From:	Keegan, Elaine
To:	mchisum@entergy.com
Cc:	"lpott90@entergy.com"; Dozier, Jerry; "erschmidt36@comcast.net"; William.Ivans@pnnl.gov; steve.short@pnnl.gov; aharris@entergy.com; "lmurr91@entergy.com"; Ramirez, Frances C; Speer, Chris; Chazell, Russell; Folk, Kevin; Rikhoff, Jeffrey; "ayoung4@entergy.com"; "rbuckley@entergy.com"; Clark, Phyllis; Dricks, Victor; Maier, Bill; McIntyre, David; RidsNrrDlr Resource; RidsNrrDlrRarb Resource; RidsNrrDlrRasb Resource; RidsNrrDlrRerb Resource; RidsNrrPMWaterford Resource
Subject:	REQUEST FOR ADDITIONAL INFORMATION FOR THE ENVIRONMENTAL REVIEW OF WATERFORD STEAM ELECTRIC STATION, UNIT 3 (CAC NO. MF7493)
Date:	Tuesday, November 22, 2016 3:33:00 PM
Attachments:	image001.png SAMA RAI Enclosure.pdf image003.png

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

Mr. Michael R. Chisum
Site Vice President
Entergy Operations, Inc.
Waterford 3
17265 River Road
Killona, LA 70057-3093

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE ENVIRONMENTAL REVIEW OF WATERFORD STEAM ELECTRIC STATION, UNIT 3 (CAC NO. MF7493)

Dear Mr. Chisum:

The U.S. Nuclear Regulatory Commission (NRC) is conducting a review of the environmental effects of renewing the operating license for Entergy Operations, Inc. (Entergy) Waterford Steam Electric Station, Unit 3 (WF3). As part of the environmental review, a site audit of the severe accident mitigation analysis (SAMA) evaluation was conducted at WF3, by NRC staff, during the week of October 24, 2016. As a result of the audit and the review of the SAMA evaluation contained in the WF3 environmental report, NRC staff has identified areas where additional information is needed to complete the review. The enclosure lists the SAMA request for information (RAI).

The NRC staff discussed the information contained in the RAI with Mr. Mark Thigpen, of your staff, Ms. Lori Potts, of Entergy, and Mr. Nick Lovelace, of Jensen Hughes, on October 27, 2016. Please provide the response within 45 days from the date of this e-mail.

If you have any questions, please contact me by telephone at 301-415-8517 or by e-mail at Elaine.Keegan@nrc.gov.

Sincerely,

Elaine M. Keegan, Sr. Project Manager
Environmental Review and
Project Management Branch
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-382

Enclosure:
As stated

cc w/encl: Listserv

ADAMS Accession no.: ML16309A580 *via e-mail

OFFICE	LA:DLR	PM:RERP:DLR	BC:RERP:DLR	PM:RERP:DLR
NAME	IBetts*	EKeegan	JRikhoff*	EKeegan
DATE	11/ 18 /2016	11/ 9 /2016	11/ 10 /2016	11/22/2016

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REQUEST FOR ADDITIONAL INFORMATION ON THE WATERFORD STEAM ELECTRIC STATION, UNIT 3, ANALYSIS OF SEVERE ACCIDENT MITIGATION ALTERNATIVES

1. Provide the following information regarding the Level 1 Probabilistic Risk Assessment (PRA) or Probabilistic Safety Assessment (PSA) used for the Severe Accident Mitigation Alternative (SAMA) analysis. The basis for this request is as follows: Applicants for license renewal are required by 10 CFR 51.53(c)(3)(ii)(L) to consider SAMAs if not previously considered in an environmental impact assessment, related supplement, or environmental assessment for the plant. As part of its review of the Waterford Electric Station, Unit 3 (WF3) SAMA analysis, NRC staff evaluates the applicant's treatment of internal events and calculation of core damage frequency (CDF) in the Level 1 PRA model. The requested information is needed in order for the NRC staff to reach a conclusion on the sufficiency of the applicant's Level 1 PRA model for supporting the SAMA evaluation.

