



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 6, 2017

Mr. Bryan C. Hanson
Senior Vice President
Exelon Generation Company, LLC
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: LIMERICK GENERATING STATION, UNITS 1 AND 2 – REGULATORY AUDIT PLAN AND AUDIT QUESTIONS REGARDING LICENSE AMENDMENT REQUEST TO ADOPT TITLE 10 OF THE CODE OF FEDERAL REGULATIONS SECTION 50.69, “RISK-INFORMED CATEGORIZATION AND TREATMENT OF STRUCTURES, SYSTEMS AND COMPONENTS FOR NUCLEAR POWER PLANTS” (CAC NOS. MF9873 AND MF9874; EPID L-2017-LLA-0275)

Dear Mr. Hanson:

By letter dated June 28, 2017, as supplemented by letter dated August 14, 2017 (Agencywide Documents Access and Management System Accession Nos. ML17179A161 and ML17226A336, respectively), Exelon Generation Company, LLC (the licensee) submitted a license amendment request 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 Nuclear Power Plants,” for the Limerick Generating Station, Units 1 and 2.

The proposed license amendment would modify the licensing basis by the addition of a license condition to allow for the implementation of the provisions of 10 CFR 50.69, which allow adjustment of the scope of equipment subject to special treatment controls (e.g., quality assurance, testing, inspection, condition monitoring, assessment, and evaluation).

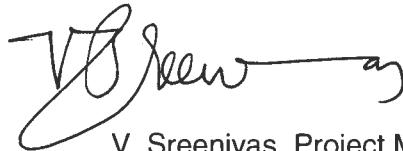
The U.S. Nuclear Regulatory Commission staff will be conducting an onsite audit starting November 14, 2017, and ending November 16, 2017, at the Exelon Generation Company, LLC offices, 300 Exelon Way, Kennett Square, PA 19348. The Regulatory Audit Plan and Audit Questions are enclosed with this letter.

B. Hanson

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If you have any questions regarding this matter, please contact me at 301-415-2597 or by e-mail to V.Sreenivas@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read 'V. Sreenivas', with a long horizontal flourish extending to the right.

V. Sreenivas, Project Manager
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-352 and 50-353

Enclosures:

1. Regulatory Audit Plan
2. Audit Questions

cc w/Enclosures: Distribution via Listserv

REGULATORY AUDIT PLAN

FOR THE AUDIT STARTING NOVEMBER 14, 2017, AND ENDING NOVEMBER 16, 2017

LIMERICK GENERATING STATION, UNITS 1 AND 2

REGARDING EXELON GENERATION COMPANY, LLC'S

LICENSE AMENDMENT REQUEST TO ADOPT 10 CFR 50.69

DOCKET NOS. 50-352 AND 50-353

1.0 BACKGROUND

By letter dated June 28, 2017 (Reference 1), as supplemented by letter dated August 14, 2017 (Reference 2), Exelon Generation Company, LLC (Exelon, the licensee) submitted a license amendment request 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 Nuclear Power Plants," for the Limerick Generating Station, Units 1 and 2 (Limerick). The proposed license amendment would modify the licensing basis by the addition of a license condition to allow for the implementation of the provisions of 10 CFR 50.69, which allow adjustment of the scope of equipment subject to special treatment controls (e.g., quality assurance, testing, inspection, condition monitoring, assessment, and evaluation).

This voluntary risk-informed alternative rule allows power reactor licensees and license applicants to apply a risk-informed categorization process to categorize structures, systems, and components (SSCs) based on their safety significance. The final rule was published in the *Federal Register* on November 22, 2004 (69 FR 68008) (Reference 3). The U.S. Nuclear Regulatory Commission (NRC) staff issued Regulatory Guide (RG) 1.201, Revision 1, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to Their Safety Significance," in May 2006 (Reference 4).

