NRR-DMPSPEm Resource

From: Galvin, Dennis
Sent: Friday, October 12, 2018 5:13 PM
To: Arthur.Zaremba@duke-energy.com; Ellis, Kevin Michael
Cc: Joshua.Duc@duke-energy.com; Vaughan, Jordan L; Hartle, Brandon
Subject: Robinson RAIs – LAR to Allow Implementation of the Provisions 10 CFR 50.69 (EPID L 2018-LLA-0095) and LAR to Adopt TSTF-425 (EPID L 2018-LLA-0104)
Attachments: Enclosure 1 - Robinson LAR- Adopt 50.69 RAIs L-2018-LLA-0095 2018-10-12.pdf; Enclosure 2 - Robinson LAR- TSTF-425 - Relocate SR Frequencies - RAIs L-2018-LLA-0104 2018-10-12.pdf

Mr. Zaremba and Mr. Ellis,

By letter dated April 5, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18099A130), as supplemented by letter dated June 16, 2018 (ADAMS Accession No. ML18162A147), Duke Energy Progress, LLC, (Duke Energy, the licensee), submitted a license amendment request (LAR) for H.B. Robinson Steam Electric Plant, Unit 2 (HBRSEP2). The proposed amendment would modify the licensing basis to allow for the implementation of the provisions of Title 10 of the Code of Federal Regulations (10 CFR), Section 50.69, "Risk informed categorization and treatment of structures, systems, and components for nuclear power plants," and provide the ability to use probabilistic risk assessment (PRA) models, namely the internal events PRA (IEPRA), internal flooding PRA (IFPRA), and internal fire PRA (FPRA) for the proposed 10 CFR 50.69 categorization process.

By letter dated April 16, 2018 (ADAMS Accession No. ML18117A006), as supplemented by letter dated September 25, 2018 (ADAMS Accession No. ML18269A009), Duke Energy Progress, LLC, submitted a LAR for HBRSEP2 to adopt Technical Specifications Task Force (TSTF) 425, Revision 3, "Relocate Surveillance Frequencies to Licensee Control – RITSTF Initiative 5b." The proposed amendment would modify HBRSEP2's Technical Specifications (TS) by relocating specific Surveillance Frequencies to a licensee-controlled program. The change also would add the Surveillance Frequency Control Program to TS Section 5, Administrative Controls.

The U.S. Nuclear Regulatory Commission (NRC) staff has determined that additional information is needed to complete its review. As risk-informed applications, some similar information was submitted in the LARs. Thus all of The TSTF-425 RAIs are similar to the 10 CFR 50.69 RAIs. Therefore the RAIs for both LARs are attached. Even though the responses may be similar, the NRC staff requests responses specific to each LAR. The RAIs regarding the implementation of 10 CFR 50.69 are included in Enclosure 1. The RAIs regarding the adoption of TSTF-425 are included in Enclosure 2. The similar RAIs are as follows:

10 CFR 50.69 RAI #	TSTF-425 RAI #	Title
PRA RAI 01 (a-d)	PRA RAI 01 (a-d)	Open/Partially Open Findings in the Process of Being Resolved
PRA RAI 03 (a-b)	PRA RAI 02 (a-b)	Identifying Key Assumptions and Uncertainties that Could Impact the Application
PRA RAI 04 (a-b)	PRA RAI 03 (a-b)	Very Early Warning Fire Detection Systems (VEWFDS) Utilized in the PRA
PRA RAI 08 (a-c)	PRA RAI 04 (a-c)	Incorporation of FLEX into the PRA Model(s)

The enclosed RAIs were e-mailed to the licensee in draft form on September 28, 2018 (ADAMS Accession No. ML18274A263). A clarification call was held on October 11, 2018. The licensee agreed to provide responses to the RAIs by November 13, 2018. The NRC staff agreed with this date.

Respectfully,

Dennis Galvin
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U.S Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of Operating Reactor Licensing
Licensing Project Branch 2-2
301-415-6256

Docket No. 50-261

Hearing Identifier: NRR_DMPS
Email Number: 623

Mail Envelope Properties (Dennis.Galvin@nrc.gov20181012171200)

Subject: Robinson RAIs – LAR to Allow Implementation of the Provisions 10 CFR 50.69 (EPID L 2018-LLA-0095) and LAR to Adopt TSTF-425 (EPID L 2018-LLA-0104)
Sent Date: 10/12/2018 5:12:56 PM
Received Date: 10/12/2018 5:12:00 PM
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Files	**Size**	**Date & Time**
MESSAGE	3153	10/12/2018 5:12:00 PM
Enclosure 1 - Robinson LAR- Adopt 50.69 RAIs L-2018-LLA-0095 2018-10-12.pdf	212962	
Enclosure 2 - Robinson LAR- TSTF-425 - Relocate SR Frequencies - RAIs L-2018-LLA-0104 2018-10-12.pdf	144416	

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

REQUEST FOR ADDITIONAL INFORMATION

RELATED TO LICENSE AMENDMENT REQUEST TO ADOPT 10 CFR 50.69,

"RISK-INFORMED CATEGORIZATION AND TREATMENT OF STRUCTURES, SYSTEMS,

AND COMPONENTS FOR NUCLEAR POWER REACTORS"