    a. WF3 Environmental Report (ER) Section D.1.4 indicates that there is approximately a factor of 3 increase in CDF and a factor of 3 decrease in large early release frequency (LERF) from PSA 2009 R4 to 2015 PSA R5 used for the SAMA analysis. Discuss the major reasons for these changes.

    b. ER Section D.1.4.5 indicates that the 2009 peer review concluded that approximately 9% of the applicable PRA standard's supporting requirements (SRs) were met at Capability Category I while 10% of the SRs were rated as not met. Discuss any findings from this review that remain open in the PRA models used for the SAMA analysis and their potential impact on the SAMA analysis.

    c. Provide the "freeze date" or the date which corresponds to the WF3 design and operation incorporated into the WF3 PSA used for the SAMA analysis. Identify any design or operational (including fuel cycle) changes that have or, are planned, since this freeze date that might impact the SAMA analysis.

    d. Confirm that no changes have been made to the WF3 model used in the SAMA analysis since the peer review that would constitute an upgrade as defined by the PRA Standard ASME/ANS RA-Sa-2009, as endorsed by Regulatory Guide (RG) 1.200, Revision 2.

    e. The revised Attachment W to the WF3 National Fire Protection Association (NFPA) 805 License Amendment Request (LAR) gives the internal events CDF and LERF as 6.5E-06 per reactor-year (rx-year) and 8.7E-08 per rx-year respectively. These values are approximately 60% of the results given for the 2015 (R5) PSA used for the SAMA analysis (internal events CDF and LERF as 1.05E-05 per rx-year and 1.36E-07 per rx-year respectively). Identify which of these values best represents WF3 for license renewal purposes, discuss the reasons for these differences and the impact on the SAMA analysis.

    f. Briefly describe the process and procedures in place to assure the technical adequacy of changes made to the WF3 PSA since the 2009 peer review.

g. ER Section D.1.1 (p. D-26) states that the CDF uncertainty factor of 1.99 is based on the ratio of the 95th percentile CDF to the mean CDF. Since the PSA results used in the cost-benefit analysis are based on point estimates, the uncertainty factor should be based on the ratio of the 95th percentile CDF to the point estimate CDF. Describe the uncertainty analysis and provide the 95th, mean and point estimate results from this analysis. Discuss the impact of the revised uncertainty factor on the results of the SAMA analysis.

h. Discuss the scope of the 2009 WF3 internal events peer review and if all applicable elements of the ASME PRA standard were assessed in this review. Discuss the potential impact on the SAMA analysis of any elements that were not assessed.

2. Provide the following information relative to the Level 2 PRA or PSA analysis. The basis for this request is as follows: Applicants for license renewal are required by 10 CFR 51.53(c)(3)(ii)(L) to consider SAMAs if not previously considered in an environmental impact assessment, related supplement, or environmental assessment for the plant. As part of its review of the WF-3 SAMA analysis, NRC staff evaluates the applicant's treatment of accident propagation and radionuclide release in the Level 2 PRA model. The requested information is needed in order for the NRC staff to reach a conclusion on the adequacy of the applicant's Level 2 PRA model for supporting the SAMA evaluation.

   a. The table in ER Section D.1.4 gives LERF for the 2015 (R5) PSA as 1.36E-06 per rx-year, while Section D.1.2.1 (p. D-27) and Table D.1-12 gives 1.88E-06 per rx -year. Explain the difference.

   b. ER Section D.1.4.4 indicates that a full level 2 model was created for the 2015 (R5) PSA based on the 2015 internal events model. Describe the full level 2 model in comparison with the prior LERF only model reviewed in the 2009 peer review, the changes made to it to obtain the 2015 (R5) level 2 model and the steps taken to insure the technical adequacy of the full Level 2 model.

