NRR-DRMAPEm Resource

From: Schaaf, Robert
Sent: Tuesday, June 18, 2019 4:05 PM
To: 'Wells, Russell Douglas'
Cc: Hulvey, Kimberly Dawn; Brown, Michael Anthony; Saba, Farideh; 'Edmondson, Carla'
Subject: Watts Bar Nuclear Plant - Final Request for Additional Information Related to Application to Adopt 10 CFR 50.69 (EPID L-2018-LLA-0493)
Attachments: Watts Bar 50.69 Final RAIs.pdf

Russ,

By letter dated November 29, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18334A363), the Tennessee Valley Authority (TVA) submitted a license amendment request (LAR) for the Watts Bar Nuclear Plant (WBN), Units 1 and 2. The requested amendments would modify the WBN Facility Operating Licenses to implement the provisions of 10 CFR, Part 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors."

The U.S. Nuclear Regulatory Commission (NRC) staff has determined that additional information, as described in the attached request for additional information (RAI), is required for the staff to complete its review of the subject LAR. These RAIs were transmitted to TVA as draft on May 9, 2019. TVA requested a clarification teleconference regarding the draft RAIs, which was held on May 30, 2019. During the call, the staff agreed to minor wording changes to DRA RAI 01 and DRA RAI 12. The staff also agreed to revise several questions in DRA RAI 08 to clarify the information requested.

During its revisions to DRA RAI 08, the staff determined the need to include an additional question regarding findings and observations (F&Os) 3-6 and 1-6. During the clarification call Attachment 3 and Attachment 6 of the LAR were discussed. Based on this discussion, the staff has added question DRA RAI 08 e. to request TVA to address the assumptions/sources of uncertainty and their application with respect to the base probabilistic risk assessment for these F&Os, similar to other DRA RAI 08 questions.

During the call, TVA requested 60 days to respond to this request to allow time for contractor support to develop uncertainty estimates. In subsequent discussion this was clarified to be 60 days from the date of the clarification call, which is July 29, 2019. The staff has determined that the requested response period is acceptable; however, to the extent practical, TVA is requested to provide responses to questions not requiring uncertainty estimates be provided by separate submittal within 45 days from the date of the clarification call, which is July 15, 2019.

The staff is evaluating the effect of the additional requested response time on the current planned completion date for the review of April 2020, and may determine that additional time is needed to complete the review. We will inform TVA promptly of any review schedule impact determination.

Please call me at 301-415-6020 if you have any questions regarding this request for information.

Regards,

Robert G. Schaaf

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Hearing Identifier: NRR_DRMA
Email Number: 59

Mail Envelope Properties (BN7PR09MB2690DB3EF1A4E1718A463035F9EA0)

Subject: Watts Bar Nuclear Plant - Final Request for Additional Information Related to Application to Adopt 10 CFR 50.69 (EPID L-2018-LLA-0493)
Sent Date: 6/18/2019 4:04:47 PM
Received Date: 6/18/2019 4:04:49 PM
From: Schaaf, Robert

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Files	**Size**	**Date & Time**
MESSAGE	2921	6/18/2019 4:04:49 PM
Watts Bar 50.69 Final RAIs.pdf	288630	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

REQUEST FOR ADDITIONAL INFORMATION

RELATED TO APPLICATION TO ADOPT 10 CFR 50.69 RISK-INFORMED

CATEGORIZATION OF STRUCTURES, SYSTEMS, AND COMPONENTS

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT, UNITS 1 & 2

FACILITY OPERATING LICENSE NOS. NPF-90 AND NPF-96

Title 10 of the Code of Federal Regulations, Section 50.69 (10 CFR 50.69), "Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors", allows licensees to use a risk-informed process to categorize systems, structures, and components (SSCs) according to their safety significance in order to remove SSCs of low safety significance from the scope of certain identified special treatment requirements. Regulatory Guide (RG) 1.201, Revision 1, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to their Safety Significance" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML061090627) endorses, with regulatory positions and clarifications, the Nuclear Energy Institute (NEI) guidance document NEI 00-04, Revision 0 "10 CFR 50.69 SSC Categorization Guideline", (ADAMS Accession No. ML052910035) as one acceptable method for use in complying with the requirements in 10 CFR 50.69. Both RG 1.201 and NEI 00-04 cite RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," (ADAMS Accession No. ML040630078) which endorses industry consensus probabilistic risk assessment (PRA) standards, as the basis against which peer reviews evaluate the technical adequacy of a PRA. Revision 2 of RG 1.200 is available at ADAMS Accession No. ML090410014.

By letter dated November 29, 2018 (ADAMS Accession No. ML18334A363), Tennessee Valley Authority (TVA), submitted a license amendment request (LAR) to adopt 10 CFR 50.69, Risk-informed Categorization and Treatment of Structures, Systems, and Components for Watts Bar Nuclear Plant (WBN), Units 1 & 2. Section 3.1.1 of the LAR states that TVA will implement the risk categorization process in accordance with NEI 00-04, Revision 0, as endorsed by RG 1.201. However, TVA's LAR does not contain sufficient information for the Nuclear Regulatory Commission (NRC) staff to determine whether TVA has implemented the guidance in NEI 00-04, as endorsed by RG 1.201, appropriately to demonstrate compliance with all the requirements in 10 CFR 50.69. The following requests for additional information (RAIs) outline the specific issues and information needed to complete the NRC staff's review:

DRA RAI 01 – Appendix X, Close-out of Facts and Observations (APLA)

Section 2 of RG 1.200 states for the applicable technical requirements, "the staff anticipates that current good practice, i.e., Capability Category II (CC II) of the American Society of Mechanical Engineers (ASME)/ American Nuclear Society (ANS) PRA standard, is the level of detail that is adequate for the majority of applications," and that a peer review is needed to determine if the intent of the requirements in the standard is met. The primary result of a peer review are the

Facts and Observations (F&Os) recorded by the peer review team. The process to close finding-level F&Os is documented in Appendix X to NEI 05-04, 07-12, and 12-13 "Close-out of Facts and Observations (F&Os)[1]," as accepted by NRC in letter dated May 3, 2017[2].