DUKE ENERGY PROGRESS, LLC

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2

DOCKET NO. 50-261

1.0 BACKGROUND

By letter dated April 5, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18099A130), as supplemented by letter dated June 16, 2018 (ADAMS Accession No. ML18162A147), Duke Energy Progress, LLC, (Duke Energy, the licensee), submitted a license amendment request (LAR) for H.B. Robinson Steam Electric Plant, Unit 2 (HBRSEP2). The proposed amendment would modify the licensing basis to allow for the implementation of the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.69, "Risk-informed categorization and treatment of structures, systems, and components for nuclear power plants," and provide the ability to use probabilistic risk assessment (PRA) models, namely the internal events PRA (IEPRA), internal flooding PRA (IFPRA), and internal fire PRA (FPRA) for the proposed 10 CFR 50.69 categorization process.

Regulatory Guide (RG) 1.201, Revision 1, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to their Safety Significance," May 2006 (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 [Structure, System, and Component] Categorization Guideline," July 2005 (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," February 2004 (ADAMS Accession No. ML040630078), which endorses industry consensus PRA standards, as the basis against which peer reviews evaluate the technical acceptability of a PRA. Revision 2 of RG 1.200 issued March 2009 is available at ADAMS Accession No. ML090410014.

Section 3.1.1 of the LAR states that Duke Energy will implement the risk categorization process of 10 CFR 50.69 in accordance with NEI 00-04, Revision 0, as endorsed by RG 1.201. However, the licensee's LAR does not contain enough information for the U.S. Nuclear Regulatory Commission (NRC) staff to determine if the licensee has implemented the guidance appropriately in NEI 00-04, as endorsed by RG 1.201, as a means to demonstrate compliance with all of the requirements in 10 CFR 50.69, including technical adequacy of the PRA models. The NRC staff requests additional information (RAI) for the following areas in order to complete its assessment.

The NRC staff notes that by letter dated April 16, 2018 (ADAMS Accession No. ML18117A006), Duke Energy submitted a LAR for HBRSEP2 to adopt Technical Specifications Task Force (TSTF) 425, Revision 3, "Relocate Surveillance Frequencies to Licensee Control – RITSTF Initiative 5b." RAIs regarding the HBRSEP2 LAR to adopt TSTF-425 are in Enclosure 2. The RAIs for this LAR, to implement 10 CFR 50.69, are similar in nature to the RAIs for HBRSEP2 to adopt TSTF-425. As such, the NRC staff requests separate responses to the RAIs for the HBRSEP2 LAR to implement TSTF-425 LAR and the HBRSEP2 LAR to implement 50.69, even though the responses may be similar.

2.0 REQUEST FOR ADDITIONAL INFORMATION (RAI)

PRA RAI 01 – Open/Partially Open Findings in the Process of Being Resolved

Section 4.2 of RG 1.200 states that the LAR should include a discussion of the resolution of the peer review facts 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 and
- 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 particular 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. Also, F&O descriptions and their dispositions were previously provided to the NRC in the LAR to adopt for Technical Specification 5.5.16 Option B, "10 CFR 50, Appendix J, Integrated Leak Rate Test Interval and Type C Leak rate testing Frequency" (ADAMS Accession No. ML16201A195) and in the LAR to adopt National Fire Protection Association Standard 805 (ADAMS Accession No. ML16337A264). For a number of F&O dispositions there is insufficient information for NRC staff to conclude that the F&O is sufficiently resolved for this application.

a. F&Os associated with Supporting Requirements (SR) AS-A5, AS-B3, LE-C4, and LE-D5 regarding thermally induced steam generator tube ruptures (SGTR):

   Open F&Os on SRs AS-A5, AS-B3, and LE-D5 in the LAR state, in part, that the thermally induced SGTR accident sequence was missing from the PRA. Separately, the LAR supplement indicates that the F&O associated with SR LE-D6 (SR LE-D6 directs that a thermally induced SGTR shall be modelled) was closed because a thermally induced SGTR accident sequence was developed and peer-reviewed with no subsequent F&Os. However, the resolutions for the open F&Os, associated with SRs LE-C4 and LE-D5 in the LAR also states, in part, that a sensitivity study demonstrates that un-modelled human failure events (HFEs) related to isolating a ruptured SG following an SGTR initiating event (i.e., apparently not a thermally induced SGTR) has a minimal impact on the PRA results and an acceptable impact of the 50.69 categorization.

   i. Clarify if the evaluation of the impact of the un-modelled isolation HFE described in the F&O resolution for SRs LE-C4 and LE-D5 in the LAR include the thermally induced SGTR accident sequence. If not please include the thermally induced SGTR accident sequence in the sensitivity study or otherwise evaluate its impact.

ii. Provide clarification that the sensitivity study related to the exclusion of the SG isolation HFE demonstrated that there was no impact on any SSC risk categorization, or

iii. Alternatively to Part ii, if the sensitivity study demonstrates that the exclusion of the operator action does impact any risk categorization, then propose a mechanism to ensure incorporation of the operator action in the PRA model of record (MOR) prior to implementation of the 10 CFR 50.69 categorization program.

b. F&O associated with SR IFEV-A7-01 regarding human-induced flood events:

One of the issues provided in the F&O description in LAR Attachment 3 concerns the proper screening of human-induced flood events to determine exclusion from the PRA MOR. The first part of the disposition states, "[t]he sensitivity study performed was overly conservative and attempted to apply all industry human induced failure events on a per piping frequency. This led to a largely over conservative value." There is no description or results for this sensitivity study provided in the LAR.

