

NRR-PMDAPEm Resource

From: Valentin-Olmeda, Milton
Sent: Friday, November 03, 2017 9:21 AM
To: Thompson, Russell R
Subject: Request for conference call to discuss clarification questions regarding the WBN SPRA submittal
Attachments: WBN SPRA Clarification Questions 11 02 2017.pdf
Importance: High

Russell,

The NRC's review of the Watts Bar SPRA submittal (ADAMS Accession No. ML17181A486) is progressing well. In order to continue the momentum and efficiency of the review, the NRC staff would benefit from a conference call with the TVA team to assist us in obtaining a clear understanding of some information in the submittal. We are not requesting any documentation or ePortal information to support this effort; this is simply an opportunity for our technical reviewers to have a discussion with TVA's technical folks to facilitate the ongoing review.

The attached file contains the clarification questions and topics we wish to cover. It is being provided to facilitate clear communication and to ensure that the appropriate staff are available to answer questions in various technical areas.

The call is scheduled for Wednesday 11/15/17 at 2:00pm (ET). Please confirm your availability.

Again, we are not requesting any documentation or written responses at this time. Please let me know if you have any questions.

Otherwise, I look forward to our discussion.

Respectfully,

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SEISMIC PROBABILISTIC RISK ASSESSMENT (SPRA) IN
RESPONSE TO REQUEST PURSUANT TO 10 CFR 50.54(F) REGARDING
RECOMMENDATION 2.1 OF NEAR TERM TASK FORCE REVIEW OF INSIGHTS FROM
FUKUSHIMA DAI-ICHI ACCIDENT
TENNESSEE VALLEY AUTHORITY (TVA)
WATTS BAR NUCLEAR PLANT UNITS 1 AND 2 (WBN)
DOCKET NOS. 50-390 AND 50-391

In support of the ongoing review of the WBN SPRA Submittal (ADAMS Accession No. ML17181A486), please prepare to discuss via conference call TVA's responses to the following clarification questions:

FRAGILITIES

Clarification Question 01 – Adequacy of the Structural Model

Please clarify the following items related to SPID Section 6.3.1, "Structural Modeling":

- a) WBN SPRA Section 4.3.2.1 stated that the structures were analyzed separately using vertical and horizontal ground motion components and the responses were subsequently combined. Criteria 2 in SPID Section 6.3.1 states that one combined structural model should be used if significant coupling between horizontal and vertical structural responses exist. Please clarify how the Criteria 2 requirements were addressed for structures identified in the WBN SPRA Table 4.3.1.
- b) To confirm that Criteria 4 in SPID Section 6.3.1, clarify the cutoff frequency considered for the SSI analysis described in Section 4.3.2 of the SPRA submittal and confirm that all modes up to structural natural frequencies of about 20 Hz in all directions were included.

Clarification Question 02 – Use of Seismic Response Scaling

WBN SPRA Section 4.3.7 states that fragility values of nuclear steam supply system components were based on scaling of the existing safety analysis results. To assess if scaling was done in accordance with SPID Section 6.3.2, please clarify whether the scaling of responses were based on either of the following:

- previously developed in-structure response spectra;
- shapes of the previous UHS/RLE (1.5 times the design response spectra);
- shape of new UHS/RLE (reevaluated seismic hazard); or
- structural natural frequencies, mode shapes, and participation factors.

Please also clarify how non-linear effects were considered if the spectral shapes of new UHS/RLE and the design basis ground motion are "non-similar". This information is needed to confirm similarity between design spectral shape and the site specific spectral shape used in the SPRA.

Clarification Question 03 – Fragility Analysis and Capacities of Relays Sensitive to High Frequencies

To evaluate whether hybrid methodology discussed in SPID 6.4.1 were appropriately used in developing fragility curves, and to understand if any high-frequency components (e.g. relays) were screened based on circuit analysis or operator actions in accordance with SPID Section 6.4.2, please confirm the following:

- a) Whether the uncertainty parameters (β_r and β_u) were estimated based on SPID Table 6-2 and discuss the basis for using uncertainty parameters different from the recommended values in the SPID.
- b) Whether circuit analysis was relied on for screening relays and other high-frequency sensitive components.
- c) Whether relay-chatter of some relays were resolved by operator actions. Discuss the approach used to analyze operator actions and how overloading of the operators from too many actions is avoided.

Clarification Question 04 – Reevaluation of Fragilities

Section 4.3.7 of the WBN SPRA submittal stated that the fragilities of contributing components are re-evaluated based on plant specific and component-specific information such as test response spectra and qualification analysis and improved analytical models. To confirm that the fragility levels for components based on plant specific testing were consistent with EPRI NP-6041 pages 6-38 to 6-41 and Appendix Q, please explain how the WBN SPRA accounted for:

- a) Differences between test response spectra and required response spectra bandwidths in determination of component fragilities.
- b) Appropriate reduction of test levels performed using single- or dual-axis testing in determination of component fragilities.
- c) Multi-mode response in determination of component fragilities for components that were tested using narrowband excitation.
- d) Inclusion of fragilities that consider both horizontal and vertical motions.