Section 3.3 of the LAR states that a finding closure review was conducted on the internal events (including internal floods) PRA (IEPRA) model in June 2017 and for the seismic PRA (SPRA) in April 2017.

a. Provide the following information to confirm that the F&O closure review for internal events, including internal flooding, was performed consistent with Appendix X to NEI 05-04, 07-12, and 12-13, as accepted by the staff, with conditions.

    i. Confirm that the Independent Assessment team was provided with and performed an independent written assessment that included justification of whether the resolution for each F&O constituted a PRA upgrade or maintenance update, as defined in the ASME/ANS ASME/ANS RA-Sa-2009 PRA Standard and endorsed by RG 1.200, Revision 2.

    OR

    ii. Alternatively, perform a subsequent Independent Assessment for F&O(s) closure and/or addendum to the Independent Assessment report to address the inconsistency with Appendix X, as accepted, with conditions, by the NRC staff via letter dated May 3, 2017. Provide any F&Os or items remaining open as a result of this review. For each F&O and/or item that remains open, provide its associated disposition to demonstrate that it has no adverse impact on the 10 CFR 50.69 risk-informed application.

b. Appendix X guidance states in part, [t]he relevant PRA documentation should be complete and have been incorporated into the PRA model and supporting documentation prior to closing the finding. For closure after the on-site review, Appendix X guidance further states, "[t]he host utility may, in the time between the on-site review and the finalization of the Independent Assessment team report, demonstrate that the issue has been addressed, that a closed finding has been achieved, and that the documentation has been formally incorporated in the PRA Model of Record [MOR]."

    Attachment 2 of the LAR states, the internal events (including internal flooding) PRA (IEPRA) models to be used in categorization for Units 1 and 2 are both Revision 3, dated March 2017 for the respective MORs. The NRC staff notes that the F&O closure review for the internal events, including internal flooding, PRA occurred in June 2017.

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[1] Anderson, V. K., Nuclear Energy Institute, letter to Stacey Rosenberg, U.S. Nuclear Regulatory Commission, "Final Revision of Appendix X to NEI 05-04/07-12/12-16, 'Close-Out of Facts and Observations," dated February 21, 2017 (ADAMS Package Accession No. ML17086A431).

[2] Giitter, J., and Ross-Lee, M. J., U.S. Nuclear Regulatory Commission, letter to Mr. Greg Krueger, Nuclear Energy Institute, "U.S. Nuclear Regulatory Commission Acceptance on Nuclear Energy Institute Appendix X to Guidance 05-04, 07-12, and 12-13, Close-Out of Facts and Observations (F&Os)," dated May 3, 2017 (ADAMS Accession No. ML17079A427).

i. Confirm that all model changes associated with the closure of all F&Os reviewed during the Independent Assessment performed in June 2017 for the IEPRA (includes internal floods) model were incorporated into the PRA models and/or the supporting documentation at the time of the finalization of the Independent Assessment team report, consistent with the staff's acceptance and conditions provided in the letter dated May 3, 2017.

OR

ii. Perform a subsequent Independent Assessment for F&O closure and/or addendum to the Independent Assessment F&O closure report to address the identified inconsistency with Appendix X, as accepted, with conditions, by the NRC staff in letter dated May 3, 2017. Provide any F&Os that remain open as a result of this review. For each F&O and/or item that remains open, provide its associated disposition to demonstrate that it has no adverse impact on the 10 CFR 50.69 risk-informed application.

iii. Alternatively, propose a mechanism that assures all the PRA model and documentation changes reviewed by the Independent Assessment team for the closure of all F&Os in the final Independent Assessment report are incorporated into the MOR(s) prior to implementation of the 10 CFR 50.69 risk-informed categorization.

c. Appendix X guidance states in part, "[i]n some cases, the Independent Assessment team may be assembled such that some reviewers are only needed for a limited number of finding reviews, and it may be possible to have these reviewers participate remotely. This remote participation should be supported with web and teleconference connection to the on-site review team, and the remote reviewers should participate in relevant consensus sessions."

i. If remote (i.e. subsequent reviews) were performed following the Independent Assessment team's onsite review, describe the scope of the remote review performed. Include details for the NRC staff to confirm consistency with Appendix X (i.e., if the subsequent review and consensus session was remote using web conferencing, or face-to-face and the number of participants).

OR

ii. Alternatively, perform a subsequent Independent Assessment for F&O closure and/or addendum to the Independent Assessment report to address the identified inconsistency with Appendix X, as accepted, with conditions, by the NRC staff in letter dated May 3, 2017. Provide any F&Os that remain open as a result of this review. For each F&O and/or item that remains open, provide its associated disposition to demonstrate it has no adverse impact on the 10 CFR 50.69 risk-informed application.

d. Appendix X guidance states in part, the team will review the Supporting Requirement (SR) to ensure that the aspects of the underlying SR that were previously not met, or met at [Capability Category] CC I, are now met, or met at CC II.

i. Explain how closure of all F&Os was assessed to ensure that the capabilities of the PRA elements, or portions of the PRA within the elements, associated with the closed F&Os now meet ASME/ANS RA-Sa-2009 SRs at CC II.

OR

ii. Alternatively, perform a subsequent Independent Assessment for F&O closure and/or addendum to the Independent Assessment report to address the inconsistency with the Appendix X process, as accepted, with conditions by the NRC staff in letter dated May 3, 2017. Provide any F&Os that remain open as a result of this review. For each F&O and/or item that remains open, provide its associated disposition to demonstrate that it has no adverse impact on the 10 CFR 50.69 risk-informed application.