The second part of the disposition states, "[h]man induced flooding events are not risk significant for this application as on the whole human induced flooding events in the industry have largely been occurring less often." The disposition makes reference to the period from 1971 to 2011, which appears to match the period used in the EPRI TR-3002000079, "Pipe Rupture Frequencies for Internal Flooding Probabilistic Assessments," Revision 3, which provides flood event probabilities including human-induced events. The NRC staff notes that the EPRI TR is an update of the 2006 TR data and would reflect the decreasing trend of events over that period.

The NRC staff has issued two information notices (IN) related to human-induced flooding events since 2007, IN 2007-01 and IN 2016-11.

Section 5.6 of EPRI TR-1019194, "Guidelines for Performance of Internal Flooding Probabilistic Risk Assessment," provides specific methodology, including screening, for maintenance-induced flooding events.

Capability Category (CC) I/II for ASME/ANS 2009 PRA Standard for SR IFEV-A7 states, "[i]nclude consideration of human-induced floods during maintenance through application of generic data." SRs IFSN-A10 and IFSN-A15 provide flood event screening criteria. In light of these observations:

i. Describe the sensitivity study mentioned in the F&O disposition. Include in this discussion the purpose of the sensitivity study, what modifications to the PRA model were performed, the results of the study, and the insights from this sensitivity study.

ii. Provide justification, such as industry approved screening criteria, to exclude the remaining maintenance-induced internal flooding events, using industry generic data, from the PRA model, and provide justification that exclusion of these maintenance-induced events does not affect SSC risk categorization, or

iii. Alternatively to Part ii, propose a mechanism to ensure F&O IFEV-A7-01 will be resolved prior to implementation of the 10 CFR 50.69 categorization process. This mechanism

should also provide an explicit description of changes that will be made to the PRA model and documentation to resolve the issue.

c. F&O associated with SR IFSN-A8-01 regarding door failure heights

The description of the finding in LAR Attachment 3 states the, "[u]se of EPRI door failure criteria of 1 ft [foot] / 3 ft may not be appropriate depending on the actual door attributes and flooding scenario."

The disposition states, "[t]he current IFPRA assumes that the majority of the components would fail at or around 1 ft to 3 ft," and concludes the effects, "minimal on modeling results and therefore will have no impact on the quantified values with regard to the 50.69 application." The disposition does not discuss how the application provides a bounding assessment for this assumption.

Appendix D of EPRI TR-1019194, "Guidelines for Performance of Internal Flooding Probabilistic Risk Assessment," provides methodology for determining door failure heights. In light of these observations:

i. Provide justification, such as a sensitivity study, that the exclusion of the correct door failure heights would not impact any SSC risk categorization, or

ii. Alternatively, propose a mechanism that ensures F&O IFSN-A8-01 will be resolved prior to implementation of the 10 CFR 50.69 categorization process. This mechanism should also provide an explicit description of changes that will be made to the PRA model and documentation to resolve the issue.

d. F&O associated with SR IFSN-A8-02 regarding door gap flooding propagation

The disposition in LAR Attachment 3 states that it identified one scenario where additional equipment would be impacted. In evaluating the additional failures the disposition states, "[c]rediting flow underneath door gaps would increase the time that operators would be able to potentially isolate the scenario. Therefore as it is currently modeled, scenarios for this flood area are conservative." The disposition concludes, "[t]he timing effects of this open F&O is minimal on modeling results and therefore will have no impact."

In accordance with the SR IFSN A10 (ASME/ANS 2009 PRA Standard), each developed flood scenario includes, "giving credit for appropriate flood mitigation systems or operator actions, and identifying susceptible SSCs." The NRC staff notes the exclusion of SSC(s) impacts from initiating events reduces their contribution to risk and can therefore impact their importance measures, thus potentially impacting the importance measures of other SSC(s) as well. In light of these observations:

i. Provide justification, such as a sensitivity study, that the exclusion of the additional PRA SSC impacts from the door gap propagation has no impact on the 10 CFR 50.69 categorization results, or

ii. Alternatively, propose a mechanism that ensures F&O IFSN-A8-02 will be resolved prior to implementation of the 10 CFR 50.69 categorization process. This mechanism should also provide an explicit description of changes that will be made to the PRA model and documentation to resolve the issue.