      ER Sections D.1.2.1, "Containment Performance Analysis," and D.1.2.2.6, "Mapping of Level 1 Results into the Various Release Categories," both provide discussions regarding the transfer of Level 1 core damage results to the Level 2 fission product release analyses. The ER states:

      > For the WF3 Level 2 analysis, no grouping into [Plant Damage States] PDS was performed to group accident sequences with similar safety features and containment failure responses. A more rigorous approach was taken where each Level 2 accident sequence was assessed individually based on the accident-specific containment response.
      >
      > The WF3 Level 2 accident sequences were named using the two or three letter identification for the CD sequences from the Level 1 core damage event trees (i.e., AX, MU, SB, TQX, TKQ, and RB) and combined with a one-letter code to represent core melt sequences (core damage with containment safeguard systems).

Provide additional information on this process including a description of the Level 1 and Level 2 sequence naming nomenclature and how the Level 2 sequences or Containment Event Tree (CET) endpoints were assigned to the Level 2 release categories.

c. ER Section D.1.2.1 states that 4 CETs were used to model the core melt progression and radioactive releases. Four trees, Trees B, D, F and H, representing four combinations of containment heat removal, are subsequently discussed. Confirm that these are the four CETs used and describe the use of the four trees considering that the two containment heat removal systems are explicitly represented by CET nodes.

d. ER Section D.1.2.2.7 indicates that for: Containment Bypass Sequences, Containment Isolation Sequences, Reactor Vessel Rupture Events and Interfacing System Loss of Coolant Accident (LOCA) Events; there was no consideration of fission product (FP) scrubbing, retention, or deposition and all were assigned to the High-Early (H-E) release category (RC). Clarify this statement since with no scrubbing, retention or deposition, 100 percent release of volatile FPs would be expected.

e. ER Section D.1.5.2.9 states:

> The representative accident sequences selected for each release category represented both the dominant accident class based on the Level 2 results and the maximum release of fission products from the MAAP analyses.

Provide a more detailed discussion of this process including a description of the Level 2 sequences used to characterize the source terms for each of the significant release categories, the basis for this selection and its appropriateness for use in determining the benefit for the Phase II SAMAs evaluated. Note that using the dominate sequence in each RC to characterize the releases for that category may not necessarily lead to the correct benefit for the individual SAMA cost-benefit analyses.

f. The start of release times given in ER Table D.1-10 are not consistent with the RC definitions in Table D.1-8 for a number of release categories. For example: for RC H-E (start of release less than 4 hours after general emergency declaration), the time of the start of release (plume 1) is 13.4 hours while the time of declaration of a general emergency is 15 minutes; and for RC High – Intermediate (H-I) (start of release is greater than 4 hours after general emergency declaration), the time of release is 2.0 hours. Provide a discussion of the reasons for these differences and the impact on the results of the SAMA analysis.

g. ER Section D.1.2.2.6 indicates that level 2 accident sequences were evaluated deterministically using the Modular Accident Analysis Program (MAAP) 4.0.6 code and a 36-hour accident time period, and that this time period was selected to ensure that sufficient time was allotted to allow for late failures and to capture the peak steady-state FP release concentrations. Provide support that the 36 hour accident

time period yields the peak FP release over the 48 hour time period beginning at the time of declaration of a general emergency. If the peak FP release does not occur using the 36 hour accident time period, discuss the impact on the SAMA analysis if the analysis is extended to 48 hours after the declaration of a general emergency.

h. ER Table D.1-9 states that the frequency of the "intact" RC is obtained from the difference between the base CDF and the total of the other release categories. Provide the results for the "intact" RC from the sum of the no containment failure containment event tree end states. Discuss the impact of cut set truncation on the CDF and RC frequencies and the validity of the approach taken to determining the RC frequencies.

