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To: [Huhmann, Bruce E](#)
Cc: [Philpott, Stephen](#); [Hiller, Justin W](#)
Subject: Request for supporting information for the Callaway SPRA audit review
Date: Thursday, January 02, 2020 9:23:00 AM

Bruce,

The purpose of this email is to solicit that the following supporting information associated with the Callaway 50.54(f) seismic probabilistic risk assessment (SPRA) submittal (ADAMS Accession No. [ML19225D321](#)) and associated supplemental information (ADAMS Accession No. [ML19325D662](#)) is made available in the ePortal (IMS Certrec) audit folder:

Audit questions on Topic #15 - Documentation of the Seismic PRA (SPID Section 6.8)

The NRC staff identified apparent inconsistencies and anomalies in the documentation and the risk results that appear have the potential to impact the conclusions of this submittal. First, based on statements in the submittal and results reported in the submittal and other SPRA documentation, it is unclear whether or to what extent FLEX equipment or actions were credited in the SPRA. Second, there appears to be inconsistencies between the CDF and LERF importance measure listed for fragility groups presented in the submittal and in the fragility ranking tables presented in the submittal supplement when compared to the top CDF and LERF important measures listed in the results section of the SPRA quantification notebook provided on the document ePortal. The third concerns unfeasible importance measure results reported in SPRA quantification notebook. Therefore, address the following:

- a. It is unclear whether or to what extent FLEX equipment or actions were credited in the SPRA submittal. Section 5.3.2 of the submittal states (on page 48 of 92) that “conservatively, the internal events and S-PRA’s do not credit FLEX implementation.” Concerning crediting FLEX, Section 5.7.6 of the submittal also states (on page 69 of 92) that the “SPRA model currently includes minimal credit for this equipment in the baseline model (flags set to 0.99).” However, Table 5-6 of the submittal, which is a summary of top seismic LERF cutsets, indicates that three of the top ten cutsets includes the event: “FLEXAFWFFAIL (FLEX AFW to Steam Generator Fails).” The contribution of this FLEX event in the top cutsets may indicate that more than minimal credit was taken for FLEX equipment and/or actions in the SPRA. Additionally, Table 4-11 of PRA-SPRA-002, Draft Revision 0-E, “Seismic Probabilistic Risk Assessment, Quantification Analysis Notebook” (non-public) provided on the document portal presents a high Risk Reduction Worth (RRW) importance measure for this event. In light of these observations, address the following:
 - i. Clarify whether and to what extent FLEX equipment and actions were credited in the baseline SPRA model used to support the submittal. Include explanation for why FLEX failures appear in the list of the top 10 seismic LERF cutsets and why the failure, “FLEXAFWFFAIL,” is listed in the quantification notebook as having a high RRW importance value.

- ii. If FLEX equipment and actions were credited in the baseline SPRA model used to support the applications, then clarify what impact this credit has on the seismic CDF and LERF estimates corresponding importance measures estimates. The sensitivity study discussed in Section 5.7.6 of the submittal indicates that any credit taken for FLEX would have small impact on the seismic CDF and LERF. Confirm this is true after clarifying to what extent FLEX was credited in the SPRA.
- b. There appears to be inconsistencies in the CDF and LERF importance measures listed for events presented in the submittal and in the supplement dated September 4, 2019 compared against importance values presented in the SPRA quantification report provided on the document portal. For example, there are failures such as FLEXAFWFFAIL and RELAY_2.6 with high Risk Reduction Worth (RRW) values presented in Table 4-11 of the PRA-SPRA-002, Draft Revision O-E, quantification notebook that do not appear in Table 5-3 or Table 5-7 of the submittal or in the importance ranking tables provided at the end of the supplement. NRC staff recognizes that the importance measures listed in the SPRA quantification report on the portal are presented as RRW values, whereas the importance values presented in the submittal and the supplement are expressed as Fussell-Vesely (F-V) values. However, the NRC staff has accounted for this difference by converting the RRW values to F-V values. After performing this conversion, the NRC staff observed that importance values presented in the SPRA quantification report are not consistent with either the submittal or supplement for the same seismic events. Accordingly, reconcile the inconsistencies noted above by addressing the following:
 - i. Justify why failure events with high importance values (e.g., FLEXAFWFFAIL and RELAY_2.6) are identified in in the PRA-SPRA-002 quantification notebook and are not identified in the submittal dated August 12, 2019 or supplement dated September 4, 2019.
 - ii. Justify why RRW values presented in the PRA-SPRA-002 quantification notebook when converted to F-V values were not completely consistent for the same failure events listed in the submittal and supplement.
- c. Section 5.7.8 of the submittal discusses a sensitivity study on operator error bin (i.e., SH1, SH2, SH3, and SH4) definitions. It appears from the information provided in the submittal that operator error bins are defined by ground motion levels (i.e., seismic hazard intervals), and that the Human Error Probability (HEP) for a given operator error in the same operator bin (i.e., SH1, SH2, SH3, and SH4) is same even though the error may be used in more than one seismic hazard interval. Section 5.7.8 of the submittal provides the results for three cases in which the operator error bins were defined differently. The results show that the seismic CDF and LERF are relatively insensitive to the operator error bin definitions except Case 2 in which the seismic CDF increased by 171.4%. The submittal does not justify this significant increase except to state that operator error bins used in the base case were defined to be realistic based on the relevant component fragilities used to define plant damage states. In light of these observations, address the following:

- i. Explain the approach used to perform the sensitivity on operator error bin definition in Case 2 and given the impact on seismic CDF of operator error bin definition in Case 2, justify that the operator error bin definitions for the sensitivity Case 2 are unrealistic for use in the base case and do not significantly impact the conclusions of the submittal.
- ii. If the operator error bin definitions for sensitivity Case 2 cannot be justified as being unrealistic for the base case, provide updated list of dominant risk contributors for SCDF and SLERF for that sensitivity. Also, determine whether there may be a cost justified plant modification that significantly reduces seismic CDF based on this information.

This information will help the staff to continue filling in the technical checklist used for our audit review (ADAMS Accession No. ML18173A017).

Please let me know when the information is available for audit or if we need to discuss this request.

Respectfully,

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