given the changes in release frequencies, such as the 10 fold increase in LL5, it is not clear whether all important basic events are

identified as part of the 45 basic events presented in the Section 4.1 table. Please provide the RRWs for basic events contributing to LL-5, SE-3, and SELL down to a minimum RRW value that would ensure the maximum possible benefit would exceed the cost of a simple hardware or administrative change (~\$100K). If this requires addressing further basic events, please include their evaluation in Table 2 of Section 4.3.

- b. Table 2 of Section 4.3 provides the benefit of SAMAs specifically devised for reducing the risk associated with each of the top 16 initiating events contributing to CDF and the top 15 initiating contributing to LERF. The RRW values for these initiating events are not provided, and because they are not provided it is not clear if all important initiators against CDF and LERF are addressed by SAMA evaluation. Please provide RRWs values for initiating events against CDF and LERF. Provide importance analysis listing down to a minimum RRW value that would ensure that the maximum possible benefit would exceed the cost of a simple hardware or administrative change (~\$100K). If this requires addressing more than the 16 initiating events already considered against CDF and the 15 initiating events already considered against LERF please include their evaluation in Table 2 of Section 4.3.
- c. Step (b) in the general approach to the reassessment (Section 2.0) does not list at least three criteria by which SAMA candidates were previously eliminated: (1) being combined with another similar SAMA, (2) costing more than the MAB, and (3) being related to a non-risk significant system. Please provide additional information describing how these criteria were considered in the re-assessment. (Note that this RAI also applies to step 2 in Section 4.1 [see. p. 28 of 96].)

4) Please provide the following with regard to the Phase II cost-benefit evaluations:

- a. In Section 4.2, on p. 34 of 96, it is stated that “[t]he sensitivity of the updated SAMA results to variations in other Level 3 parameters is expected to be consistent with previous sensitivity results.” Please provide discussion comparing the updated results to the previous results confirming this expectation.
- b. In Section 4.2, on p. 35 of 96, it is stated that “[n]o new potentially cost-beneficial SAMAs were [sic] identified as a result of the 3% and 8.5% sensitivity calculations.” Please clarify if this is relative to the original analysis (submittal plus RAI responses) or to the re-analysis provided here for cost-beneficial SAMAs.
- c. Section 4.2 provides the new Maximum Averted Benefit (MAB) (i.e., \$3.05M) using the SSPSS-2011 PRA model. Also please provide the Averted Public Exposure (APE) costs, Averted Off-site Property Damage Costs (AOC), Averted Occupational Exposure (AOE) costs, and Averted Onsite Costs (AOC).
- d. In Table 1 of Section 4.3, neither the risk reduction values nor PRA modeling assumptions for SAMA case MAB are provided. The evaluation for SAMA 77 incorrectly states that “Cost to engineer and implement installation of large passive air cooling system is far in excess of the attainable benefit”. The original SAMA evaluation submittal estimated the cost of implementing this SAMA to be >\$3M. Please provide the risk reduction values and PRA modeling assumptions for SAMA case MAB. Also, please provide justification of the cost of SAMA 77 and explain why it was necessary to increase this cost estimate.