3. Provide the following information with regard to the treatment and inclusion of external events in the SAMA analysis. The basis for this request is as follows: Applicants for license renewal are required by 10 CFR 51.53(c)(3)(ii)(L) to consider SAMAs if not previously considered in an environmental impact assessment, related supplement, or environmental assessment for the plant. As part of its review of the WF3 SAMA analysis, NRC staff evaluates the applicant's treatment of external events in the PRA models. The requested information is needed in order for the NRC staff to reach a conclusion on the sufficiency of the applicant's PRA models for supporting the SAMA evaluation.

   a. In response to NRC requests following the accident at the Fukushima Daiichi Nuclear Power Plant, new seismic hazard curves have been developed for each nuclear power plant site. The Entergy response to NRC staff RAIs on the WF3 NFPA 805 transition LAR (Agencywide Documents Access Management System (ADAMs) ML14162A506) provided an assessment of the seismic CDF that is different from that given in the integrated leak rate testing interval extension LAR used in the SAMA analysis. Provide an updated WF3 seismic CDF using the approach of the NFPA 805 assessment but based on the new post Fukushima hazard curves and discuss the impact of using this seismic CDF on the WF3 SAMA analysis.

   b. As stated above, the revised Attachment W to the WF3 NFPA 805 LAR gives the internal events CDF and LERF as 6.5E-06 per rx-year and 8.7E-08 per rx-year respectively. These values are approximately 60% of the results given for the 2015 (R5) PSA used for the SAMA analysis. If the 2015 (R5) value is the most appropriate for use in the license renewal application (LRA), provide an assessment of the impact of this more recent internal events model on the results of the fire PSA used in the SAMA analysis and the resulting impact on the SAMA analysis.

   c. ER Section D.1.3.4 indicates that internal flooding is not included in the 2015 internal events PSA used for the SAMA analysis. It is also stated that changes were made to internal flooding analysis that allowed the internal flooding analysis to satisfy the requirements in the ASME Standard and RG 1.200. Provide further information on this analysis including consistency with the system modeling in the 2015 (R5) PSA, the impact of any differences on the internal flood CDF and the SAMA analysis and the process used to insure the technical adequacy of the internal flooding analysis.

   d. As discussed in the NRC staffs "Interim Staff Response to Reevaluated Flood Hazards" at WF3 dated April 12, 2016, there are a number of reevaluated flood

hazards that exceed the current design-basis. Provide a discussion of the current status of the WF3 Mitigation Strategy Assessment (MSA) and integrated assessment or focused evaluation, and a discussion of the impact of flood hazards on the WF3 risk. Provide support for the ER's conclusion that flood hazards are negligible and need not be included in the external events multiplier.

4. Please provide the following information regarding the Level 3 PRA used in the SAMA analysis. The basis for this request is as follows: Applicants for license renewal are required by 10 CFR 51.53(c)(3)(ii)(L) to consider SAMAs, if not previously considered, in an environmental impact assessment, related supplement, or environmental assessment for the plant. As part of its review of the WF3 SAMA analyses, NRC staff evaluates the applicant's analysis of accident consequences in the Level 3 PRA. The requested information is needed in order for the NRC staff to reach a conclusion on the sufficiency of the applicant's Level 3 PRA model for supporting the SAMA evaluations.

   a. ER Table D.1-10 includes a time to declaration of general emergency (GE) and a warning time that is said to include a 15 minute GE declaration. The GE declaration time is 15 minutes for all release categories while the warning time ranges from 15 minutes to 9 hours. Discuss the use of these times in the consequence analysis and how they were determined. The GE declaration time would be expected to be sequence specific and based on site procedures.

   b. The NRC staff notes in ER Table D.1-12 that while the population dose for the Low-Intermediate (L-I) RC is greater than that for the H-E RC, the cesium and Iodine release fractions given in Table D.1-10 are about 4 percent of those for the H-E RC. Similarly, while the population dose for the Moderate-Intermediate RC is higher than that for the H-E RC, the cesium and iodine release fractions are about 33 percent and 12 percent of those for the H-E RC, respectively. Explain the reason for this unexpected result and the impact on the SAMA cost-benefit analysis. As part of this explanation and to the extent applicable, summarize the treatment of relevant release characteristics (e.g., energy of release, source term, etc.) used to define each RC.