The NRC staff's review of the application has commenced in accordance with the Office of Nuclear Reactor Regulation's (NRR's) Office Instruction LIC-101, "License Amendment Review Procedures." The NRC staff has determined that a regulatory audit of Exelon's 10 CFR 50.69 application should be conducted in accordance with NRR Office Instruction LIC-111, "Regulatory Audits," for the staff to gain a better understanding of the licensee's proposed risk-informed categorization process.

A regulatory audit is a planned license or regulation-related activity that includes the examination and evaluation of primarily non-docketed information. A regulatory audit is conducted with the intent to gain understanding, to verify information, and/or to identify information that will require docketing to support the basis of a licensing or regulatory decision. Performing a regulatory audit of the licensee's information is expected to assist the staff in efficiently conducting its review or gain insights on the licensee's processes or procedures. Information that the NRC staff relies upon to make the safety determination must be submitted

on the docket. However, the NRC staff may review supporting information retained as records under 10 CFR 50.71 and/or 10 CFR 54.37, which although not required to be submitted as part of the licensing action, would help the staff better understand the licensee's submitted information.

The objectives of this regulatory audit are to determine the technical adequacy of the application by:

- verifying conformance of the categorization process with NRC-endorsed guidance and the licensee's implementation of the endorsed categorization process;
- validating probabilistic risk assessment (PRA) quality is adequate for use in the application;
- confirming that non-PRA methods used for evaluating the risk from external hazards are consistent with those allowed in Nuclear Energy Institute (NEI) 00-04, Revision 0, "10 CFR 50.69 SSC Categorization Guideline," July 2005 (Reference 5), and consider the current as-built, as-operated plant;
- observing the results of the Integrated Decisionmaking Panel (IDP); and
- identifying new information that is needed in order for staff to reach a licensing or regulatory decision in discussing audit questions.

2.0 REGULATORY AUDIT BASIS

The basis of this audit is Exelon's application dated June 28, 2017, as supplemented by letter dated August 14, 2017; 10 CFR 50.69; RG 1.201, Revision 1; and NRC Inspection Manual Inspection Procedure 37060, "10 CFR 50-69 Risk-Informed Categorization and Treatment of Structures, Systems, and Components Inspection" (Reference 6). Additional references provide more regulatory information that will be used to support the audit.

3.0 REGULATORY AUDIT SCOPE OR METHOD

The NRC staff will verify conformance of the categorization process with NRC-endorsed guidance and confirm that authorization of work for any non-PRA methods proposed for use in the categorization process is consistent with authorization of work allowed in NEI 00-04, as endorsed, with clarifications in RG 1.201, Revision 1. The team plans to discuss audit questions and identify the need for additional information or clarification.

4.0 INFORMATION AND OTHER MATERIAL NECESSARY FOR THE AUDIT

The NRC audit team will require access to licensee personnel knowledgeable in all aspects of the Exelon 10 CFR 50.69 application. At a minimum, a hard copy and electronic copy of the following documentation should be available to the audit team on the first day of the audit. In addition, presentations and specific discussion topics may be requested prior to the audit.

Documents

- Internal events and fire PRA documentation models should be available on computer with licensee support
- Internal events and fire PRA peer review reports and facts and observations (F&O) closure reports
- Documentation of changes to the PRA models with justification of upgrades/updates
- Limerick 10 CFR 50.69 license amendment request, as supplemented
- 10 CFR 50.69 draft procedures
- Documentation of categorization results

Presentations

- 10 CFR 50.69 process presentation
- Walk-through categorization results

Discussions

- Discussions of audit questions related to:
 - F&Os
 - PRA updates/upgrades, focused-scope peer reviews, and F&O closure
 - Categorization steps
 - A description of how the IDP meetings are being conducted, with example categorizations of SSCs resulting from the IDP deliberations

