

## **NRR-DMPSPeM Resource**

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**From:** Hon, Andrew  
**Sent:** Tuesday, January 15, 2019 2:41 PM  
**To:** Lewis, Donald Lee; Wells, Russell Douglas  
**Subject:** RAI - Sequoyah Nuclear Plant, Units 1 and 2, LAR to Adopt 10 CFR50.69 Risk-informed SSC ) (EPID: L-2018-LLA-0066)

By letter dated March 16, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18075A365), Tennessee Valley Authority (the licensee or TVA) submitted a license amendment request (LAR) to adopt Title 10 of the Code of Federal Regulations (10 CFR) Section 50.69, "Risk-informed Categorization and Treatment of Structures, Systems, and Components," for Sequoyah Nuclear Plant (Sequoyah). Section 3.1.1 of the LAR states that TVA will implement the risk categorization process in accordance with Nuclear Energy Institute (NEI) NEI 00-04, "10 CFR 50.69 SSC Categorization Guideline," Revision 0, as endorsed by Regulatory Guide (RG) 1.201, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to Their Safety Significance."

The NRC staff has reviewed the LAR and determined that additional information is required to complete the review. The NRC staff's request for additional information (RAI) is listed below. The draft RAI was clarified during a phone call on January 3, 2018 and the TVA staff indicated that there was no proprietary or sensitive information. The TVA staff requested, and NRC agreed, to a RAI response in 45 days, due the need for additional analyses to respond.

The NRC staff considers that timely responses to RAIs help ensure sufficient time is available for staff review and contribute toward the NRC's goal of efficient and effective use of staff resources. Please note that if you do not respond to this request by the agreed-upon date or provide an acceptable alternate date, we may deny your application for amendment under the provisions of Title 10 of the *Code of Federal Regulations*, Section 2.108. If circumstances result in the need to revise the agreed upon response date, please contact me at (301) 415-8480 or via e-mail [Andrew.Hon@nrc.gov](mailto:Andrew.Hon@nrc.gov).

### **REGULATORY BASIS**

- Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.69, "Risk-informed Categorization and Treatment of Structures, Systems, and Components"
- Regulatory Guide (RG) 1.201, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to Their Safety Significance," endorsed Nuclear Energy Institute (NEI) NEI 00-04, "10 CFR 50.69 SSC Categorization Guideline," Revision 0,
- RG 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities."
- RG 1.174, Revision 3, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis."
- NUREG-1855, Revision 1, "Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making."

### **REQUESTS FOR ADDITIONAL INFORMATION**

#### **RAI 01 – Appendix X, Close-out of Facts and Observations**

Section 3.3 of the LAR states that [a] finding closure review was conducted on the identified PRA models on May 8 to May 10, 2017. Closed findings were reviewed and closed using the process documented in the NEI letter to the NRC, "Final Revision of Appendix X to NEI 05-04/07-12/12-16, Close-Out of Facts and Observations (F&O)," as accepted by the NRC on May 3, 2017. Provide the following information to clarify and

confirm that the Independent Assessment for F&O(s) closure was performed consistent with Appendix X to NEI 05-04, NEI 07-12, and NEI 12-06 guidance, governing the process for "Close Out of Facts and Observations" as accepted, with conditions, by the NRC staff via letter dated May 3, 2017.

- a) Confirm that the Independent Assessment team was provided with a written assessment and justification of whether the resolution of each F&O, within the scope of the Independent Assessment, constitutes a PRA upgrade or maintenance update, as defined in the American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) RA-Sa-2009 and qualified by RG 1.200, Revision 2.

OR

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 of F&O(s) after the on-site review, Appendix X guidance explicitly 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]."
  - i. Confirm that all model changes associated with the closure of all F&Os reviewed during the Independent Assessment performed in May 2017 were incorporated into the PRA and/or the supporting documentation at the time of the finalization of the Independent Assessment team report, consistent with Appendix X, as accepted, with conditions, by the NRC staff via letter dated May 3, 2017 (ADAMS Accession No. ML17079A427).

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.

OR

- iii. Alternatively, propose a mechanism that assures all the PRA model logic and all 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. Summarize why this deviation the May 3, 2017, Appendix X, whereby an intermediate PRA model and documentation is reviewed instead of the current MOR, is acceptable for use in the 10 CFR 50.69 risk-informed application.
- 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, provide a brief summary describing the subsequent 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.
  - ii. For any F&Os associated with SR IFQU-A6, and SR HR-I1 that were determined to be closed during the Independent Assessment performed in May 2017, include detailed justification for why the supporting SR was considered to be met at CC II.