DRA RAI 02 – Seismic PRA Peer-Review and Use of Appendix X, Close-out of Facts and Observations for the Seismic PRA (RILIT)

Section 2.2 of RG 1.200, Revision 2, provides regulatory guidance regarding peer reviews and the staff regulatory position on NEI 00-02, "Probabilistic Risk Assessment (PRA) Peer Review Process Guidance" (ADAMS Accession No. ML061510619), 05-04 "Process for Performing Follow-On [Internal Events] PRA Peer Reviews Using the American Society of Mechanical Engineers (ASME)/American Nuclear Society (ANS) PRA Standard" (ADAMS Accession No. ML083430462), and 07-12 "Fire Probabilistic Risk Assessment (FPRA) Peer Review Process Guidelines" (ADAMS Accession No. ML102230070). Section 2 of TVA's response to the 10 CFR 50.54(f) information request arising from Near Term Task Force (NTTF) recommendation 2.1 (ADAMS Accession No. ML17181A485) states that the seismic PRA (SPRA) peer review was performed in accordance with the guidance in NEI 12-13. NRC letter, "U.S. Nuclear Regulatory Commission Acceptance of Nuclear Energy Institute (NEI) Guidance NEI 12-13, "External Hazards PRA Peer Review Process Guidelines," (August 2012)," dated March 7, 2018 (ADAMS Accession No. ML18025C025), provides the staff clarifications and qualifications on this guidance for seismic and external hazard PRA peer reviews. Further, the staff accepted the F&O independent assessment process, with conditions, in NRC letter, "U.S. Nuclear Regulatory Commission Staff Expectations For An Industry Facts And Observations Independent Assessment Process," dated May 3, 2017 (ADAMS Accession No. ML17079A427). The LAR does not discuss the consideration of the staff's clarifications and qualifications on NEI 12-13 during the performance of the peer review for the licensee's SPRA or the consideration of the staff's conditions on the F&O independent assessment process used for closure of the SPRA finding level F&Os.

Discuss how the SPRA peer review and the F&O independent assessment considered the staff's clarifications and qualifications on NEI 12-13 in the NRC letter dated March 7, 2018, and the staff's conditions on the use of the F&O independent assessment process in the NRC letter dated May 3, 2017. Provide justification for not considering specific clarifications, qualifications, or conditions in those letters in the context of this application.

DRA RAI 03 – SSCs Categorization Based on Other External Hazards (RILIT)

Paragraph (b)(2)(ii) of 10 CFR 50.69 requires that the quality and level of detail of the systematic processes that evaluate the plant for external events during operation is adequate for the categorization of SSCs.

Section 3.2.4 of the LAR Enclosure 1 states that, “[a]ll other external hazards were screened from applicability to WBN Units 1 and 2 per a plant-specific evaluation in accordance with Generic Letter (GL) 88-20 and updated to use the criteria in ASME PRA Standard RA-Sa-2009. Attachment 4 provides a summary of the other external hazards screening results.”

a. Attachment 4, “External Hazards Screening,” of the LAR screens external flooding based on the following criteria:

   PS1: Design Basis hazard cannot cause a core damage accident.

   PS2: Design basis for the event meets the criteria in the NRC 1975 Standard Review Plan (SRP).

   Therefore, TVA's basis for screening the external flooding hazard from consideration for this application seems to rely on compliance with the Current Design Basis (CDB) with respect to mitigation of the hazard. The attachment further states that flood protection plans, designed to minimize impact of floods above plant grade on safety-related facilities are in place.

   The NRC staff’s assessments of TVA’s response to 10 CFR 50.54(f) information request for the re-evaluated flood hazard at its site (ADAMS Accession Numbers ML15310A080 and ML15239B287) identifies three flooding hazards that were not bounded by the current design basis; namely local intense precipitation (LIP), flooding in streams and rivers, and the combined effects flood caused by probable maximum flood (PMF) and maximum wind-wave activity. The discussion for external flooding in Attachment 4 of the LAR does not discuss the above cited flooding hazards. It is unclear to the NRC staff if the hazard screening included recent information and if an updated assessment has been conducted. In light of these observations:

   i. Provide justification using the criteria in Section 6.2-3 of ASME/ANS RA-Sa-2009 for screening the external flooding hazard from this application including consideration of the hazards that were found to not be bounded by the current licensing basis. The justification should include consideration of uncertainties in the determination of demonstrably conservative mean values as discussed in Section 6.2-3 of ASME/ANS RA-Sa-2009.

   ii. If the external flooding hazard cannot be screened out, provide justification using the criteria in Section 6.2-3 of ASME RA-Sa-2009 for screening the external flooding hazard from this application. The justification should include consideration of the following factors:

      - Uncertainties in the determination of demonstrably conservative mean values.
      - Reevaluated external flood hazard information,
      - The frequency of external flooding mechanisms including local intense precipitation (LIP), flooding in streams and rivers, and combined event flooding hazards,
      - The impact of external flooding hazards, such as LIP flooding in streams and rivers, and combined event river flooding hazards, on

plant SSCs and plant operation including the ability to cope with upset conditions,

- The operating experience associated with reliability of flood protection measures, including operator action reliability, and
- Identify and justify what type of SSCs, if any, are credited in the screening of the external flooding hazard, including both passive and active features.

iii. If the external flooding hazard is screened out, identify any active and passive SSCs that are credited for the screening (i.e. credited as flood protection features) and discuss how those SSCs will be included and considered in the proposed categorization process.

b. Attachment 4, "External Hazards Screening," of the LAR screens extreme wind and tornado hazards. The discussion of the screening criteria is based on the design of Category I structures as well as the design and protection against tornado and tornado missile hazards. It is unclear if any SSCs are being credited as part of the screening (i.e. protection features) of the high winds and tornado, including tornado missile, hazard and how any such SSCs will be considered in the categorization process.

Identify any active and passive SSCs that are credited for screening the external winds and tornado hazard and discuss how those SSCs will be included and considered in the proposed categorization process.

DRA RAI 04 – Identification of Key Assumptions and Sources of Uncertainties (APLA/RILIT)

Paragraphs (c)(1)(i) and (ii) OF 10 CFR 50.69 require that a licensee's PRA be of sufficient quality and level of detail to support the SSC categorization process, and that all aspects of the integrated, systematic process used to characterize SSC importance must reasonably reflect the current plant configuration and operating practices, and applicable plant and industry operational experience.