5.0 TEAM AND ASSIGNMENTS

V. Sreenivas, Project Manager, NRR/DORL
Mihaela Biro, NRR/DRA
Jonathan Evans, NRR/DRA
Stacey Rosenberg, NRR/DRA
Leslie Fields, NRR/DRA
Michael Levine, NRR/DRA
Jessie Quichocho, NRR/DE
Garill Coles – NRC Contractor (PNNL)

The audit will be conducted by NRC staff from the NRR Division of Risk Assessment (DRA), PRA Licensing Branch, and an NRC contractor from the Pacific Northwest National Laboratories (PNNL) in support of the technical audit team members. Staff knowledgeable in 10 CFR 50.69 and risk-informed licensing reviews will comprise the audit team. Observers at the audit may include NRR technical reviewers and project managers (PM). The NRC audit team leader will be Leslie Fields (PM), and the NRC technical lead will be Mihaela Biro (PRA). The audit team leader will conduct daily briefings on the status of the review and coordinate audit activities while on site. The following table shows the planned audit team composition and assigned areas for review during the audit.

| Audit Milestones and Schedule | | |
|---|-------------------------|--|
| Activity | Timeframe | Comments |
| Onsite Audit Kick-Off Meeting | 11/14/2017 | NRC will present a brief team introduction and discuss the scope of the audit. The licensee should introduce team members and give logistics for the week. |
| End of Day Summary Briefings | 11/14/2017-11/15/2017 | Meet with licensee to provide a summary of any significant findings and requests for additional assistance. |
| Provide Rooms for Focused Topic Discussions | 11/14/2017 – 11/16/2017 | Facilitate discussions between site and staff technical areas. Provide one to two breakout areas, if possible, for smaller discussions. |
| Onsite Audit Exit Meeting | 11/16/2017 | NRC staff will hold a brief exit meeting with licensee staff to conclude audit activities. |
| Audit Summary (see Section 8.0) | 30 days after exit | To document the audit. (30 business days) |

| Regulatory Audit Plan Review Areas and Assignments | | | |
|---|---|-------------|----------------|
| | | Lead | Support |
| 1 | Categorization Process | Team | Team |
| 2 | PRA Technical Adequacy | M. Biro | PNNL |
| 2.a | Peer Reviews | M. Biro | PNNL |
| 2.b | Facts and Observations | M. Biro | PNNL |
| 2.c | PRA Updates/Upgrades | M. Biro | PNNL |
| 3 | External Hazards | M. Biro | PNNL |
| 4 | Integrated Decisionmaking Panel | M. Biro | PNNL |
| 5 | Documentation, Configuration Control, and Quality | L. Fields | Team |

6.0 LOGISTICS

This regulatory audit will begin November 14, 2017, and will last approximately 3 days. A draft audit plan was provided to the licensee on October 30, 2017, and a clarification call was not requested. An entrance meeting for this audit will be held on the first day at 9:00 a.m., and an exit meeting will be held the final day at 4:00 p.m. (or earlier or later) based on a mutually agreed upon time. The NRC audit team leader will provide daily progress briefings to licensee personnel on the first and second day of the audit.

The audit will take place at the Exelon Generation Company, LLC offices in Kennett Square, Pennsylvania, where (1) the necessary reference material and (2) appropriate Exelon staff should be available to support the review. Visitor access will be requested for the entire audit team. We recommend that security paperwork and processing be handled prior to the first day of the audit, if possible.

7.0 SPECIAL REQUESTS

The regulatory audit team will require the following to support the regulatory audit:

- two computers with internet access and printing capability in the NRC room, access to the site portal, and wired or wireless guest internet access for all team members;
- one main conference room with one additional private area for conference calling capability should be made available. The main NRC conference room should be set up for six to eight NRC staff and contractors; and
- access to licensee personnel knowledgeable in the categorization process, plant design, operation, and the plant PRA. In addition, Exelon staff who participated in preparing the license amendment request submittal should be available for discussion.