OR

- iii. Alternatively, perform a subsequent Independent Assessment for F&O closure and/or addendum to the Independent Assessment report to address the 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.

## **RAI 02 – SSCs Categorization Based on Other External Hazards**

Sections 50.69(c)(1)(ii) of 10 CFR require that the licensee determine SSC 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 3.2.4 of the LAR states that [a]ll other external hazards were screened from applicability to Sequoyah Units 1 and 2 per a plant-specific evaluation in accordance with GL 88-20 and updated to use the criteria in the ASME/ANS PRA Standard RA-Sa-2009. This statement appears to indicate that TVA proposes to treat all SSCs as low-safety-significant (LSS) with respect to other external events risk. The LAR also states that “[a]s part of the categorization assessment of other external hazard risk, an evaluation is performed to determine if there are components being categorized that participate in screened scenarios and whose failure would result in an unscreened scenario,” and that “[c]onsistent with the flow chart in Figure 5-6 of Section 5.4 of NEI 00-04, these components would be considered [high-safety-significant] HSS”. Attachments 4 and 5 of the LAR provide a summary of the other external hazards screening results, but do not appear to address any considerations related to applying Figure 5-6 of NEI 00-04 to those hazards.

- a) Identify the external hazards that will be evaluated according to the flow chart in NEI 00-04, Section 5.4, Figure 5-6. Provide detailed justification for screening external hazards (i.e., external flood, high winds, and tornados) using the criteria in Part 6 of ASME/ANS RA-Sa-2009. As applicable, the justification should include consideration of uncertainties in the determination of demonstrably conservative mean values as discussed in Section 6.2-3 of the ASME/ANS RA-Sa-2009 PRA Standard.

- i. For screening criterion PS1 Attachment 5 of the LAR, provide justification for concluding that the external flooding, high winds and tornado hazard(s) cannot cause a core damage accident.
  - ii. For the external flooding hazard, provide detailed justification for concluding that screening criterion PS4 applies, i.e. external flooding hazard CDF is less than  $1\text{E-}06/\text{reactor-year}$ .
  - iii. For the high winds and tornado hazard, provide detailed justification for concluding that the screening criterion PS3 applies, i.e. the mean frequency is less than  $1 \times 10^{-5}$  per reactor-year and the mean conditional core damage probability is less than 0.1.
- b) Figure 5-6 of NEI 00-04 illustrates that if an SSC is included in a screened scenario(s), then for that SSC to be considered a candidate LSS, the licensee has to demonstrate that upon removal of the component, the screened scenario(s) would not become unscreened.
- i. Identify and justify what type of SSCs, if any, are credited in the screening of the external hazard(s), including both passive, active, and temporary features.
  - ii. If there are any SSCs credited for screening of the external hazard(s), then explain and justify how the guidance in Figure 5-6 of NEI 00-04 will be applied for each of the external hazard(s).
- c) If the external hazards (i.e., external flood, high winds and tornados) cannot be screened out in item (a), discuss, using quantitative or qualitative assessments, how the risk from those hazards will be considered in the 10 CFR 50.69 categorization process. The discussion should include consideration of and, as applicable, the basis for the following factors:
- The frequency of the external hazard(s),
  - The impact of the external hazard(s) on plant SSCs and plant's operation including the ability to respond to the external hazard initiating event,
  - The operating experience associated with reliability of the external hazard(s) protection measures (e.g., flood seals), and
  - The reliability of operator actions.

### **RAI 03 – License Condition for 10 CFR 50.69**

The NEI 00-04 guidance allows licensees to implement different approaches, depending on the scope of their PRA (e.g., the approach if a seismic margins analyses is relied upon is different and more limiting than the approach if a seismic PRA is used). Regulatory Guide 1.201 states that “as part of the NRC's review and approval of a licensee's or applicant's application requesting to implement §50.69, the NRC staff intends to impose a license condition that will explicitly address the scope of the PRA and non-PRA approaches used in the licensee's categorization approach.”

The LAR proposed the following License Condition:

TVA is approved to implement 10 CFR 50.69 using the processes for categorization of Risk-Informed Safety Class (RISC)-1, RISC-2, RISC-3, and RISC-4 structures, systems, and components (SSCs) specified in the license amendment dated [XXXX].