Section 5 of NEI 00-04 provides guidance for performing sensitivity studies for each PRA model to address the uncertainty associated with those models. Specifically, Sections 5.1 and 5.3 provide guidance for such sensitivities for the internal events PRA and SPRA, respectively. The sensitivity studies are performed to ensure that assumptions and sources of uncertainty (e.g., human error, common cause failure, and maintenance probabilities) do not mask importance of components.

In Section 4.1 of the LAR, Watts Bar identifies RG 1.174, Revision 3 as an applicable regulatory guidance. Regulatory Guide 1.174, Revision 3, cites NUREG-1855, Revision 1, as related guidance. In Section B of RG 1.174, Revision 3, the guidance acknowledges specific revisions of NUREG-1855 to include changes associated with expanding the discussion of uncertainties.

Attachment 6 of the LAR contains a total of three key assumptions/sources of uncertainties identified within the IEPRA (includes internal floods) and the SPRA. Section 3.2.7 of the LAR states in part, "[t]he detailed process of identifying, characterizing and qualitative screening of model uncertainties is found in Section 5.3 of NUREG-1855 (Revision 0) and Section 3.1.1 of

[Electric Power Research Institute (EPRI) Technical Report (TR)] 1016737." For identification of the three key assumptions and sources of uncertainty provided in Attachment 6 of the LAR, Section 3.2.7 of the LAR states, in part,

> "[t]he list of assumptions and sources of uncertainty were reviewed to identify those which would be significant for the evaluation of this application. If the WBN PRA model used a non-conservative treatment, or methods that are not commonly accepted, the underlying assumption or source of uncertainty was reviewed to determine its impact on this application. Only those assumptions or sources of uncertainty that could significantly impact the configuration risk calculations were considered key for this application."

NUREG-1855 has been updated to Revision 1 as of March 2017 (ADAMS Accession No. ML17062A466). Section 3.2.3 of RG 1.200, Revision 2, as well as NUREG-1855 (Revision 1) provide guidance on how to identify, characterize, and treat key sources of uncertainty relevant to a risk-informed application. Revision 1 of NUREG-1855 additionally cites EPRI TR-1026511, "Practical Guidance on the Use of Probabilistic Risk Assessment in Risk-Informed Applications with a Focus on the Treatment of Uncertainty."

Additionally, Section 3.3.2 of RG 1.200, Revision 2, defines key assumptions and sources of uncertainty. The NRC staff requests the following information to confirm that the key assumptions and sources of uncertainty provided in Attachment 6 of the LAR were properly assessed from the base PRAs that have received peer reviews:

a. Provide a description of the process used to determine the key sources of uncertainty and assumptions for each PRA model used to support this application. The discussion should be provided separately for the IEPRA (includes internal floods) and SPRA and include:

    i. A description of how the key assumptions and sources of uncertainties provided in Attachment 6 were identified from the initial comprehensive list of PRA model(s) (i.e., base model) source of uncertainties and assumptions, including those associated with plant-specific features, modeling choices, and generic industry concerns. This can include an identification of the sources of plant-specific and applicable generic modeling uncertainties identified in the uncertainty analyses for the base internal events and internal flooding PRA.

    ii. A discussion on how the process and the criteria used to identify an assumption or source of uncertainty as "key" is consistent with RG 1.200, and/or NUREG-1855, Revision 1, or Revision 2, or other NRC-accepted methods.

b. If the process of identifying "key" assumptions or sources of uncertainty for the PRA models used to support this application cannot be justified for use in the 10 CFR 50.69

categorization process, provide the results of an updated assessment that includes a description of each key assumption or source of uncertainty identified.

DRA RAI 05 – Dispositions of Key Assumptions and Sources of Uncertainties (APLA/RILIT)

Paragraph (c)(1)(i) of 10 CFR 50.69 requires the licensee to consider the results and insights from the PRA during categorization. The guidance in NEI 00-04 specifies sensitivity studies to be conducted for each PRA model. The sensitivity studies are performed to ensure that assumptions and sources of uncertainty (e.g., human error, common cause failure, and maintenance probabilities) do not mask importance of components. NEI 00-04 guidance states that additional "applicable sensitivity studies" from characterization of PRA adequacy should be considered.

The NRC notes that modelling conservatisms (i.e., assumptions and sources of uncertainty) can mask the importance measures of other SSCs. Sections 5.1, and 5.3 of NEI 00-04 provide guidance on performing individual sensitivity studies for key assumptions and sources of uncertainties as part of the categorization process. Section 3.2.7 of the LAR states, "[t]he conclusion of this review is that no additional sensitivity analyses are required to address WBN PRA model specific assumptions or sources of uncertainty." It is unclear to the NRC staff if any sensitivity studies will be performed for each of the key assumptions and sources of uncertainties provided in Attachment 6 of the LAR and how the determination to either perform or not perform sensitivities was made. Considering these observations, address the following:

a. For any additional key assumptions/sources of uncertainty identified as a result of the response to DRA RAI 04, discuss how each identified key assumption and uncertainty will be dispositioned in the categorization process. The discussion should clarify whether TVA is following the guidance in Section 5 of NEI 00-04 by performing sensitivity analysis or other accepted guidance such as NUREG-1855. The summaries and descriptions should be provided separately for the identified key assumptions and uncertainties related to the IEPRA (includes internal floods) and SPRA.

b. The key assumptions and sources of uncertainties identified as part of the LAR may change because updates to the PRAs supporting this application (i.e., IEPRA (includes internal floods) and SPRA) could affect the significance of those assumptions for this application or create new key assumptions or sources of uncertainties for this application.

   Describe how TVA's 10 CFR 50.69 program assures that the evaluation of "key" assumptions and sources of uncertainty for the PRAs supporting this application (i.e., IEPRA (includes internal floods) and SPRA) are modified to support the categorization process.

DRA RAI 06 – Alternate Method Proposed to Assess Contribution from Internal Fires (APLA)

Paragraph (c)(1)(ii) of 10 CFR 50.69 requires that the licensee determine the SSC's functional importance using an integrated, systematic process for addressing initiating events (internal

and external), SSCs, and plant operating modes, including those not modeled in the plant-specific PRA.