8.0 DELIVERABLES

A regulatory audit summary will be issued by the NRC staff within approximately 30 business days after the completion of the audit. The summary will use the guidance of NRR Office Instruction LIC-111 for content. Audit questions are being provided along with this audit plan. After the audit, formal requests for additional information will be sent to the licensee from NRR's Division of Operator Licensing (DORL). The audit summary will be placed in the Agencywide Documents Access and Management System (ADAMS).

9.0 REFERENCES

1. Letter from J. Barstow, Exelon, to NRC, "Limerick Generating Station, Units 1 and 2 – Application to Adopt 10 CFR 50.69, 'Risk-Informed Categorization and Treatment of Structures, Systems, and Components (SSCs) for Nuclear Power Plants,'" dated June 28, 2017 (ADAMS Accession No. ML17179A161).
2. Letter from J. Barstow, Exelon, to NRC, "Limerick Generating Station, Units 1 and 2 – Supplement to Application to Adopt 10 CFR 50.69, Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors," dated August 14, 2017 (ADAMS Accession No. ML17226A336).
3. *Federal Register* Notice (69 FR 68008, dated November 22, 2004) – "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Plants" (ADAMS Accession No. ML042960073).
4. NRC RG 1.201, Revision 1, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants according to Their Safety Significance," issued May 2006 (ADAMS Accession No. ML061090627).

5. Nuclear Energy Institute, NEI 00-04, Revision 0, "10 CFR 50.69 SSC Categorization Guideline," issued July 2005 (ADAMS Accession No. ML052900163).
6. NRC Inspection Manual, Inspection Procedure 37060, "10 CFR 50.69 Risk-Informed Categorization and Treatment of Structures, Systems, and Components Inspection" (ADAMS Accession No. ML102700396).
7. NRC RG 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," issued March 2009 (ADAMS Accession No. ML090410014).

AUDIT QUESTIONS

FOR THE AUDIT STARTING NOVEMBER 14, 2017, AND ENDING NOVEMBER 16, 2017

LIMERICK GENERATING STATION, UNITS 1 AND 2

REGULATORY AUDIT IN SUPPORT OF EXELON GENERATION COMPANY, LLC'S

APPLICATION FOR LICENSE AMENDMENT TO ADOPT 10 CFR 50.69

DOCKET NOS. 50-352 AND 50-353

Question 01 – Internal Events and Internal Flooding Probabilistic Risk Assessment (PRA) Facts and Observations (F&Os)

- a. F&O HR-A1-01 – Review of Procedures and Practices for Test and Maintenance Pre-Initiators

F&O HR-A1-01 appears to indicate that the test and maintenance pre-initiators were not derived from a review of procedures and practices as prescribed by PRA standard supporting requirement (SR) HR-A1. The disposition to the F&O in Attachment 3.a, "Open and Partially Resolved Peer Review Findings," of the licensee's application dated June 28, 2017, states that the risk-significant pre-initiators are included in the model, without explaining how the test and maintenance pre-initiators were identified. Explain how the test and maintenance pre-initiators were derived (e.g., through a review of procedures) and explain how the conclusion that the risk-significant pre-initiators have been included was reached.

- b. F&O IF-B3-01 – Water Volume not Considered

F&O IF-B3-01 indicates that internal flooding scenarios may have been inappropriately screened out because the full volume of water that could drain from the cited cooling water systems was not considered. The disposition to this F&O in Attachment 3.a states that flood scenarios need to be reviewed in the next update to determine if revisions or additional scenarios are needed, but any changes are expected to have "no material impact" on the licensee's Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.69 application. Given the acknowledgement that scenarios may need to be added, it is not clear why these exclusions can have no material impact on the 10 CFR 50.69 application. Justify why the excluded scenarios cannot have a material impact on the 10 CFR 50.69 application, or alternatively, incorporate the additional water volumes cited in the F&O into the internal flooding PRA.