PRA RAI 02 - Qualitative Function Categorization

Table 3-1 of the LAR indicates that the evaluation of the seven qualitative criteria defined in Section 9.2 of NEI 00-04 is performed at the function level and prior to the Integrated Decision-making Panel (IDP). The LAR states that "NEI 00-04 only requires the seven qualitative criteria in Section 9.2 of NEI 00-04…. to be completed for components/functions categorized as LSS." LAR Table 3-1 Table 1 contains the entry "Allowable" at the intersection of the "IDP change HSS [high safety significant] to LSS [low safety significant]" column and "Qualitative Criteria" row, which appears to contradict the premise that the seven criteria are only applied to LSS functions. The guidance in NEI 00-04 states that the IDP "should consider the impact of loss of the function/structure, system, and component (SSC) against the remaining capability to perform the basic safety functions."

Explain how the IDP will collectively assess the seven specific questions to identify a function/SSC as LSS as opposed to HSS including a clarification of the "Allowed" entry in LAR Table 3-1 and confirm that a negative answer to any of the seven questions would result in the function/SSC to be categorized as HSS.

PRA RAI 03 - Identifying Key Assumptions and Uncertainties that Could Impact the Application

Section 1.3 of RG 1.200 describes the level of detail of a PRA required and states, "[i]n general, the level of detail for the base PRA needs to be consistent with current good practice." Current good practices are those practices that are generally accepted throughout the industry and have shown to be technically acceptable in documented analyses or engineering assessments.

Section 3.2.7 of the LAR states that, "[t]he detailed process of identifying, characterizing and qualitative screening of model uncertainties is found in Section 5.3 of NUREG-1855 (Revision 0) ["Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making," March 2009 (ADAMS Accession No. ML090970525)] and Section 3.1.1 of EPRI TR-1016737." The NRC staff notes that one of these sources has been superseded by a revision (Revision 1 of NUREG-1855, "Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decisionmaking," March 2017 (ADAMS Accession No. ML17062A466), which references the updated EPRI guidance TR-1026511, "Practical Guidance on the Use of Probabilistic Risk Assessment in Risk-Informed Applications with a Focus on the Treatment of Uncertainty," (2012)).

Attachment 6 of the LAR contains ten key assumptions/sources of uncertainties from three PRA models, whereas industry guidance documents such as NUREG-1855, Revision 1, and EPRI TR-1026511 address a large number of potential assumptions and uncertainties. For example two key sources of fire PRA modeling assumptions/uncertainty are provided in the LAR, compared to the 2012 EPRI document which identifies 71 potential sources of uncertainty. There appear to be no uncertainties or assumptions associated with large early release (LERF) and internal flooding.

The LAR continues, "[t]he list of assumptions and sources of uncertainty were reviewed to identify those which would be significant for the evaluation of this application. Only those assumptions or sources of uncertainty that could significantly impact the risk calculations were considered key for this application."

The NRC staff notes that Stages C, D, E, and F of NUREG-1855 (Revision 1) provides guidance on how to identify key sources of uncertainty relevant to the application.

To address the observations above, the staff requests the following additional information:

a. Provide a detailed summary of the process used to determine the impact of each of the 71 potential sources of uncertainty in the EPRI documents and describe how this process resulted in the final set of ten key assumptions and sources of uncertainty presented in Attachment 6 of the LAR. Include in this discussion an explanation of how the process is in accordance with NUREG-1855, Rev. 1, or another NRC-accepted method.

b. If the process of identifying key sources of uncertainty or assumptions for these PRA models cannot be justified, provide the results of an updated assessment of key sources of uncertainty or assumptions.

PRA RAI 04 – Very Early Warning Fire Detection Systems (VEWFDS) Utilized in the PRA

Assumption/Uncertainty No. 4 in Attachment 6 of the LAR states, "[t]he HBRSEP2 Fire PRA assumes Incipient Detection System functions as outlined in NUREG-2180 ["Determining the Effectiveness, Limitations, and Operator Response for Very Early Warning Fire Detection Systems in Nuclear Facilities (DELORES-VEWFIRE), Final Report," December 2016 (ADAMS Accession No. ML16343A058)]." The disposition to this uncertainty states, "[t]he current method of crediting Incipient Detection at RNP is similar to NUREG-2180 with more credit for operators to prevent fires based upon actual plant experience and plant procedures." It is not clear to the NRC staff how much actual plant experience with fires has been collected and what differences exist between NUREG-2180 and the licensee's approach. Therefore, the staff requests the following information:

a. Provide a summary of the method the licensee used for crediting Incipient Detection at HBRSEP2.

b. Provide an explanation of any differences between the licensee's method and the method as described in NUREG-2180. If there are differences, provide justification for the differences and explain how they are expected to impact the 10 CFR 50.69 risk categorization process.

PRA RAI 05 - Key Assumptions and Uncertainties that Could Impact the Application

Section 1.2.10 of RG 1.200 discusses the technical approach in determining the impact of assumptions and sources of uncertainty on the PRA model.