Section 3.2.2 of the LAR states in part, "[t]he WBN categorization process will use the Fire Safe Shutdown Equipment List (SSEL) for evaluation of safety significance related to fire hazards." It further states that this approach addresses conditions defined by 10 CFR 50, Appendix R, NRC Branch Technical Position CMEB 9.5-1, regulatory exemptions, and fire-induced multiple spurious operations to identify equipment. The LAR describes this approach as an alternate ***process*** from the NEI 00-04 endorsed approaches and is considered to be a conservative method, compared to the FIVE methodology or fire PRA, based on industry assessments.

Section 3.3 of NEI 00-04, Revision 0, provides limited guidance for determining the technical adequacy attributes required for these types of analyses for this specific application. RG 1.201, Revision 0, states in part, "as part of the plant-specific application requesting to implement §50.69, the licensee or applicant will provide the bases supporting the technical adequacy of its…non-PRA-type analyses for this application."

Address the following regarding the proposed alternate approach:

a. Provide justification that use of the Fire SSEL method is technically adequate relative to the acceptable methods identified in NEI 00-04. Include in the justification: (1) the industry assessments referenced in the LAR and (2) TVA summary of the industry evaluations and how the results from the evaluations support the conclusion that the TVA's proposed approach to use the Fire SSEL is conservative. The justification provided should also demonstrate how additional SSCs will be assigned high safety significance (HSS) with TVA's approach compared to using a previously accepted method (e.g., additional SSCs would not be identified in a FIVE or fire PRA analysis when compared to the Fire SSEL method).

b. Section 3.2.2 of the LAR states in part, "[t]he fire safe shutdown paths identify the safety functions and associated sets of equipment credited to achieve and maintain safe shutdown under postulated fire conditions" and that, "[t]he fire SSEL identifies the credited equipment." Section 3.2.2 of the LAR also states "additional equipment that is relied upon to establish and maintain safe shutdown will be retained as HSS." In review of Figure 3.1 of the LAR, it appears there are other SSCs, not on the Fire SSEL, that may be considered for safe shutdown. According to Figure 3.1, if an SSC is not already on the SSEL, the next step in the process is to question whether the SSC is relied upon to maintain safe shutdown for a fire. An affirmative response to this question would categorize the SSC as candidate HSS.

    i. Provide clarification along with a rationale for the additional equipment that will be identified as HSS for a fire event that is not on the SSEL.

    ii. Confirm that all the SSCs identified as candidate HSS per Figure 3.1 of the LAR will remain HSS at the end of the categorization and cannot be recategorized by the Integrated Decision-making Panel.

c. Clarify whether the fire detection and suppression (and fire dampers) equipment is included on WBNs SSEL. If not included, summarize how the risk-significance of this

equipment will be evaluated to determine whether the equipment is HSS or low safety significance (LSS).

d. Fire protection actions can be credited if they are “feasible and reliable” but PRA actions generally are not credited unless they are proceduralized and have a failure probability assigned. Provide discussion for how the probability of failure of operator actions is incorporated/considered in the analysis for determining SSCs identified on the SSEL.

DRA RAI 07 - Integrated PRA Hazards Model (APLA/RILIT)

Paragraph (c)(1)(ii) of 10 CFR 50.69 requires that the SSC functional importance be determined using an integrated, systematic process. NEI 00-04, Section 5.6, “Integral Assessment,” discusses the need for an integrated computation using available importance measures. It further states that the “integrated importance measure essentially weighs the importance from each risk contributor (e.g., internal events, fire, seismic PRAs) by the fraction of the total core damage frequency [or large early release frequency] contributed by that contributor.” The guidance provides formulas to compute the integrated Fussel-Vesely (FV), and integrated Risk Achievement Worth (RAW).

Based on the information provided in the LAR, it is not clear to NRC staff how TVA proposes to address the integration of importance measures across all hazards (i.e., internal events, internal flooding, and seismic). Considering these observations provide the following:

a. Explain how the integration of importance measures across hazards for the 10 CFR 50.69 categorization process will be performed and whether it will be performed using an integrated one-top (single top gate) model across multiple PRA hazards.

b. Discuss how the individual importance measures (e.g., FV and RAW) for the PRA model are derived and justify why the importance measures generated do not deviate from the NEI guidance or Table 3-1 of the LAR. If the practice or method used to generate the integrated importance measures is determined to deviate from the NEI guidance, then provide justification to support why the integrated importance measures computed are appropriate for use in the categorization process.

c. Describe how the importance measures (i.e., FV and RAW) for the PRA one-top, all hazards model are derived for the SPRA considering that the seismic hazard is discretized into ‘bins.’ The discussion should include how the same basic events, which were discretized by binning during the development of the SPRA, are then combined (i.e., combined across ‘bins’ as well as across failure modes such as seismic and random failure modes) to develop representative importance measures. Further, discuss how they are compared to the importance measure thresholds in NEI 00-04. Provide justification to support the determined impact on the categorization results and describe how the approach is consistent with the guidance in NEI 00-04.

d. In the context of the "integral assessment" described in Section 5.6 of NEI 00-04, it is understood that importance evaluations performed in accordance with the process in NEI 00-04 are determined on a component basis. However, it is not apparent from the LAR and the NEI 00-04 guidance how the integrated importance measures are calculated for certain components where corresponding basic events, which represent different failure modes for a component, in the SPRA may not align with

basic events in other PRA modeled hazards. Examples of such basic events include those that are specific to the SPRA, including implicitly modeled components, or basic events that represent a subcomponent modeled within the boundary of an internal events PRA component.

Provide details and justification to support how the integrated importance measures will be calculated for the SPRA modeled basic events that may not align directly with basic events modeled in other PRA hazards. Include discussion for any 'mapping' that will be performed across the SPRA basic events and those in other PRA modeled hazards where additional modelling is determined to be necessary.

DRA RAI 08 – Open/Partially Open Findings from the Independent Assessment (APLA/RILIT)

Section 4.2 of RG 1.200 states that the LAR should include a discussion of the resolution of the peer review findings and observations (F&Os) that are applicable to the parts of the PRA required for the application. This discussion should take the following forms:

- a discussion of how the PRA model has been changed
- a justification in the form of a sensitivity study that demonstrates the accident sequences or contributors significant to the application decision were not adversely impacted (remained the same) by the issue.