      Explain the reason for this unexpected result and the impact on the SAMA cost-benefit analysis. As part of this explanation and to the extent applicable, summarize the treatment of relevant release characteristics (e.g., energy of release, source term, etc.) used to define each RC.

   c. ER Table D.1-11 provides the estimated core inventory input to the Level 3 analysis; however, there is no description regarding how this input was developed. Clarify that the core inventory estimates applied in support of the Level 3 analysis are specific to WF3. Additionally, clarify whether additional adjustments of the core inventory values are necessary to account for differences between fuel cycles expected during the period of extended operation and the fuel cycle upon which the Level 3 analysis is based (e.g., to account for any changes in future fuel management practices or fuel design).

   d. Regarding ER Section D.1.5.3, the NRC staff notes that the consequence analysis assumed site-specific meteorological data from year 2010, given that it generated the highest population dose and offsite economic cost. However, Section D.1.5.2.6 indicates that certain meteorological data, including that for year 2010, was not available and was

addressed, at least in part, by using "data from approved data substitution methods as needed." Quantify the amount of missing meteorological data, which were estimated using data substitution, and clarify the methods used.

e. ER Section D.1.5.2.1 discusses population data. Explain why the population distribution used in the analysis is appropriate, and justify the method used for population extrapolation. In doing so, describe how those parishes with declining population projections were addressed (if applicable). Additionally, clarify whether transient and special facility populations were included, and if not, justify their exclusion.

f. ER Section D.1.5.2 describes the assumptions used for many of the parameters applied in support of the Level 3 analysis, but significant gaps exist in the information provided. Specifically, the guidance in Section 3.4.2 of NEI 05-01, "SAMA Analysis Guidance Document," identifies several economic parameters utilized in the WinMACCS model that are not discussed (e.g., cost of evacuation, cost of temporary relocation, cost of land decontamination, etc.). Describe how each of these cost parameters were developed, and provide the values and technical basis for any inflation/escalation factors utilized.

g. NUREG-1530, Revision 1, Reassessment of NRC's Dollar per Person-Rem Conversion Factor Policy (DRAFT) is publicly available in ADAMS at ML15049A114. Since Commission approval of the NUREG is expected by the middle of 2017, this would be new and significant information that would need to be evaluated before the WF3 license renewal is issued. WF3 used the old value of $2000 per person-rem in the current SAMA analysis. In anticipation of this change, please provide a sensitivity analysis using the anticipated new value of $5,200 per person-rem.

h. On May 4, 2016, the Commission issued a decision (CLI 16-07) in the Indian Point license renewal proceeding, in which it directed the staff to supplement the Indian Point SAMA analysis with sensitivity analyses. Specifically, the Commission held that documentation was lacking for two inputs (TIMDEC and CDNFRM) used in the MACCS computer analyses, and that uncertainties in those input values could potentially affect the SAMA analysis cost-benefit conclusions. The Commission therefore directed the staff to perform additional sensitivity analyses.

   The two inputs (TIMDEC and CDNFRM) are commonly used in the SAMA analyses performed for LRAs. These two input values were generally based on the values provided in NUREG 1150, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants" and NUREG/CR 3673, "Economic Risks of Nuclear Power Reactor Accidents." The TIMDEC input value defines the time required for completing decontamination to a specified degree. The CDNFRM input parameter defines the cost (on a per person basis) of decontaminating non-farmland by a specified decontamination factor. The CDNFRM values used in NUREG 1150 ($3,000/person for decontamination factor of 3 and $8,000/person for decontamination factor of 15) stem from decontamination cost estimates provided in NUREG/CR 3673, the same 1984 economic risk study referenced in support of the decontamination time inputs. These decontamination cost inputs are commonly escalated to account for inflation.