The dispositions presented in Attachment 6 of the LAR for key assumptions and modeling uncertainties state in each case that: "this does not represent a key source of uncertainty and will not be an issue for the 50.69 calculations." However, in a number of instances there is not enough information provided in the dispositions for the NRC staff to determine whether the uncertainty will not impact 10 CFR 50.69 risk categorization. In light of these observations address the following:

a. <u>Feed and Bleed Success Criteria for loss of secondary heat removal</u>

LAR Attachment 6 (page 48) states that the current PRA MOR success criteria for Feed and Bleed is one high pressure safety injection (HPSI) and two power operated relief valves (PORVs), but the thermal hydraulic analysis concludes only one PORV is required. The disposition states that this could result in certain SSCs in having higher risk significance and therefore is considered conservative. The staff notes that conservative modeling choices can potentially artificially lower other components risk importance values below the safety significance threshold criteria (i.e. masking). In light of these observations, address the following:

i. Provide justification, such as a sensitivity study, that the exclusion of the updated success criteria does not affect any of the SSC risk categorizations.

ii. Alternatively, propose a mechanism to incorporate the updated success criteria into the PRA MOR prior to implementation of the 10 CFR 50.69 categorization program.

b. Operator Action Recovery Dependency Analysis

LAR Attachment 6 (page 48) discusses the floor value applied to HFE combinations. For performing HRA dependency analysis, NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines - Final Report," July 2012 (ADAMS Accession No. ML12216A104), discusses the need to consider a minimum value for the joint probability of multiple HFEs, and refers to NUREG-1792, "Good Practices for Implementing Human Reliability Analysis (HRA)," April 2005 (ADAMS Accession No. ML051160213) (Table 2-1), which recommends joint human error probability (JHEP) values should not be below 1E-5. Table 4-3 of EPRI TR 1021081, "Establishing Minimum Acceptable Values for Probabilities of Human Failure Events," October 2010, provides a lower limiting value of 1E-6 for sequences with a very low level of dependence. Assigning JHEPs that are less than a minimum value should be individually reviewed for timing, cues, etc., to check the dependency between all the operator actions in the cutset.

Assumption/Uncertainty #8 (page 47) provides a statement that the lower bound value of 1E-05 is applied for any individual HFE. However in Assumption/Uncertainty #9, the floor value applied to HFE combinations is not specified. Therefore, provide the following:

i. Clarify the floor value that is applied to HFE combinations in the Robinson IEPRA.

ii. If the floor value is less than 1E-06, provide an estimate of the number of these JHEP values below 1E-6 in the IEPRA, discuss the range of values and confirm that justification is documented for each of these JHEPs.

PRA RAI 06 - Key Assumptions and Uncertainties Subject to Sensitivity Studies

In LAR Attachment 6, assumptions 1, 2, and 3 address reactor coolant pump seal failure, loss of offsite power frequencies, and fire modelling respectively. Each of these assumptions is dispositioned with,

In accordance with NEI 00-04, sensitivity studies will be used to determine whether other conditions might lead to the component being safety significant. The assessment of the uncertainties, therefore, is appropriately addressed by the sensitivity studies required by this risk-informed application.

NEI 00-04 sensitivity studies in Tables 5-2, 5-3, 5-4, and 5-5 all include human error probabilities, CCF probabilities, and maintenance unavailabilities. The uncertainties in assumptions 1, 2 and 3 are not related to these issues or parameters and therefore the sensitivity studies in the Tables do not resolve the effect of the assumptions. However, each Table also has provision for "[a]ny applicable sensitivity studies identified in the characterization of PRA adequacy" but these PRA specific studies need to be identified. For each Assumption 1, 2, and 3:

a. Describe the applicable sensitivity study that will be undertaken to address each uncertainty or otherwise resolve the effect of the assumption on the categorization process.

b. Propose a mechanism that ensures that the identified sensitivity studies will be included in the categorization evaluations. This mechanism should also provide an explicit description of the each sensitivity study.

PRA RAI 07 – SSCs Categorization Based on Other External Hazards

Section 3.2.4 of the LAR states:

> As 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. Consistent with the flow chart in Figure 5-6 in Section 5.4 of NEI 00-04, these components would be considered HSS. All remaining hazards were screened from applicability and considered insignificant for every SSC and, therefore, will not be considered during the categorization process.

The last sentence implies that the assessment has been completed and concludes that all other external hazards will never need evaluation during categorization. The individual plant examination of external events (IPEEE) screening process did not include the additional step illustrated in Figure 5-6 in Section 5.4 of NEI 00-04. Figure 5-6 and its associated text states that an evaluation is performed to determine if there are components being categorized that participate in screened external event scenarios whose failure would result in an unscreened scenario.

Clarify how the screening criteria in LAR Attachment 5, "Progressive Screening Approach for Addressing External Hazards," satisfy the guidelines that HSS will be assigned to SSCs whose failure would cause a screened external event scenario to become unscreened.

PRA RAI 08 – Incorporation of FLEX into the PRA Model(s)

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 the licensee has incorporated FLEX mitigating strategies and associated equipment into the PRA models at Robinson.

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

a. If FLEX mitigating strategies and associated equipment have not been incorporated into the base PRA and the external hazard evaluations, confirm that FLEX equipment is not modelled.

b. If FLEX mitigating strategies and associated equipment have been incorporated into the base PRA and the external hazard evaluations but do not impact the categorization process, summarize the evaluation supporting the conclusion that there is no impact on categorization.

c. If FLEX mitigating strategies and associated equipment have been incorporated into the base PRA and the external hazard evaluations and do impact categorization, provide the following information:

    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 a justification explaining the rational 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 HEPs 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 probability of failure to initiate mitigating strategies.

    iv. The ASME/ANS RA-Sa-2009 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.