Attachment 3 of the LAR, "Disposition and Resolution of Open Peer Review Findings and Self-Assessment Open Items," provides finding-level F&Os that are still open or only partially resolved after the F&O closure review. Address the following:

a. For F&Os 2-28 and 7-10, associated with Supporting Requirements (SR) QU-C1 and IFQU-A6, the disposition provided in Attachment 1 of the LAR states in part, "[t]he issues associated with these F&Os will be corrected." However, the dispositions provided in Attachment 3 of the LAR for the F&Os (i.e., 2-28 and 7-10) states that, "TVA intends, to set joint human error probabilities (JHEP) values greater than or equal to $1.0x10^{-5}$ and re-evaluate and update human event probabilities (HEP) for actions that are less than one hour. It is unclear to the NRC staff based upon TVAs *intentions* how the final resolutions to these F&Os will be incorporated into the PRA models used for the categorization process.

   Provide clarification that, for the dispositions (resolutions) of these F&Os, TVA's intentions will include (1) addressing all the JHEPs in the recovery rule file(s) with a floor value of 1E-05 and (2) updating all HEPs for operator actions that are less than one hour.

b. For F&O 7-22, associated with LE-D5, for the disposition of this F&O provided in Attachment 3 of the LAR, TVA states in part, "[t]he result of not taking credit for secondary side isolation for a SGTR [Steam Generator Tube Rupture] results in an over-conservatism that would potentially cause more SSCs to be categorized as HSS, RISC-1 and RISC-2 than LSS RISC-3 and RISC-4 if credit had been taken." The NRC acknowledges that modelling conservatisms have the potential to mask the importance measures of other modeled SSCs. NUREG-1855 and NEI 00-04 provide guidance to address instances for which sensitivities should be performed to quantitatively assess

the identification, characterization, and treatment of implicit modeling assumptions where the potential exists for the risk metrics to be used for the risk-informed application.

Section 4.3.2 of NUREG-1855, Revision 1, states in part, "[t]he analyst may screen out initiating events, component failure modes, and human failure events so that the model does not become encumbered with insignificant detail." The guidance goes on to further state, "[t]he generally conservative bias that results, could be removed by developing a more detailed model." Section 7.4 of NUREG-1855, for Stage E states in part, "[a]ny such source of model uncertainty that could cause the risk metric results to challenge or further exceed the acceptance guidelines are considered to be key." It is unclear to the NRC staff how TVA concluded that not crediting the operator actions in the PRA models, especially for SGTR, would not adversely impact the categorization of SSCs for future risk-analysis without performing a case sensitivity study or inclusion of the operator actions into the model. Considering these observations, provide the following:

i. Provide qualitative or quantitative justification that supports the determination that not modeling secondary side isolation for a SGTR in the base IEPRA (includes internal floods) will not adversely impact the categorization of SSCs in the 10 CFR 50.69 application and is not a key assumption/source of uncertainty. If determined to be a key assumption/source of uncertainty provide an updated Attachment 6 of the LAR. For any quantitative justification used, discuss how it is consistent with the recommended sensitivities prescribed in Tables 5-2, 5-3, 5-4, and 5-5 of NEI 00-04 and the guidance provided in NUREG-1855, Revision 1, to identify, characterize, and treat assumptions and sources of modeling uncertainty that are key to an application.

OR

ii. Alternatively, incorporate the operator actions involving isolation of the secondary side into the PRA models used for the categorization process. If determined that the incorporation of the HEPs and any other logic changes into the PRA model constitutes an upgrade to the PRA model as defined in the ASME/ANS RA-Sa-2009 PRA Standard, propose a mechanism to perform a focused scope peer review and resolve any potential F&Os generated from the peer review prior to implementing the SSC categorization process.

c. For F&O 7-21, the associated SR IFEV-B3 remains not met at CC-II for the Watts Bar IEPRA (includes internal floods). The SR IFEV-B3 in the ASME/ANS Ra-SA 2009 PRA standard states to [d]ocument sources of model uncertainty and related assumptions (as identified in QU-E1 and QU-E2) associated with the internal flood-induced initiating events. SRs QU-E1 and QU-E2 further states to identify sources of model uncertainty and assumptions made in the development of the PRA. For the disposition provided in Attachment 3 of the LAR, the Independent Assessment team discusses that [i]t is not clear from the documentation how the selected error factor was calculated in cases where different error factors are shown for various pipe sizes and further explains that Section 2-2.7 of the ASME/ANS Ra-SA 2009 PRA standard for SR QU-E3 prescribes how quantification is to be performed for internal events, which involves parametric uncertainty analysis be performed. For the disposition the licensee states in part, "[t]his

finding will require sensitivity studies to be performed as needed to support evaluation in the 50.69 categorization process."

It is unclear to the NRC staff what the assumption(s)/sources of model uncertainty are for the internal flood-induced initiating events associated with F&O 7-21 or the applicable treatment (i.e., sensitivities to be performed). . Considering these observations, provide the following:

i. Provide all the sources of uncertainty and assumptions associated with F&O 7-21 for the base IEPRA (includes internal floods) model. For each source of uncertainty and assumption, confirm if it is key to the 10 CFR 50.69 categorization process and provide an updated Attachment 6 of the LAR if necessary.

ii. Describe the sensitivities to be performed and how they are applicable for addressing each of the sources of uncertainty and assumptions identified in RAI 08.c.(i). In the description, include how the application of the sensitivities is consistent with NUREG 1855, Revision 1 and NEI 00-04 as endorsed, to address the parametric model uncertainty in the IEPRA (includes internal floods) model that will be used for SSC categorization.

d. For F&O 5-8, associated with SRs LE-C2, LE-C7, LE-C9, and LE-E1, for the disposition provided in Attachment 3 of the LAR, the Independent Assessment team concluded that SR LE-C9 may be considered MET at CC II-III and SR LE-C2 remains MET at CC I because there are operator actions following the onset of core damage that were treated conservatively and not updated to address the F&O. The disposition does not address if the Independent Assessment team determined if the other SRs LE-C7 and LE-E1 were met or not met at CC-II. It is unclear to the NRC staff if those SRs (i.e., LE-C7 and LE-E1) associated with the F&O are met at CC-II.

i. Confirm that the Independent Assessment team determined if the SRs LE-C7 and LE-E1 were determined met at CC-II for F&O 5-8. If the SRs were determined met at CC II, provide a summary of the evaluation performed by the Independent Assessment team to support the conclusion.