The NRC staff believes the Commission's decision in CLI 16-07 may be applicable to the SAMA analysis performed for WF3, inasmuch as that analysis may have also relied upon the NUREG 1150 values for TIMDEC and CDNFRM. We therefore request that Entergy either justify why CLI 16-07 does not apply to the SAMA analysis performed for WF3 or supplement the SAMA analysis with sensitivity analyses for the CDNFRM and TIMDEC values. Entergy is requested to review the input values specified in CLI 16-07 for the Indian Point LRA, and (1) to apply the maximum values specified by the Commission (one year (365 days) for TIMDEC and $100,000 for the CDNFRM values for the decontamination factor of 15) or, in the alternative, (2) to explain, with sufficient justification, its rationale for choosing any other value(s) for its sensitivity analyses. In any event, Entergy should execute sensitivity analyses for the release categories modeled that exceed 1015 Becquerels of Cs 137 released. Entergy is requested to evaluate how these sensitivity analyses may affect its identification of potentially cost-beneficial SAMAs. Finally, upon completing its sensitivity analysis, Entergy is requested to submit the spreadsheet (or equivalent table if another method is used) that conveys the population dose and off-site economic cost for each release category and integrates the results into a Population Dose Risk and an Offsite Economic Cost Risk for WF3.

5. Provide the following information with regard to the selection and screening of Phase I SAMA candidates. The basis for this request is as follows: Applicants for license renewal are required by 10 CFR 51.53(c)(3)(ii)(L) to consider SAMAs if not previously considered in an environmental impact assessment, related supplement, or environmental assessment for the plant. As part of its review of the WF3 SAMA analysis, NRC staff evaluates the applicant's basis for the selection and screening Phase I SAMA candidates. The requested information is needed in order for the NRC staff to reach a conclusion on the adequacy of the applicant's Phase I SAMA selection and screening process for the SAMA evaluation.

    a. Based on the review of importance analysis in ER Tables D.1-2:

        i. The risk reduction worth (RRW) for event %TAC3, "Loss of 4.16Kv Bus 3A3-S" (1.0914), is considerably less than that for %TAC4, "Loss of 4.16Kv Bus 3B3-S" (1.318). Explain the reasons for this difference and consider a potential SAMA that addresses the cause of this difference.

        ii. Event ZDHFBAT_LSP, "Failure to shed loads on the A or B battery," is failure of a human action and is addressed by several hardware related SAMAs. Discuss the potential for SAMAs relating to improvements in procedures and training to reduce the impact of this human error and other human error events (e.g. Events ZHF-C2-011).

    b. ER Section D.1.3.4 indicates that, while the internal flooding analysis is not integrated with the internal events analysis, changes were made to the internal flooding analysis that allowed the internal flooding analysis to satisfy the requirements in the ASME Standard and RG 1.200. Two SAMAs, SAMA 67, "Improve internal flooding response procedures and training to improve the response to internal flooding events," and SAMA 68, "Install flood doors to prevent water

propagation in the electric board room," were included in the in the Phase II evaluation. Provide a discussion of the identification of additional candidate SAMAs for mitigating internal flooding risk based on review of important contributors to the internal flooding CDF.

c. The ER indicates that the WF3 fire PRA was utilized to identify potential SAMAs. Three fire related SAMAs (74, 75 and 76) are included in the SAMA analysis based on their being commitments in the WF3 NFPA 805 LAR. The WF3 fire PRA model gives a CDF for internal fires that is 1.7 times higher than the internal events CDF after crediting these commitments. Provide a discussion of the identification of other candidate SAMAs for mitigating internal fire risk based on review of important contributors to the internal fire CDF.

d. The disposition of Individual Plant Examination (IPE) and Individual Plant Examination of External Events (IPEEE) insights is given in Table D.2-1.

    i. Phase I SAMA 184, "Install a portable generator to charge the AB battery," is screened out as "already installed". The stated disposition indicates that the intent of this SAMA is met by the ability to manually control the turbine-driven emergency feedwater pump after loss of direct current (DC). Provide the importance of this human action and the potential for a SAMA involving the use of a portable generator.

    ii. Phase I SAMA 185, "Add guidance for aligning the low pressure safety injection (LPSI) pump for containment spray," is screened out because it is "already installed." The procedure implemented is stated to address use of LPSI pumps for containment spray only for Large LOCAs. Discuss the benefit of this SAMA for other LOCAs or transients.

e. Identify the number of Phase I SAMA candidates identified from the various sources (i.e. NEI 05-01 Generic List, other industry documents of PWR SAMAs, the WF3 IPE and IPEEE, plant specific internal events importance analysis and other sources). If the total number of Phase 1 SAMA candidates is different than the 201 identified in Section D.2.1 of the ER, then provide an explanation for this difference.

f. Section D.1.2.1 states that Table D.1-5 provides the correlation between all level 2 release states RRW risk significant events down to 1.005 identified from the WF3 PRA Level 2 model and the SAMAs evaluated in Section D.2. Clarify specifically which release categories are included in the importance analysis: all release categories, all except the intact RC, or all except intact and high-early release categories?