- c. F&O IF-C2b-01 – Drain Capacity Uncertainty

The disposition to F&O IF-2Cb-01 states that a formal analysis of drain capacity was not performed. Instead, the disposition implies that drain capacity was conservatively not credited except for flood zone RB-FL09. The disposition in Attachment 3.a states that drain capacity for flood zone RB-FL09 was estimated based on "discussion with engineers and review of plant drawings." It is not clear from this description how the conservative estimate

of drain capacity was obtained. Explain what input from engineers and plant drawings was used to estimate drain capacity credit, and justify why the estimate is conservative or does not have an impact on this application, or alternatively, incorporate a realistic or bounding estimate of the drain capacity into the internal flooding PRA.

d. F&O SC-SY-B1-01 – Fire Water Makeup

F&O SC-SY-B1-01 stated that “a high probability was used for failure of fire water makeup to the vessel to prevent core damage” ... “to include the uncertainty as to whether or not the fire protection system can actually prevent core damage after depressurizing the reactor and within four hours after an initiating event.” The reported resolution in Attachment 3.b, “Resolved Peer Review Findings,” of the licensee’s application dated June 28, 2017, was that a “detailed HRA [human reliability analysis] calculation was performed for aligning fire water makeup to the reactor vessel.” Performing a “detailed HRA calculation” provides confidence that the alignment is feasible and failure to align is properly quantified, but not necessarily whether the flow and amount of water is sufficient to prevent core damage. Confirm that sufficient flow and amount of water was determined as part of the HRA calculation, or alternatively, provide justification that the fire protection system can successfully prevent core damage as credited in the PRA model.

Question 02 – Fire PRA Facts and Observations

Attachment 3.a, “Open and Partially Resolved Peer Review Findings,” of the license amendment request (LAR) also provides information regarding the disposition of fire PRA F&Os that have not been closed. The following requests relate to dispositions of fire event F&Os that do not seem fully resolved for the 10 CFR 50.69 application.

a. F&O 2-8 Against SR PRM-B6 New Success Criteria

This F&O is stated to be a “documentation issue with no impact on the application”; however, this F&O appears to identify potential modeling issues in the PRA model. Both the finding and the disposition to this F&O state that “the characterization of a [main steam isolation valve] MSIV spurious opening as a [large loss-of-coolant accident] LLOCA above [top of active fuel] TAF was not supported by [thermal-hydraulic] T/H evaluations.” Provide justification that appropriate success criteria have been used in the PRA model for scenarios that consider MSIV spurious opening as a LLOCA.

b. F&O 2-25 Against SR FSS-D7 – Crediting Fire Detection and Suppression Systems

The disposition to the finding only addresses the availability and/or reliability of the fire detection and suppression system(s). Both the standard and the finding state that fire detection and suppression systems may only be credited if they are installed and maintained in accordance with applicable codes and standards. Proper installation and maintenance is normally documented in a code compliance calculation. Verify that all credited fire detection and suppression systems have been reviewed for compliance to applicable codes and documented in a code compliance calculation. If not, evaluate all credited fire detection and suppression systems against the original code of construction upon completion, and adjust credit in the PRA accordingly (remove credit for those systems not installed in accordance with the original code of construction or provide justification that any deviations from the code(s) do not impact system effectiveness).

c. F&O 4-6 Against SR HRA-A3 – Undesired Operator Actions

The disposition states that undesired operator actions such as the tripping or isolating equipment were identified that could result from spurious signals, but such actions were determined to have “no material impact” on the 10 CFR 50.69 application. The disposition explains that, in such cases, there would be time for recovery if there is no damage to equipment from fire. Undesired operator actions based on spurious signal create additional risk. Moreover, the success of recovery actions can be hampered by fire or fire damage and the difficulty of diagnosing what is happening in the plant when spurious signals have occurred. In light of these observations:

- 1) Provide justification that the operators would recover from spurious signals (cues), since operators are trained to believe their instrumentation and procedural controls may dictate that the undesired action should be taken. Include discussion of procedural guidance that limits the possibility of undesired actions and the cognitive and execution challenges associated with recovering from undesired operator actions.
- 2) Provide further justification that the risk from undesired operator actions is negligible and can be excluded from the fire PRA.
- 3) If it cannot be justified that the risk from undesired operator actions is negligible, then incorporate undesired operator actions caused by spurious signals into the fire PRA.

d. F&O 4-23 against SR PRM-C1 – New Contributors Due to Spurious Operations

F&O 4-23 identifies that “MCRAB Event tree uses existing FPIE success criteria and T-H analysis,” without the proper confirmation or justification of applicability. The reported resolution in Attachment 3.b states, “In general, the use of internal events and/or fire non-abandonment T/H runs for MCRAB actions is appropriate when the scenario details match closely enough.” The use of the terms “in general” and “closely enough” seem to imply that there are situations where the use of internal events and/or fire non-abandonment T/H runs are not appropriate. Provide a discussion of how the situations where the internal events and/or fire non-abandonment T/H runs are not appropriate were addressed.

e. F&O 4-30 Against SR IGN-A7 – Exclusion of Junction Box Modelling

The disposition to F&O 4-30 states that the risk contribution from junction boxes has not been included in the fire PRA, but that the fire PRA will be modeled consistent with guidance in Frequently Asked Question (FAQ)13-0006 during the next PRA update. It is not clear to NRC staff that the risk associated with junction boxes is negligible for the 10 CFR 50.69 application. Provide justification that the risk from junction boxes has negligible impact on the 10 CFR 50.69 application, or alternatively, incorporate the risk associated with junction boxes into the fire PRA model.

f. F&O 4-34 Against SR FSS-G1 – Exclusion of Certain Transient Fire Modeling

F&O 4-34 cites examples of transient fires that were excluded from consideration without justification. The disposition to this F&O states that better documentation is needed of

the basis for this screening but does not provide the basis for the exclusion. Identify the guidance used or explain why transient fires are excluded in specific scenarios such as those cited in the F&O, or alternatively, incorporate the excluded transient fires into the fire PRA model.

g. F&O N/A Against FSS-C6 – Focused-Scope F&Os Against THIEF Model

The disposition associated with PRA standard SR FSS-C6 explains that a focused-scope peer review was performed on the implementation of the THIEF fire modelling tool, which resulted in two F&Os that “are being resolved in the current (2017) model update.” The impact of the resolution of these two F&Os on the 10 CFR 50.69 program is unknown. Provide justification for why the two unresolved F&Os from the focused-scope peer review associated with a PRA upgrade of the fire modeling have minimal impact on the 10 CFR 50.69 application, or alternatively, incorporate resolution to these two focused-scope fire modeling F&Os into the fire PRA model.

Question 03 – PRA Maintenance Versus PRA Upgrade

- a. Attachment 3.b provides information regarding the disposition of fire PRA F&Os that were closed by the July 2016 F&O closure review. The disposition for the F&Os does not include a discussion about whether each change is PRA maintenance or a PRA upgrade. Inspection of the reported change indicates that some changes may use a new methodology and that the change could impact significant accident sequences or the significant accident progression sequences (i.e., the change was an upgrade that should be peer reviewed).

For each of the following changes, summarize the original method in the PRA and the new method to demonstrate that the change is not an upgrade because “a new methodology was not used and that the changes do not impact significant accident sequences or the significant accident progression sequences.” If the change is determined to be an upgrade, propose a mechanism to ensure that these upgrades are peer reviewed and any resulting F&Os closed using an F&O closure process prior to the implementation of the 10 CFR 50.69 categorization process.