- e. Table 1 of Section 4.3 presents revised SAMA case CONTX1 which is defined to eliminate alternating current (AC) and direct current (DC) power and Primary Component Cooling Water (PCCW) support system failures for one division of Containment Building Spray (CBS). The evaluation for this SAMA case explains that this case more realistically represents the potential risk reduction benefit than the case it replaced (i.e., CONT01 - Installation of an independent division of containment spray). It is not clear that the PRA assumption for this case (CONTX1), which consists of eliminating support system failures, bounds the SAMAs represented by this case (i.e., #91, #94, #99, #102, and #107). In light of the potentially high cost benefit (the current cost benefit with uncertainty and the seismic multiplier is >\$5.7M), please provide justification for why this case is representative of each SAMA grouped under it and clarify whether a less restrictive or different case may be more appropriate. If a less restrictive or different case may be more appropriate please provide the corresponding evaluations.
- f. In Table 1 of Section 4.3, the expected cost of SAMA 162 (Increase the capacity margin of the condensate storage tank (CST)) is >\$2.5M. In the original submittal the expected cost of this SAMA was presented as >\$100K. The evaluation of this SAMA in the supplement states that the "Cost of expanding capacity of the CST is based on project scope of installing a new (larger) safety grade CST, which is judged necessary to achieve full benefit." In light of the fact that the new cost benefit with uncertainty and the seismic multiplier is \$171K, please explain the basis for the earlier cost estimate and why it was necessary to increase this cost estimate by a factor of 25.
- g. In Table 1 of Section 4.3, the expected cost of SAMA 189 (Modify or analyze supplemental emergency power supply (SEPS) capability; 1 of 2 SEPS for loss of off-site power (LOSP) non-safety injection (SI) loads, 2 of 2 LOSP SI loads) is >\$2M. In the original submittal the expected cost of this SAMA was presented as >\$300K. The SAMA appears that it could primarily be an analytical task. In light of this and the fact that the new cost benefit with uncertainty and the seismic multiplier is \$311K, please explain why it was necessary to increase this cost estimate by a factor of 7.
- h. In Table 2 of Section 4.3, the cost benefit for SAMA case OHSB0 (for BE #5) is presented as >\$1M in the "Expected SAMA cost" column, yet the discussion in the "Evaluation" column states that the cost was estimated to be \$1.5M. Please clarify this apparent discrepancy.
- i. In Table 2 of Section 4.3, the evaluation for BE #34 states that the PRA case "conservatively assumes that elimination of Bus E5 and E6 random failures that could cause an initiating event.... and/or fail the associated power division during mission time". Please clarify whether the PRA assumptions for this modeling case (i.e., SWGE561) include elimination of initiators, basic events or both.
- j. In Table 2 of Section 4.3, the event description for BE #38 refers to operator actions after loss of coolant accident (LOCA) and steam generator tube rupture (SGTR), but the evaluation refers to actions after a small LOCA (SLOCA) and interfacing system LOCA (ISLOCA). Please clarify this apparent discrepancy.
- k. In Table 2 of Section 4.3, the entries for IE #8 and #9 appear to be duplicates. Please clarify.

- l. In Table 2 of Section 4.3, the cost benefit analyses provided for IE #16 is a hardware installation to improve Component Cooling Water (CCW) reliability. In the evaluation for IE #16 on page 93 the associated SAMA case (i.e., CCTE1) is not identified as a cost beneficial SAMA. Yet, CCTE1 is identified as cost beneficial in Table 1 on page 65. Please clarify this apparent discrepancy.
- m. In Table 2 of Section 4.3, cost benefit analyses are provided for IE #23, #24, #25, #26, and #27, which are seismic initiators of different levels, (0.7g, 1.0g, 1.4g, 1.8g, and 2.5g) that lead to ATWS events (SAMA case NOATWS). No description of the associated SAMA is provided nor is the basis for the presented cost estimate (i.e., >\$500K). Table 2 shows that IE #28, which is an ATWS event with loss of Main Feedwater, is also grouped into this SAMA case. It is not clear why this initiating event (i.e., IE#28) can be grouped as part of a seismic upgrade related SAMA case. Please provide the SAMA description and basis for the cost estimate for these six initiator cases.

July 16, 2012

Mr. Kevin Walsh  
Site Vice President  
c/o Mr. Michael O'Keefe  
NextEra Energy Seabrook, LLC  
P.O. Box 300  
Seabrook, NH 03874

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Sincerely,

/RA/

Michael Wentzel, Project Manager  
Projects Branch 2  
Division of License Renewal  
Office of Nuclear Reactor Regulation

Docket No. 50-443

Enclosure: As stated

cc w/encl: Listserv

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Letter to K. Walsh from M. Wentzel dated July 16, 2012

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