Prior NRC approval, under 10 CFR 50.90, is required for a change to the categorization process specified above (e.g., change from a seismic margins approach to a seismic probabilistic risk assessment approach and or change from fire SSEL to a fire probabilistic risk assessment approach).

TVA shall complete the items listed in Attachment 1, List of Categorization Prerequisites, of TVA letter dated [XXXX], prior to implementation.

The proposed license condition does not explicitly address the PRA and non-PRA approaches that were used. Please provide a licensee condition that explicitly addresses the approaches, e.g.

TVA is approved to implement 10 CFR 50.69 using the processes for categorization of Risk Informed Safety Class (RISC)-1, RISC-2, RISC-3, and RISC-4 structures, systems, and components (SSCs) using: Probabilistic Risk Assessment (PRA) model to evaluate risk associated with internal events, including internal flooding; the alternative method approved by the NRC staff in the safety evaluation using the results of the *fire safe shutdown equipment list for internal fire as supplemented in letter dated [MONTH, DAY YEAR] (ADAMS Accession No. ML XXXXXXXX)*; the NUMARC 96-01 shutdown safety assessment process to assess shutdown risk; the Arkansas Nuclear One, Unit 2 (ANO-2) passive categorization method to assess passive component risk for Class 2 and Class 3 SSCs and their associated supports; and the results of non PRA evaluations that are based on the IPEEE Screening Assessment for External Hazards, i.e., seismic margin analysis (SMA) to evaluate seismic risk, and a screening of other external hazards updated using the external hazard screening significance process identified in ASME/ANS PRA Standard RA-Sa-2009; as specified in Unit [x] License Amendment [Number].

Prior NRC approval, under 10 CFR 50.90, is required for a change to the categorization process specified above (e.g., change from a seismic margins approach to a seismic probabilistic risk assessment approach, change from alternative method for internal fire to a fire probabilistic risk assessment approach).

TVA shall complete the items listed in Attachment 1, List of Categorization Prerequisites, of TVA letter dated [XXXX], prior to implementation.

*Note: The license condition may need to be expanded to address any implementation items identified in response to the RAIs.*

#### **RAI 04 – Key Assumptions and Sources of Uncertainties**

Paragraphs 50.69(c)(1)(i) and (ii) of 10 CFR requires a licensee's PRA be of sufficient quality and level of detail to support the SSC categorization process, and requires 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. The guidance in NEI 00-04 specifies sensitivity studies to be conducted for each PRA model to address uncertainty. 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 the SSC(s) importance.

In Section 4.1 of the LAR, Sequoyah identifies RG 1.174, Revision 2, as an applicable regulatory requirement/criteria. RG 1.174 has been updated to Revision 3, dated January 2018 (ADAMS Accession No. ML17317A256). 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. 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, ["Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making," March 2009 (Revision 0) (ADAMS Accession No. ML090970525)] and Section 3.1.1 of EPRI Technical Report (TR)-1016737. Attachment 6 of the LAR provides four key assumptions and sources of uncertainties applicable to the internal events (includes flooding) PRA (IEPRA) model.

NUREG-1855 has been updated to Revision 1 as of March 2017 (ADAMS Accession No. ML17062A466). The NRC staff notes that NUREG-1855, Revision 1, provides guidance in stages A through E for how to treat uncertainties associated with PRA models in risk-informed decision-making. Revision 1 of NUREG-1855 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." Considering these observations provide the following:

- i. A detailed summary of the process used to identify the key assumptions and sources of uncertainty presented in Attachment 6 of the LAR. The discussion should include: How the process is consistent with NUREG-1855, Revision 1, or other NRC-accepted methods (e.g.,

- NUREG-1855, Revision 0). If deviating from the current guidance provided in NUREG-1855, Revision 1, provide a basis to justify the appropriateness of any deviations for use in the 10 CFR 50.69 categorization process (e.g., exclusion/consideration of EPRI TR-1026511).
- ii. A brief description of how the key assumptions and sources of uncertainties provided in Attachment 6 of the LAR 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. Include a disposition for each of the assumptions and/or uncertainties addressing their impact on the 10 CR 50.69 risk-informed categorization process. For any source of uncertainty or assumption judged not to be key to the application, provide discussion for why it is not pertinent to the application and therefore does not need to be further addressed (i.e., sensitivity does not need to be performed).
  - a) If the process used to identify, characterize, and assess the key assumption(s) and the treatment for the sources of uncertainty provided in Attachment 6 of the LAR cannot be justified for use in the 50.69 categorization process, provide the results of an updated assessment of the key assumptions, sources of uncertainty, and treatment of the sources of uncertainty performed in accordance with NUREG-1855, Revision 1, and NEI 00-04, Revision 0. If sensitivity studies are proposed to be performed for the treatment of a specific key assumption or source of uncertainty, include a detailed description of the proposed sensitivity studies and justify how it is bounding to address the specific key assumption and/or source of uncertainty.