   It is noted that the Phase II candidate SAMAs did not include adding an emergency diesel generator (EDG). Discuss why the cost-benefit of adding an EDG was not performed or provide such an evaluation.

6. Provide the following information with regard to the Phase II cost-benefit evaluations. The basis for this request is as follows: Applicants for license renewal are required by 10 CFR 51.53(c)(3)(ii)(L) to consider SAMAs if not previously considered in an environmental impact

assessment, related supplement, or environmental assessment for the plant. As part of its review of the WF3 SAMA analysis, NRC staff evaluates the applicant's cost-benefit analysis of Phase II SAMAs. The requested information is needed in order for the NRC staff to reach a conclusion on the acceptability of the applicant's cost estimations for individual SAMAs and cost-benefit evaluation.

a. The benefit of SAMA 31, "Install a digital feedwater upgrade," is addressed by Case 2, "Improve Feedwater Reliability." Case 2 was evaluated by eliminating the loss of feedwater initiating event. Discuss the added benefit that might occur if the upgrade would increase the availability of feedwater subsequent to other initiating events.

b. The assumption for Case 7, "Reduced Frequency of Loss of Auxiliary Component Cooling Water (ACCW)," given in ER Table D.2-2 is the elimination of failure of ACCW. Section D.2.3 indicates that the model was changed by adding the ability to cross-tie the ACCW. Provide further information on the modeling to clarify this apparent difference.

c. SAMA 19, "Add redundant DC control power for SW pumps," is evaluated in Case 12, "Increase Availability of ACCW," by eliminating the DC control power gates to the ACCW pumps. While this SAMA is from the generic PWR list in NEI 05-01 and does not necessarily represent an important failure mode at WF3, discuss the benefit associated with eliminating DC control power failures for the component cooling water (CCW) pumps, in addition to the ACCW pumps.

d. Provide more details on the WF3 specific cost estimate for SAMA 35, "Provide a redundant train or means of ventilation." It is not clear if the scope of the cost estimate is consistent with the assumed elimination of failure of emergency diesel generator (EDG) room 3A cooling for Case 23, "Increased availability of [Heating, ventilation and air conditioning] HVAC used to assess the benefit of SAMA 35."

e. Clarify that the scope of SAMA 36, Implement procedures for temporary HVAC, is applicable to rooms other than EDG room 3A. Analysis of this SAMA only assumed elimination of failure of EDG room 3A cooling (Case 23). Based on the benefit results for Case 23, it appears likely that the implementation of temporary HVAC for the other rooms listed in SAMA 36 may also be potentially cost-beneficial.

f. Case 24, "Debris Coolability and Core Concrete Interaction," was evaluated by eliminating failure of debris coolability and core concrete interaction to determine the benefit associated with the relatively low cost SAMAs; 38, 47, 72 and 73. These low cost SAMAs provide water to the cavity or otherwise improve core coolability or reduce core concrete interaction. Case 28, "Increase Cooling and Containment of Molten Core Debris," was evaluated by eliminating containment core melt propagation and was used to determine the benefit associated with relatively high cost SAMAs 44, 45, and 46. The benefit associated with Case 28 is approximately $6,900,000 compared to that for Case 24 of $61, 000. It appears that the SAMAs evaluated by Case 24 would achieve much of the benefit associated with Case 28. Discuss the reasons for this significant difference and the potential for SAMAs 38, 47, 72 and 73, or some combination of them, to be cost-beneficial.