- 1) changes to the fire PRA events trees to use of the fire initiating event decision tree (FIEDT);
- 2) change to use the “fire modeling workbook” approach;
- 3) change to replacement of fire modelling treatment notebook based reduced heat release rates for transient fires of 60 kilowatts (kW) and 140 kW with guidance endorsed by the June 21, 2012, memo from Joseph Giitter to Biff Bradley, “Recent Fire PRA Methods Review Panel Decisions,” and Electric Power Research Institute (EPRI) 1022993, ‘Evaluation of Peak Heat Release Rates in Electrical Cabinets Fires’ (ADAMS Accession No. ML12172A406), and associated documentation;
- 4) change to using the guidance in FAQ 14-0009, “Treatment of Well Sealed MCC Electrical Panels Greater than 440V”; and
- 5) change to using the guidance in FAQ 12-0064, “Hot Work/Transient Fire Frequency: Influence Factors.”

- b. A September 19, 2016, request for additional information (RAI) response (ADAMS Accession No. ML16263A218) associated with an earlier relief request dated April 13, 2016 (ADAMS Accession No. ML16104A122), reported changes in the internal events PRA after the 2005 full scope peer review. The 2008 model LG108A and LG208A changes converted the HRA from a spreadsheet to the "EPRI HRA Calculator." The September 19, 2016, RAI response stated that the change was PRA maintenance because "the HRA Calculator uses the same HRA methodologies as were used in the spreadsheets." Please briefly confirm that or alternatively summarize how the previous spreadsheets applied the following HRA methodologies used in the HRA calculator:
- included pre-initiator, post-initiator, and dependency analysis;
 - quantified pre-initiators using accident sequence evaluation program (ASEP) or technique for human error rate prediction (THERP);
 - included a cognitive error and an execution error for each post-initiator human failure events (HFEs);
 - analyzed the cognitive error using the EPRI CBDTM and HCR/ORE, THERP, or SPAR-methods;
 - analyzed the execution error using THERP; and
 - included a dependency analysis that could identify combinations of HFEs in cutsets and analyze combinations of pre-initiators, post-initiators, and both pre- and post-initiators.

- c. Closed F&Os DA-C14-01 and QU-A4-01 related to credit for repair provided in Attachment 3.b stated that credit for repair had been removed for some listed systems but implied that credit was retained for the Instrument Air (IA) system.

The internal events gap assessment results and resolutions have previously been provided for an inservice inspection relief request dated April 13, 2016, as supplemented by RAI response dated September 19, 2016. In the September 19, 2016, RAI response, the licensee stated that SR DA-D9 is not applicable because "repair is not credited in the current model."

- 1) Identify any SSCs for which repair is credit in the current PRA.
- 2) If repair has been credited, clarify which processes have been used to review the implementation of repair in the PRA models.

Question 04 – Assumptions and Uncertainties

Table 2 of the LAR supplement dated August 14, 2017, presents dispositions for assumptions and modeling uncertainties that include planned updates to the PRA models after the 10 CFR 50.69 amendment has been issued and before implementation of the 10 CFR 50.69 program. The future updates include accounting for load shedding directed by procedure, updating the internal flooding pipe break frequencies, and removing credit for core melt arrest in vessel. It appears that these future update uncertainties can have an impact on the

10 CFR 50.69 categorizations; therefore, either justify why these issues have no impact on the 10 CFR 50.69 categorization results or propose a mechanism to ensure that the categorization process will use a PRA that has been updated as described.

Question 05 – Overall Categorization Process

LAR Section 3.1.1, “Overall Categorization,” process has two different sets of bulleted elements and concludes with an additional list of ten elements. Some of the elements discuss training that will be given, some discuss the different hazard models, and some discuss PRA model results. It is not clear from these discussions what the sequence of evaluations will be in the categorization process, what information will be developed and used, and what guidance on the acceptable decisions by the IDP will be followed during the categorization of each system. Information on the training and expertise of the IDP team is provided in the LAR and need not be repeated in this RAI response.