PLANT RESPONSE

Clarification Question 05 – Peer Review and Technical Adequacy of Internal Events PRA

The SPRA submittal describes the adequacy of the internal events PRA model which was used as the basis for the model development of the SPRA. To better assess the peer review and technical adequacy of the internal events PRA used for the SPRA under review, please clarify:

- a) The bases for the determination that the following findings from the 2009 internal events PRA, as resolved and described in Appendix A, Section A.7, Table A-3 of the subject submittal, had no impact on the SPRA:
 - i. F&O (Finding and Observation) 1-5 – Explain what “changes necessary to support” resolution of F&O 1-5 were incorporated.
 - ii. F&O 1-8 – Justify the separation of Essential Raw Cooling Water (ERCW) and Auxiliary Feedwater (AFW) pump common cause groups for running and standby pumps.
 - iii. F&O 3-1 – Explain whether the convergence analysis performed to resolve F&O 3-1 meets PRA standard supporting requirement (SR) QU-B3. (i.e., reductions in truncation value of one decade result in decreasing changes in core damage frequency (CDF) or large early release frequency (LERF), and the final change is less than 5%).
 - iv. F&O 3-6 – Explain whether state of knowledge correlation (SOKC) assessment was performed as suggested in the finding or how it impacts the SPRA results.
 - v. F&O 3-8 – Explain how comparing the total CDF and LERF instead of comparing the CDF and LERF for individual initiators or the importance values of risk significant systems, structures, and components (SSCs) or human failure events for similar plants is a sufficient resolution to F&O 3-8.
 - vi. F&O 5-1 – Explain how the mission times that were cited by the peer review team as being “optimistically justified” were found to be realistic.
 - vii. F&O 7-4 – Explain whether the flood sources were re-screened to consider frequency of occurrence or other criteria.
 - viii. F&O 7-8 – Explain the basis for the internal flooding (IF) event trees and how they were developed using the internal events (IE) event trees.
- b) Whether any PRA upgrades – as defined per PRA Standard ASME/ANS-Sa-2009 – were made between the time of the 2009 internal events PRA peer review and the version of the internal events PRA model which was used to develop the subsequent SPRA model. Some examples to consider could be the revision of common cause modelling performed in response to F&O 1-7 and the flow rate and accumulation studies for the internal flooding PRA performed in response to F&O 7-1.

Clarification Question 06 – Peer Review and Technical Adequacy of F&O Closure Process

The SPRA submittal describes the technical adequacy of the SPRA model development. To further understand the closure process to the peer review findings, please clarify the following related items:

- a) Indicate which version of the PRA Standard (ASME/ANS-Sa-2009 or ASME/ANS-Sb-2013) was used to evaluate the technical adequacy of the SPRA by the SPRA peer review team and subsequent independent assessment team.
- b) In “NEI 05-04/07-12/12-06 Appendix X: Close Out of Facts and Observations (F&Os),” Section X.1.3, “Close Out F&Os by Independent Assessment,” (ADAMS Accession No. ML17086A451) describes the process by which an independent assessment team can close out F&Os. The NRC staff accepted this process, as modified by two conditions, by letter dated May 3, 2017 (ADAMS Accession No. ML17079A427). Please clarify whether the independent assessment team adhered to the requirements in Appendix X in its entirety. Specifically, clarify whether the independent assessment team reviewed the documented finding closure basis prepared by the host utility, decided if the finding was adequately addressed, and included a summary of the independent assessment review team’s decisions for each finding within the scope of the review. In particular, please clarify the process that was used to close out findings associated with the following PRA Standard SRs: SFR-A2, SFR-F1, and SFR-G2.

Clarification Question 07 – Fragility Analysis Using Separation of Variables Methodologies

Section 4.3.8 of the SPRA submittal states that detailed separation of variables (SoV) fragility calculations have been performed for selected high risk significant SSCs. A final set of the most important contributors to SCDF [seismic core damage frequency] and SLERF [seismic large early release frequency] are summarized in Tables 5.4-3, 5.4-4, 5.5-3, and 5.5-4 of the SPRA submittal. These tables show the Fussell-Vesely importance measure values and indicate which fragility calculation method was used in the SPRA. However, the submittal does not describe WBN’s method for selecting the dominant risk contributors on which to perform SoV fragility calculations or provide a basis for that approach. Moreover, the cited tables only present one case for which SoV fragility analysis was performed (i.e., the “Southern DG Block Walls”). Accordingly, it is not clear whether guidance in the EPRI Seismic Evaluation Guidance (SPID) for performing SoV fragility calculations on the dominant risk contributors was followed. In light of these observations, explain WBN’s method for selecting the dominant risk contributors on which SoV fragility calculations were performed and provide justification for the approach.

Clarification Question 08 – Review of Plant Modifications

The Executive Summary and Section 6.0 (Conclusions) of the SPRA submittal state that “no seismic hazard vulnerabilities were identified, and no plant actions have been taken or are planned...” To better understand TVA’s basis for the cited statement and continue our review, please clarify:

- a) Which factors were considered in determining that no plant improvements should be implemented to reduce the seismic risk, particularly with respect to the SLERF.
- b) Whether there were any conservatisms and/or non-conservatisms in the analysis and how they contributed to this determination with respect to SLERF results.
- c) Whether any potential modifications were considered to address the significant contributors identified in Table 5.5-3 and Table 5.5-4, and whether there were

differences in those considerations for Unit 1 versus Unit 2. If potential modifications were considered, please discuss the conclusions with respect to the following items:

- i. “seismically induced failure of HRA [human reliability analysis] instrumentation” and the associated functionality/anchorage failure mode
 - ii. “seismically induced flooding event” and the associated anchorage failure mode
 - iii. “breaker chatter LVS [low voltage switchgear]” and “breaker chatter MVS [medium voltage switchgear]” and the associated breaker chatter failure mode
- d) How the importance measures were determined from the SPRA in the context of the ‘binning’ approach employed in the WBN SPRA and whether the results are considered to be realistic, conservative, or non-conservative. Also, clarify how the same basic events, which were discretized by bin during the development of the SPRA, were then combined to develop representative importance measures.