        (1) Provide an evaluation of the model changes associated with incorporating mitigating strategies, which demonstrates that none of the following criteria are 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

(2) 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.

PRA RAI 09 – Proposed License Condition

The guidance in NEI 00-04 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). RG 1.201, Revision 1 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 methods used in the licensee's categorization approach."

Section 2.3 of the LAR Supplement proposed the following License Condition:

> Duke Energy 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 request dated April 5, 2018.
>
> 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).

The proposed license condition does not explicitly address the PRA and non-PRA approaches that were used. Provide a license condition that explicitly address the approaches, e.g.:

> Duke Energy 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) models to evaluate risk associated with internal events, including internal flooding, and internal fire; the shutdown safety assessment process to assess shutdown risk; the Arkansas Nuclear One, Unit 2 (AN0-2) 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 2 License Amendment No. [XXX] dated [DATE].
>
> 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).

Note that if implementation items are identified, the license condition may need to be expanded to address them.

REQUEST FOR ADDITIONAL INFORMATION

RELATED TO LICENSE AMENDMENT REQUEST TO ADOPT TSTF-425, "RELOCATE SURVEILLANCE FREQUENCIES TO LICENSEE CONTROL – RITSTF INITIATIVE 5B"

DUKE ENERGY PROGRESS, LLC

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2

DOCKET NO. 50-261

1.0 BACKGROUND

By letter dated April 16, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18117A006), as supplemented by letter dated September 25, 2018 (ADAMS Accession No. ML18269A009), Duke Energy Progress, LLC, (Duke Energy, the licensee), submitted a license amendment request (LAR) for H.B. Robinson Steam Electric Plant, Unit 2 (HBRSEP2) to adopt Technical Specifications Task Force (TSTF) 425, Revision 3, "Relocate Surveillance Frequencies to Licensee Control – RITSTF Initiative 5b." The proposed amendment would modify HBRSEP2's Technical Specifications (TS) by relocating specific Surveillance Frequencies to a licensee-controlled program. The change also would add the Surveillance Frequency Control Program to TS Section 5, Administrative Controls.

Regulatory Guide (RG) 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities" (ADAMS Accession No. ML090410014) provides guidelines regarding the technical adequacy of PRA models used in risk informed applications. RG 1.200 describes a peer review process utilizing American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) PRA standard RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications, Addendum A to RA-S-2008," as one acceptable approach for determining the technical adequacy of the PRA once acceptable consensus approaches or models have been established for evaluations that could influence the regulatory decision.

To complete its review, the U.S. Nuclear Regulatory Commission (NRC staff) requests additional information (RAI) to the items below. The NRC staff notes that by letter dated April 5, 2018 (ADAMS Accession No. ML18099A130), Duke Energy submitted a LAR for HBRSEP2 to implement the provisions of Title 10 of the Code of Federal Regulations (10 CFR), Section 50.69, "Risk-informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Plants." RAIs regarding the HBRSEP2 LAR to implement the provisions of 10 CFR 50.69 are in Enclosure 1. The RAIs for this LAR, to adopt TSTF-425, are similar in nature to the RAIs for HBRSEP2 to implement 10 CFR 50.69. As such, the NRC staff requests separate responses to the RAIs for the HBRSEP2 LAR to implement TSTF-425 LAR and the HBRSEP2 LAR to implement 50.69, even though the responses may be similar.

2.0 REQUEST FOR ADDITIONAL INFORMATION (RAI)

PRA RAI 01 – Open/Partially Open Findings in the Process of Being Resolved

Section 4.2 of RG 1.200 states that the LAR should include a discussion of the resolution of the peer review facts 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 and
- 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 particular issue.

LAR Attachment 2, Tables 1, 2, and 3, provide finding-level F&Os that are still open or only partially resolved after the F&O closure review. Also, F&O descriptions and their dispositions were previously provided to the NRC in the LAR to adopt for Technical Specification 5.5.16 Option B, "10 CFR 50, Appendix J, Integrated Leak Rate Test Interval and Type C Leak rate testing Frequency" (ADAMS Accession No. ML16201A195) and in the LAR to adopt National Fire Protection Association Standard 805 (ADAMS Accession No. ML16337A264). For a number of F&O dispositions there is insufficient information for NRC staff to conclude that the F&O is sufficiently dispositioned for this application.

a. F&Os associated with Supporting Requirements (SR) AS-A5, AS-B3, LE-C4, and LE-D5 regarding thermally induced steam generator tube ruptures (SGTR):

   Open F&Os on SRs AS-A5, AS-B3, and LE-D5 in the LAR state, in part, that the thermally induced SGTR accident sequence was missing from the PRA. Separately, the LAR supplement indicates that the F&O associated with SR LE-D6 (SR LE-D6 directs that a thermally induced SGTR shall be modelled) was closed because a thermally induced SGTR accident sequence was developed and peer-reviewed with no subsequent F&Os. However, the resolutions for the open F&Os, associated with SRs LE-C4 and LE-D5 in the LAR also states, in part, that a sensitivity study demonstrates that un-modelled human failure events (HFEs) related to isolating a ruptured SG following an SGTR initiating event (i.e., apparently not a thermally induced SGTR) has a minimal impact on the PRA results and an acceptable impact of the adoption of TSTF-425.