- a. Please summarize, in the order they will be performed, the sequence of elements or steps that will be followed for each system that will be categorized. A flow chart, such as that provided in the NEI presentation (ADAMS Accession No. ML17249A072) for the September 6, 2017, public meeting with Nuclear Energy Institute (NEI) regarding 10 CFR 50.69 LARs (ADAMS Accession No. ML17265A020) may be provided instead of a description. The steps should include:
 - 1) The input from all PRA evaluations such as use of the results from the internal events, internal flooding, and fire PRAs.
 - 2) The input from non-PRA approaches if any.
 - 3) The input from the responses to the qualitative questions.
 - 4) When a function will be determined to be high-safety-significant (HSS) and what the impact of that determination will be on the components supporting each function.
 - 5) The input from the defense in depth matrix.
 - 6) The input from the passive categorization methodology.
 - 7) In this description, please clarify the difference between “preliminary HSS” and “assigned HSS” and identify which inputs can, and which cannot, be changed from preliminary HSS to the licensing support system by the IDP, and confirm that the proposed approach is consistent with the guidance in NEI 00-04, as endorsed by RG 1.201.
 - 8) The industry flow chart presented at the September 6, 2017, public meeting shows that the passive categorization would be undertaken separately from the active categorization. Explain how the results from the passive categorization will be integrated with the overall categorization results.

Question 06 – SSCs Categorization Based on Other External Hazards

NEI 00-04 provides guidance on including external events in the categorization of each SSC to be categorized. Fire (Section 5.2) and seismic (section 5.3) hazards are discussed in Sections 5.2 and 5.3, respectively. All other hazards are discussed in Section 5.4, “Assessment of Other External Hazards.” Figure 5-6 in Section 5.4 illustrates the process that begins with the SSC selected for categorization and then proceeds through the flow chart for each external hazard.

LAR Section 3.2.4 states that the “Limerick categorization process will use screening results from the Individual Plant Evaluation of External Events (IPEEE) in response to GL 88-20 for evaluation of safety significance related to the [following] other external hazards.” LAR Section 3.2.4 continues that “[a]ll SSCs credited in other IPEEE external hazards are considered HSS.” The use of “other” instead of a more precise description does not allow the NRC staff to compare the license’s proposed process with the guidance.

- a. Identify the external hazards that will be evaluated according to the flow chart in Figure 5-6.
- b. Identify which hazards will have “[a]ll SSCs credited [...] considered HSS” instead of using the flow chart.
- c. Describe any additional method(s) different from a. or b. that will be used to evaluate individual SSCs against external hazards and identify the hazards that will be evaluated with these methods.
- d. Confirm that all hazards not included in the categorization process a., b., or c. above will be considered insignificant for every SSC and, therefore, will not be considered during the categorization process.

Question 07 – Shutdown Risk

LAR Section 3.2.5 states the Limerick risk-informed safety class categorization process will use the shutdown safety management plan described in NUMARC 91-06 for categorization of safety significance related to low power shutdown conditions. However, the LAR does not cite the other criteria specified in NEI 00-04, Section 5.5, pertaining to low power shutdown events (i.e., includes defense-in-depth attributes and failures that would initiate a shutdown event). Clarify and provide a basis for how the categorization of SSCs will be performed for shutdown events and how it is consistent with the guidance in NEI 00-04, as endorsed by RG 1.201.

SUBJECT: LIMERICK GENERATING STATION, UNITS 1 AND 2 – REGULATORY AUDIT PLAN AND AUDIT QUESTIONS REGARDING LICENSE AMENDMENT REQUEST TO ADOPT TITLE 10 OF THE CODE OF FEDERAL REGULATIONS SECTION 50.69, "RISK-INFORMED CATEGORIZATION AND TREATMENT OF STRUCTURES, SYSTEMS AND COMPONENTS FOR NUCLEAR POWER PLANTS" (CAC NOS. MF9873 AND MF9874; EPID L-2017-LLA-0275) DATED NOVEMBER 6, 2017

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