Furthermore, in the disposition provided in Attachment 3 of the LAR for F&O 5-8, the licensee states, [t]he absence of crediting operations is an over-conservatism that would potentially result in more HSS SSCs, RISC-1 and RICS-2 than LSS RISC-3 and RISC-4 if credit has been taken." The NRC acknowledges that modelling conservatisms have the potential to mask the importance measures of other modeled SSCs. Section 4.3.2 of NUREG-1855, Revision 1 states in part, "[t]he analyst may screen out initiating events, component failure modes, and human failure events so that the model does not become encumbered with insignificant detail." The guidance goes on to further state, "[t]he generally conservative bias that results, could be removed by developing a more detailed model." Section 7.4 of NUREG-1855, for Stage E states in part, "[a]ny such source of model uncertainty that could cause the risk metric results to challenge or further exceed the acceptance guidelines are considered to be key." It is unclear to the NRC staff how TVA concluded that not crediting the operator actions in the PRA models would not adversely impact the categorization of SSCs for future risk-analysis without

performing a case sensitivity study or inclusion of the operator actions into the base model(s). Considering these observations, provide the following:

i. Provide qualitative or quantitative justification that supports the determination that not including the operator actions into the base PRA models will not adversely impact the categorization of SSCs in the 10 CFR 50.69 application and is not a key assumption/source of uncertainty. If determined to be a key assumption/source of uncertainty provide an updated Attachment 6 of the LAR. For any quantitative justification used, discuss how it is consistent with the recommended sensitivities prescribed in Tables 5-2, 5-3, 5-4, and 5-5 of NEI 00-04 and the guidance provided in NUREG-1855, Revision 1 to identify, characterize, and treat assumptions and sources of modeling uncertainty that are key to an application.

OR

ii. Alternatively, incorporate the operator actions involving isolation of the secondary side into the PRA models used for the categorization process. If determined that the incorporation of the HEPs into the PRA model constitutes an upgrade to the PRA model as defined in the ASME/ANS RA-Sa-2009 PRA Standard, propose a mechanism to perform a focused scope peer review and resolve any potential F&Os generated from the peer review prior to implementing the SSC categorization process.

e. For F&O 3-6 and 1-6 provided in Attachment 3 of the LAR, both dispositions state, [t]he NEI 00-04 categorization process, which TVA will follow, exercises key areas of uncertainty in the PRA (e.g., human reliability, CCF and no maintenance plant configurations). Attachment 6 of the LAR provides the PRA(s) identified key assumptions and sources of uncertainty along with the dispositions, however the assumptions and sources of uncertainty associated with F&O 3-6 and 1-6 are not provided as key in Attachment 6 of the LAR.

i. Provide qualitative or quantitative justification to demonstrate that the F&Os (i.e., 3-6 and 1-6) will not adversely impact the categorization of SSCs in the 10 CFR 50.69 application and is not a key assumption/source of uncertainty. If determined to be a key assumption/source of uncertainty provide an updated Attachment 6 of the LAR. For any quantitative justification used, discuss how it is consistent with the recommended sensitivities prescribed in Tables 5-2, 5-3, 5-4, and 5-5 of NEI 00-04 and the guidance provided in NUREG- 1855, Revision 1 to identify, characterize, and treat assumptions and sources of modeling uncertainty that are key to an application.

OR

ii. Alternatively, propose a mechanism to resolve the F&Os (i.e., 3-6 and 1-6) and include the specific actions (i.e., PRA changes) to be performed. If determined that the incorporation of the PRA changes into the PRA model constitutes an upgrade as defined in the ASME/ANS RA-Sa-2009 PRA Standard, include a mechanism to perform a focused scope peer review and resolve any potential

F&Os generated from the peer review prior to implementing the SSC categorization process.

DRA RAI 09 – Addition of FLEX to the PRA Model (APLA/RILIT)

The NRC memorandum dated May 30, 2017, "Assessment of The Nuclear Energy Institute 16-06, 'Crediting Mitigating Strategies in Risk-Informed Decision Making,' Guidance for Risk-Informed Changes to Plants Licensing Basis" (ADAMS Accession No. ML17031A269), provides the NRC's staff assessment of challenges to incorporating FLEX equipment and strategies into a PRA model in support of risk-informed decision making in accordance with the guidance of RG 1.200. The LAR does not state whether or not TVA has incorporated FLEX mitigating strategies and associated equipment into the PRA models used to support this application. Therefore, it is unclear whether FLEX equipment and operator actions are modeled in the PRA models used to support this application and, if applicable, whether the incorporation of FLEX equipment and actions into the PRA models was performed in an acceptable manner.

Provide the following information separately for internal events PRA, SPRA, and external hazard screening as appropriate:

a. Clarify whether FLEX equipment and associated actions have been credited in the PRAs used to support this application, identifying the specific PRA(s) that include such credit. If not incorporated or their inclusion is not expected to impact the PRA results used in the categorization process, no response to parts (b) and (c) is requested.

b. If the FLEX equipment or operator actions have been credited, and their inclusion is expected to impact the PRA results used in the categorization process, provide the following information separately for the IEPRA (includes internal floods) and SPRA, as appropriate:

    i. A discussion detailing the extent of incorporation, i.e. summarize the supplemental equipment and compensatory actions that have been quantitatively credited for each of the PRA models used to support this application.

    ii. If any credited FLEX equipment is dissimilar to other plant equipment credited in the PRA (i.e. SSCs with sufficient plant-specific or generic industry data), discuss the data and failure probabilities used to support the modeling and provide the rationale for using the chosen data. Include discussion on whether the uncertainties associated with the parameter values are in accordance with the ASME/ANS PRA Standard as endorsed by RG 1.200, Revision 2.

    iii. If any operator actions related to FLEX equipment are evaluated using approaches that are not consistent with the endorsed ASME/ANS RA-Sa-2009 PRA Standard (e.g., using surrogates), discuss the methodology used to assess human error probabilities for these operator actions. The discussion should include:

        1. A summary of how the impact of the plant-specific human error probabilities and associated scenario-specific performance

shaping factors listed in (a)-(j) of supporting requirement HR-G3 of the ASME/ANS RA-Sa-2009 PRA Standard were evaluated.