   i. Clarify whether the evaluation of the impact of the un-modelled isolation HFE described in the F&O resolution for SRs LE-C4 and LE-D5 in the LAR includes the thermally induced SGTR accident sequence. If not, include the thermally induced SGTR accident sequence in the sensitivity study or otherwise evaluate its impact.

   ii. Provide clarification that the sensitivity study related to the exclusion of the SG isolation HFE demonstrated that there was no impact on the relocation of surveillance frequencies, or

   iii. Alternatively to Part ii, if the sensitivity study demonstrates that the exclusion of the operator action does impact any relocation of surveillance frequencies, then propose a mechanism to ensure incorporation of the operator action in the PRA model of record (MOR) prior to implementation of TSTF-425.

b. F&O associated with SR IFEV-A7-01 regarding human-induced flood events:

One of the issues provided in the F&O description in LAR Attachment 2 concerns the proper screening of human-induced flood events to determine exclusion from the PRA MOR. The first part of the disposition states, "[t]he sensitivity study performed was overly conservative and attempted to apply all industry human induced failure events on a per piping frequency. This led to a largely over conservative value." There is no description or results for this sensitivity study provided in the LAR.

The second part of the disposition states, "[h]uman induced flooding events are not risk significant for this application as on the whole human induced flooding events in the industry have largely been occurring less often." The disposition makes reference to the period from 1971 to 2011, which appears to match the period used in the EPRI TR-3002000079, "Pipe Rupture Frequencies for Internal Flooding Probabilistic Assessments," Revision 3, which provides flood event probabilities including human-induced events. The NRC staff notes that the EPRI TR is an update of the 2006 TR data and would reflect the decreasing trend of events over that period.

The NRC staff has issued two information notices (IN) related to human-induced flooding events since 2007, IN 2007-01 and IN 2016-11.

Section 5.6 of EPRI TR-1019194, "Guidelines for Performance of Internal Flooding Probabilistic Risk Assessment," provides specific methodology, including screening, for maintenance-induced flooding events.

Capability Category (CC) I/II for ASME/ANS 2009 PRA Standard for SR IFEV-A7 states, "[i]nclude consideration of human-induced floods during maintenance through application of generic data." SRs IFSN-A10 and IFSN-A15 provide flood event screening criteria. In light of these observations:

i. Describe the sensitivity study mentioned in the F&O disposition. Include in this discussion the purpose of the sensitivity study, what modifications to the PRA model were performed, the results of the study, and the insights from this sensitivity study.

ii. Provide justification, such as industry approved screening criteria, to exclude the remaining maintenance-induced internal flooding events, using industry generic data, from the PRA model, and provide justification that exclusion of these maintenance-induced events does not impact relocation of surveillance frequencies, or

iii. Alternatively to Part ii, propose a mechanism to ensure F&O IFEV-A7-01 will be resolved prior to implementation of TSTF-425. This mechanism should also provide an explicit description of changes that will be made to the PRA model and documentation to resolve the issue.

c. F&O associated with SR IFSN-A8-01 regarding door failure heights

The description of the finding in LAR Attachment 2 states the, "[u]se of EPRI door failure criteria of 1 ft [foot] / 3 ft may not be appropriate depending on the actual door attributes and flooding scenario."

The disposition states, "[t]he current IFPRA assumes that the majority of the components would fail at or around 1 ft to 3 ft," and concludes the effects, "minimal on modeling results and therefore will have no impact on the quantified values with regard to the RITSTF Initiative 5b application." The disposition does not discuss how the application provides a bounding assessment for this assumption.

Appendix D of EPRI TR-1019194, "Guidelines for Performance of Internal Flooding Probabilistic Risk Assessment," provides methodology for determining door failure heights. In light of these observations:

i. Provide justification, such as a sensitivity study, that the exclusion of the correct door failure heights would not impact relocation of surveillance frequencies, or

ii. Alternatively, propose a mechanism that ensures F&O IFSN-A8-01 will be resolved prior to implementation of TSTF-425. This mechanism should also provide an explicit description of changes that will be made to the PRA model and documentation to resolve the issue.

d. F&O associated with SR IFSN-A8-02 regarding door gap flooding propagation

The disposition in LAR Attachment 2 states that it identified one scenario where additional equipment would be impacted. In evaluating the additional failures the disposition states, "[c]rediting flow underneath door gaps would increase the time that operators would be able to potentially isolate the scenario. Therefore as it is currently modeled, scenarios for this flood area are conservative." The disposition concludes, "[t]he timing effects of this open F&O is minimal on modeling results and therefore will have no impact on the quantified values with regard to the RITSTF Initiative 5b application."