#### **RAI 05 – Dispositions of Key Assumptions and Sources of Uncertainties**

Paragraph 50.69(c)(1)(i) of 10 CFR 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.

NRC staff observes that even small impacts to each hazard PRA model’s CDF and LERF (both increases and decreases) could potentially increase the risk importance values for certain SSCs above the NEI 00-04 Section 5 threshold criteria for determining safety significance. Additionally, conservatisms can mask the importance measures of other SSCs. The dispositions presented in Attachment 6 of the LAR for key assumptions and modeling uncertainties did not provide sufficient information for the NRC staff to conclude that the uncertainties do not impact the 10 CFR 50.69 categorization results. Considering these observations, address the following:

- a) For the disposition of the key assumption that a leaking pipe will be detected by visual inspection with a 0.9 probability, the licensee stated that internal flooding is a significant contributor to plant risk and that the prescribed sensitivity studies in Section 5 of NEI 00-04 will be followed.

Describe which of the sensitivity studies outlined in Section 5 of NEI 00-04 is directly applicable for this key assumption. Include in the description, justification that addresses: (1) how the sensitivity study bounds the source of uncertainty being addressed and (2) how the potential to mask/skew the importance measures of other SSCs is considered.

- b) Attachment 6 of the LAR identifies passive pipe break failures, human-induced flooding and maintenance induced flooding as a key source of uncertainty. The disposition provides statement of how the impact can be treated (e.g., random sample via Monte Carlo method), but it does not provide an explicit disposition for the application.
  - i. Provide justification for why the uncertainty associated with passive pipe break failures, human-induced flooding and maintenance induced flooding has no adverse impact (mask/skew the

importance measures of other SSCs) on the 10 CFR 50.69 risk-informed categorization process, and therefore does not need to be addressed, OR

- ii. Describe how the uncertainty associated with passive pipe break failures, human-induced flooding and maintenance induced flooding will be addressed during implementation of the 10 CFR 50.69 categorization process, consistent with NEI 00-04 (e.g., sensitivity study). Include justification to address: (1) how the sensitivity study bounds the source of uncertainty under consideration and (2) how the potential to mask/skew the importance of other SSCs is considered.

c) Attachment 6 of the LAR identified a key assumption/uncertainty that equipment type code data include successful post-maintenance testing (PMT) and that this can result in an under-estimation of the failure probabilities.

- i. Provide discussion for what data type codes are impacted by PMT demands for this identified assumption/uncertainty.
- ii. Provide justification for why this uncertainty has no adverse impact (mask/skew the importance measures of other SSCs) on the 10 CFR 50.69 risk-informed categorization, and therefore does not need to be addressed;

OR

- iii. Alternatively, describe how this uncertainty will be addressed during implementation of the 10 CFR 50.69 categorization process consistent with NEI 00-04 (e.g., sensitivity study). Include in the description, justification to address (1) how the sensitivity study bounds the source of uncertainty being addressed and (2) how the potential to mask or skew the importance of other SSCs is considered.

d) Attachment 6 of the LAR identifies the State of Knowledge Correlation (SOKC) as a source of uncertainty. The discussion for this source of uncertainty states in part “[t]hose events that are used are considered correlated, which implies that the same distribution applies to all sampled events when using a Monte Carlo approach.” The disposition of this source of uncertainty states that the multiplier method used for interfacing system loss of coolant accidents (ISLOCA) is used to address the event correlation.

- i. Describe the method used to address the SOKC uncertainty. Include justification to confirm that the method applied is consistent with Appendix -6-A of NUREG-1855, Revision 1.

OR

- ii. If an alternative method was applied to address SOKC that deviates from NUREG-1855, Revision 1; provide justification for why the deviation is acceptable for use in the 10 CFR 50.69 categorization process. Refer to RAI 04(a).i if applicable.