g. Case 43, “Gagging Device to Close a Stuck Open Safety Valve,” is evaluated by eliminating failure events for stuck open relief valves and was used to estimate the benefit of SAMA 71, “Manufacture a gagging device for a steam generator safety valve and develop a procedure or work order for closing a stuck-open valve.”

    i. Provide a more detailed description of the failure events listed and their relevance to limiting release following a steam generator tube rupture (SGTR) event.

    ii. The benefit of SAMA 61, “Direct steam generator flooding after a SGTR,” prior to core damage as assessed in Case 33, “Reduce Consequences of Steam Generator Tube Ruptures,” is approximately $100,000 whereas the benefit of SAMA 71 is only $76. Both of these SAMAs are intended to reduce the releases resulting from a SGTR. The very large difference between assessed benefit is not expected. Explain the reasons for this difference or revise the assessments as appropriate.

h. Case 41, “Improve Internal Flooding Response Procedures and Training,” and Case 42, “Water Tight Doors for the Largest Contributor to Internal Flooding,” were evaluated by assuming that the reduction in risk was proportional to the reduction in internal flooding CDF. SAMAs evaluated by these cases were SAMA 67, “Improve internal flooding response procedures and training to improve the response to internal flooding events,” and SAMA 68, “Install flood doors to prevent water propagation in the electric board room.” An examination of the reductions in risk given in ER Table D.2-2 for other cases indicates that this assumption may be non-conservative depending on the failures resulting from the specific flooding events mitigated. Describe the system failures involved in the internal flood events mitigated by these SAMAs and select evaluation cases that would be more representative for these specific internal flooding SAMAs.

i. The cost for SAMA 68, “Install flood doors to prevent water propagation in the electric board room,” is given as $4,695,000 and stated to be from the Sequoyah cost estimate. The Sequoyah LRA ER indicates that this is the cost for both Sequoyah units. Further, the cost of such a modification would appear to be strongly dependent on a specific plant layout. Provide a cost that is valid for the WF3 plant configuration. Also discuss if something less than a full flood door, such as a flood barrier, might achieve the same risk reduction benefit.

j. The cost for SAMA 8, “Use fire water system as a backup source for diesel cooling,” is given as $2,000,000 and stated to be from the Seabrook cost estimate. Implementation of a similar SAMA for the Grand Gulf plant (SAMA 9) was estimated to cost $1,344,000. This is very near the assessed benefit at WF3 of $1,338,000. Provide a WF3-specific justification for the cost estimate for SAMA 8.

k. In the evaluation of the benefit of SAMA 61, “Direct steam generator flooding after a SGTR,” prior to core damage in Case 33, ER Table D.2-2 states that the SGTR CDF contribution was assigned from the H-E RC to the L-I RC. However, the NRC staff

notes that the population dose for the L-I RC is greater than that for the H-E RC. Justify the approach used to evaluate the benefit of SAMA 61 in Case 33.

7. For certain SAMAs considered in the WF3 ER, there may be lower cost or more effective alternatives that could achieve much of the risk reduction. In this regard, provide an evaluation of the following SAMA. The basis for this request is as follows: Applicants for license renewal are required by 10 CFR 51.53(c)(3)(ii)(L) to consider SAMAs if not previously considered in an environmental impact assessment, related supplement, or environmental assessment for the plant. As part of its review of the WF3 SAMA analysis, NRC staff considers additional SAMAs that may be more effective or have lower implementation costs than the other SAMAs evaluated by the applicant. The requested information is needed in order for the NRC staff to reach a conclusion on the adequacy of the applicant's determination of cost-beneficial SAMAs.

    a. SAMA 27, "Install an additional component cooling water pump," is evaluated as a means to increase cooling water availability. Consider a potentially lower cost modification of replacing one of the pumps with a diverse design that would lower the common cause pump failure.

    b. Also, regarding SAMA 27, Table D.1-2 indicates a portion of this benefit is due to eliminating the operator failure to align CCW train AB to replace lost Train A or B. Provide an assessment of a potentially lower cost SAMA candidate to provide diverse backup auto-start signals for the standby CCW trains on loss of the running train.