In accordance with the SR IFSN A10 (ASME/ANS 2009 PRA Standard), each developed flood scenario includes, "giving credit for appropriate flood mitigation systems or operator actions, and identifying susceptible SSCs [structures, systems, and components]." The NRC staff notes the exclusion of SSC(s) impacts from initiating events reduces their contribution to risk and can therefore impact their importance measures, thus potentially impacting the importance measures of other SSC(s) as well. In light of these observations:

i. Provide justification, such as a sensitivity study, that the exclusion of the additional PRA SSC impacts from the door gap propagation has no impact on the relocation of surveillance frequencies, or

ii. Alternatively, propose a mechanism that ensures F&O IFSN-A8-02 will be resolved prior to implementation of TSTF-425. This mechanism should also provide an explicit description of changes that will be made to the PRA model and documentation to resolve the issue.

PRA RAI 02 - Identifying Key Assumptions and Uncertainties that Could Impact the Application

Section 1.3 of RG 1.200 describes the level of detail of a PRA required and states, "[i]n general, the level of detail for the base PRA needs to be consistent with current good practice." Current good practices are those practices that are generally accepted throughout the industry and have shown to be technically acceptable in documented analyses or engineering assessments.

LAR Attachment 2, Section 6.0 contains three key assumptions and sources of uncertainty from three PRA models, whereas industry guidance documents such as NUREG-1855, Revision 1, "Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decisionmaking," March 2017 (ADAMS Accession No. ML17062A466), and EPRI TR-1026511, "Practical Guidance on the Use of Probabilistic Risk Assessment in Risk-Informed Applications with a Focus on the Treatment of Uncertainty," (2012) address a large number of potential assumptions and uncertainties. For example, one key source of fire PRA modeling assumptions/uncertainty are provided in the LAR, compared to the 2012 EPRI document which identifies 71 potential sources of uncertainty. There appear to be no uncertainties or assumptions associated with large early release (LERF) and internal flooding.

The LAR continues, "[t]he list below represents the modeling assumptions and uncertainties that are considered to have the greatest impact on the HBRSEP PRA results if different reasonable alternative assumptions are utilized."

The NRC staff notes that Stage C, D, E, and F of NUREG-1855 (Revision 1) provides guidance on how to identify key sources of uncertainty relevant to the application.

To address the observations above, the staff requests the following additional information:

a. Provide a detailed summary of the process used to determine the impact of each of the 71 potential sources of uncertainty in the EPRI documents and describe how this process resulted in the final set of three key assumptions and sources of uncertainty presented in LAR Attachment 2, Section 6.0. Include in this discussion an explanation of how the process is in accordance with NUREG-1855, Rev. 1, or another NRC-accepted method.

b. If the process of identifying key sources of uncertainty or assumptions for these PRA models cannot be justified, provide the results of an updated assessment of key sources of uncertainty or assumptions.

PRA RAI 03 – Very Early Warning Fire Detection Systems (VEWFDS) Utilized in the PRA

In the HBSEP2 LAR to implement 10 CFR 50.69 (ADAMS Accession No. ML18099A130), the NRC staff notes that Assumption/Uncertainty No. 4 in Attachment 6 states, "[t]he HBRSEP2 Fire PRA assumes Incipient Detection System functions as outlined in NUREG-2180 ["Determining the Effectiveness, Limitations, and Operator Response for Very Early Warning Fire Detection Systems in Nuclear Facilities (DELORES-VEWFIRE), Final Report," December 2016 (ADAMS Accession No. ML16343A058)]." The disposition to this uncertainty states, "[t]he current method of crediting Incipient Detection at RNP is similar to NUREG-2180 with more credit for operators to prevent fires based upon actual plant experience and plant procedures." It is not clear to the NRC staff how much actual plant experience with fires has been collected and what differences exist between NUREG-2180 and the licensee's approach. Therefore, the staff requests the following information:

a. Provide a summary of the method the licensee used for crediting Incipient Detection at HBRSEP2.

b. Provide an explanation of any differences between the licensee's method and the method as described in NUREG-2180. If there are differences, provide justification for the

differences and explain how they are expected to impact the relocation of surveillance frequencies.

PRA RAI 04 – Incorporation of FLEX into the PRA Model(s)

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 the licensee has incorporated FLEX mitigating strategies and associated equipment into the PRA models at Robinson.

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

a. If FLEX mitigating strategies and associated equipment have not been incorporated into the base PRA and the external hazard evaluations, confirm that FLEX equipment is not modelled.

b. If FLEX mitigating strategies and associated equipment have been incorporated into the base PRA and the external hazard evaluations but do not impact the relocation of surveillance frequencies, summarize the evaluation supporting the conclusion that there is no impact on the relocation of surveillance frequencies.

c. If FLEX mitigating strategies and associated equipment have been incorporated into the base PRA and the external hazard evaluations and do impact the relocation of surveillance frequencies, provide the following information:

    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 a justification explaining the rational 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 HEPs 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 probability of failure to initiate mitigating strategies.

iv. The ASME/ANS RA-Sa-2009 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.

(1) Provide an evaluation of the model changes associated with incorporating mitigating strategies, which demonstrates that none of the following criteria are 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

(2) 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 CC II prior to implementation of TSTF-425.