#### **RAI 06 – Qualitative Function Categorization**

NEI 00-04, Section 9.2.2, "Review of Safety Related Low Safety-Significant Functions/SSCs," states "in making their assessment, the IDP should consider the impact of loss of the function/SSC against the remaining capability to perform the basic safety functions." This section also provides seven questions that should be considered for making the final determination of the safety-significance for each system function/SSC. It is unclear from the LAR how the IDP will collectively assess these seven specific questions. LAR Table 3-1 contains the entry "Allowable" at the intersection of the "IDP change HSS to LSS" column and "Qualitative Criteria" row.

- a) Clarify how the IDP will collectively assess the seven specific questions to identify a function/SSC as LSS as opposed to HSS. For example, a function/SSC is considered HSS when the answer to any one question is false.
- b) If the criteria provided in part (a) considers more than one question is false for the IDP to assign a category of HSS to an SSC, provide justification to support the rationale for why this is appropriate to use in the 10 CFR 50.69 risk-informed application.

### **RAI 07 – Alternate Non-PRA Method for Fire to Categorize SSCs**

Sections 50.69(c)(1)(ii) of 10 CFR 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 SQN categorization process will use the Fire 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 states that the alternate approach proposed is considered to be a conservative method, compared to FIVE 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 the Fire SSEL method is technically adequate relative to the acceptable methods in NEI 00-04. Include in the justification, (1) the industry assessments referenced in the LAR (2) a summary of the industry evaluations and results that support the conclusion that Sequoyah's proposed approach to use the fire SSEL is conservative, and (3) discussion for how additional SSCs will be assigned HSS in comparison to using an acceptable method (e.g., additional HSS SSCs would not be identified by a FIVE or fire PRA analysis).
- b) Clarify the follow: The first paragraph of 3.2.2 states that, "[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." In review of Figure 3.1 of the LAR, it appears there are other SSCs, not on the fire SSEL, necessary 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 re-categorized by the IDP.
- c) Clarify whether fire detection and suppression (and fire dampers) equipment is included in Sequoyah's SSEL. If not included, summarize how the risk-significance of this equipment will be evaluated to determine whether the equipment is HSS or LSS.
- d) Provide a discussion to justify how the probability of failure for operator actions (which could be high) is considered in the analysis for determining SSCs identified on the SSEL, since fire protection actions can be credited if they are feasible, but PRA actions generally are not credited unless they are



proceduralized and have a failure probability assigned. Some feasible actions have a high failure probability.

## **RAI 08 – Addition of FLEX to the PRA Model**

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 identified challenges and strategies for incorporating FLEX equipment 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 the licensee has incorporated FLEX mitigating strategies and associated equipment into the PRA models at Sequoyah. For the NRC staff to assess the potential incorporation of FLEX equipment into the Sequoyah PRA model(s), provide the following:

- a) State whether FLEX equipment and strategies have been credited in the PRA model(s). If not incorporated or their inclusion is not expected to impact the PRA results used in the categorization process no additional response is requested.
- b) If the equipment or strategies have been credited, and their inclusion is expected to impact the PRA results used in the categorization process, provide the following information separately for each of the PRA model(s) (i.e., IEPRAs (includes flooding), external hazards PRA(s)), and external hazards screening as appropriate:
  - i. A discussion detailing the extent of incorporation, i.e. summarize the supplemental equipment and compensatory actions, including FLEX strategies that have been quantitatively credited for each of the PRA models used to support this application.
  - ii. A discussion detailing the methodology used to assess the failure probabilities of any modeled equipment credited in the licensee’s mitigating strategies (i.e., FLEX). The discussion should include justification explaining the rationale for parameter values, and whether the uncertainties associated with the parameter values are considered in accordance with the ASME/ANS PRA Standard as endorsed by RG 1.200.
  - iii. A discussion detailing the methodology used to assess operator actions related to FLEX equipment and the licensee personnel that perform these actions. The discussion should include:
    - 1. A summary of how the licensee evaluated 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.
    - 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 licensee’s procedures governing the initiation or entry into mitigating strategies are ambiguous, vague, or not explicit, a discussion detailing the technical bases for the 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 PRA Standard 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 mitigating strategies, 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 meet Capability Category II prior to implementation of the 10 CFR 50.69 categorization program. An example would be a table of listed implementation items referenced in a license condition.

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**Mail Envelope Properties** (Andrew.Hon@nrc.gov20190115144000)

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