2. Whether maintenance procedures for the portable equipment were reviewed for possible pre-initiator human failures that renders the equipment unavailable during an event, and if the probabilities of the pre-initiator human failure events were assessed as described in HLR-HR-D of the ASME/ANS RA-Sa-2009 PRA standard.

3. If the procedures governing the initiation or entry into mitigating strategies are ambiguous, vague, or not explicit, a discussion detailing the technical bases for probability of failure to initiate mitigating strategies.

c. The ASME/ANS RA-Sa-2009 PRA standard defines PRA upgrade as the incorporation into a PRA model of a new methodology or significant changes in scope or capability that impact the significant accident sequences or the significant accident progression sequences. Section 1-5 of Part 1 of ASME/ANS RA-Sa-2009 states that upgrades of a PRA shall receive a peer review in accordance with the requirements specified in the peer review section of each respective part of this Standard.

i. Provide an evaluation of the model changes associated with incorporating non-safety related SSCs that were included following the FLEX mitigation strategies (permanently installed and/or portable) but are not similar to safety-related SSCs, which demonstrates that none of the following criteria is satisfied: (1) use of new methodology, (2) change in scope that impacts the significant accident sequences or the significant accident progression sequences, (3) change in capability that impacts the significant accident sequences or the significant accident progression sequences,

OR

ii. Propose a mechanism to ensure that a focused-scope peer review is performed on the model changes associated with incorporating mitigating strategies, and associated F&Os are resolved to Capability Category II prior to implementation of the 10 CFR 50.69 categorization program.

DRA RAI 10 – Implementation Items (APLA/RILIT)

Paragraph (b)(2)(ii) of 10 CFR 50.69 requires that a licensee's application contain a description of the measures taken to assure that the quality and level of detail of the systematic processes that evaluate the plant for internal and external events during normal operation, low power, and shutdown are adequate for the categorization of SSCs.

If the responses to RAIs 01 through 09 above require any follow-up actions prior to implementation of the 10 CFR 50.69 categorization process, provide a list of those actions and any PRA modeling changes, including any items that will not be completed prior to issuing the

amendment but must be completed prior to implementing the 10 CFR 50.69 categorization process.

Propose a mechanism that ensures these activities and changes will be completed and appropriately reviewed and any issues resolved prior to implementing the 10 CFR 50.69 categorization process. An example would be a table of listed implementation items referenced in a license condition.

As an alternative to providing an implementation item for an F&O, demonstrate that the F&O(s) will have no adverse impact and/or insignificant impact on the 10 CFR 50.69 categorization process.

DRA RAI 11 – Use of Addendum B of the PRA Standard (2013) (RILIT)

Section 4 of RG 1.200, Revision 2, states that a risk informed submittal should contain discussions concerning peer review. If the peer review is not performed against the established standards, then information needs to be included in the submittal demonstrating that the different criteria used are consistent with the established standards, as endorsed by NRC.

Section 3.2.3 of Enclosure 1 to the LAR states that the seismic PRA was peer reviewed against the requirements in the ASME/ANS PRA Standard (ASME/ANS RA-Sb-2013). RG 1.200, Revision 2, endorses ASME/ANS PRA Standard Addendum A (ASME/ANS RA-Sa-2009). As noted in the NRC letter dated July 6, 2011, "U.S. Nuclear Regulatory Commission (NRC) Comments on "Addenda to a Current ANS: ASME RA-SB - 20XX, Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications" (ADAMS Accession No. ML111720067), NRC did not endorse Addendum B of the PRA Standard. TVA's seismic PRA peer review was performed using a PRA Standard different from that endorsed by the NRC staff in RG 1.200, Revision 2.

Discuss how the supporting requirements (SRs) in Addendum B, which is not endorsed by the NRC for licensing applications, and the NRC staff's comments in the above cited letter dated July 6, 2011, are consistent with the SRs in Part 5 of Addendum A, for this application. If the different criteria are not consistent with the endorsed Standard, describe how the analogous Addendum A supporting requirements have been met.

DRA RAI 12 – Propagation of Closed and Open/Partially Open Findings from DRA RAI 08 (RILIT)

According to Sections 7-1.2 and 8-1.2 of the 2009 ASME/ANS PRA Standard it is assumed that full-scope internal-events at-power Level 1 and Level 2 LERF PRAs exist and that those PRAs are used as the basis for the SPRA. Therefore, the acceptability of the internal events PRA model used as the foundation for the SPRAs is an important consideration. Section 3.3 of the Enclosure 1 to the LAR states that the internal events findings were reviewed and closed using the process documented in Appendix X to NEI 05-04, NEI 07-12, and NEI 12-13. Further, Attachment 3 of the LAR provides finding-level F&Os that are still open or only partially resolved after the F&O closure review. However, the LAR does not provide information about the propagation of changes made to the IEPRA (includes internal floods) and/or the SPRA for (1) resolving the finding level F&Os that are closed, and (2) addressing the open/partially open finding level F&Os.

a. Clarify whether changes made to the internal events model to close finding level F&Os or to disposition the open/partially open finding level F&Os that are applicable to the

SPRA have been implemented in the SPRA used to support this application or justify not implementing the changes in the context of impact on this application.

b. Discuss how changes to the IEPRA (includes internal floods) arising from the review of this application, as part of any implementation item resulting from this application, or as part of routine maintenance and updating of the IEPRA (includes internal floods) will be propagated to the SPRA used to support this application.