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10 CFR 50.90
10 CFR 50.69

December 15, 2021

U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
ATTN: Document Control Desk

Limerick Generating Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Subject: Supplement - Application to Implement an Alternate Defense-in-Depth Categorization Process, an Alternate Pressure Boundary Categorization Process, and an Alternate Seismic Categorization Process in Accordance with the Requirements of 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors"

References:

1. Exelon Generation Company, LLC letter to the U.S. Nuclear Regulatory Commission, Limerick Generating Station, Units 1 and 2, "Application to Implement an Alternate Defense-in-Depth Categorization Process, an Alternate Pressure Boundary Categorization Process, and an Alternate Seismic Tier 1 Categorization Process in Accordance with the Requirements of 10 CFR 50.69, 'Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors,'" dated March 11, 2021 (ADAMS Accession No. ML21070A412).

2. Email from A. Klett (U.S. Nuclear Regulatory Commission) to G. Stewart (Exelon Generation Company, LLC), "Supplement to Limerick 50.69 Audit Plan dated October 1, 2021 (L-2021-LLA-0042)," dated October 20, 2021 (ADAMS Accession No. ML21295A036).

3. Alternative Approaches for Addressing Seismic Risk in 10 CFR 50.69 Risk-Informed Categorization, EPRI, Palo Alto, CA: 2020. 3002017583.

4. Exelon Generation Company, LLC letter to the U.S. Nuclear Regulatory Commission, Limerick Generating Station, Units 1 and 2, "Supplement - Application to Implement an Alternate Defense-in-Depth Categorization Process, an Alternate Pressure Boundary Categorization Process, and an Alternate Seismic Tier 1 Categorization Process in Accordance with the Requirements of 10 CFR 50.69, 'Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors,'" dated May 5, 2021 (ADAMS Accession No. ML21125A215).

In Reference [1], Exelon Generation Company, LLC (Exelon) submitted an application for amendment of the Renewed Facility Operating License Nos. NPF-39 and NPF-85 for Limerick Generating Station (Limerick), Units 1 and 2, respectively.

The proposed amendments would modify the licensing basis by revising the related License Condition in Appendix C to allow the use of an alternate defense-in-depth categorization process, an alternate pressure boundary categorization process, and an alternate seismic categorization process for implementation of the risk-informed categorization and treatment of structures, systems, and components for Limerick in accordance with the requirements of 10 CFR 50.69.

By email dated October 20, 2021 (Reference [2]), the NRC notified Exelon of their intent to conduct a regulatory virtual audit the week of November 15, 2021 with Exelon staff and associated contractors in support of the license amendment request (LAR) in Reference [1]. The email contained a supplemented regulatory virtual audit plan with attached audit questions. During the audit, questions were raised by the NRC concerning the acceptability of the application of the alternate Seismic Tier 1 categorization process to Limerick. Although Exelon continues to believe that Limerick is a Tier 1 plant based on the guidance provided in Electric Power Research Institute (EPRI) Report 3002017583, "Alternative Approaches for Addressing Seismic Risk in 10 CFR 50.69 Risk-Informed Categorization," dated February 2020 (Reference [3]), Exelon has decided to pursue the alternate Seismic Tier 2 categorization process provided in the same EPRI Report in order to move forward with the review of this LAR.

Therefore, this letter is a supplement to the Reference [1] LAR. Attachment 1 to this letter provides the information needed to justify the application of the alternate Seismic Tier 2 categorization process for implementation of the risk-informed categorization and treatment of structures, systems, and components for Limerick in accordance with the requirements of 10 CFR 50.69. The information is identified by the Sections within the original Reference [1] LAR that discussed the alternate seismic approach and supersedes that information in its entirety. In addition, the alternate Seismic Tier 1 information provided in Section 2 of Exelon supplement letter dated May 5, 2021 (Reference [4]) is no longer relevant or necessary for this LAR since Exelon is now submitting Limerick as an alternate Seismic Tier 2 site.

As a result of submitting this supplement to transition to the alternate Seismic Tier 2 approach, a minor change is required to the Facility Operating License (FOL) Appendix C License Condition wording that was proposed in the original Reference [1] LAR. Attachment 2 provides the revised FOL Appendix C License Condition markups.

Exelon has reviewed the information supporting the No Significant Hazards Consideration and the Environmental Consideration that was previously provided to the NRC in the Reference [1] LAR. The information in this LAR supplement does not impact the conclusion that the proposed license amendments do not involve a significant hazards consideration. However, since the No Significant Hazards Consideration information provided in the original LAR made specific mention of the alternate Seismic Tier 1 categorization process, a revised No Significant Hazards Consideration discussion is provided in the attachment to remove the Tier 1 wording. The information in Attachment 1

also does not impact the conclusion that there is no need for an environmental assessment to be prepared in support of the proposed amendments.

There are no regulatory commitments contained in this supplement.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), Exelon is notifying the Commonwealth of Pennsylvania of this license amendment request supplement by transmitting a copy of this letter to the designated State Official.

If you should have any questions regarding this submittal, please contact Glenn Stewart at 610-765-5529.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 15th day of December 2021.

Respectfully,

David P. Helker
Sr. Manager - Licensing and Regulatory Affairs
Exelon Generation Company, LLC

Attachment 1: License Amendment Request Supplement - Application to Implement Alternate Categorization Processes in Accordance with the Requirements of 10 CFR 50.69.
Attachment 2: Revised Proposed FOL Appendix C License Condition Mark-ups

cc: Regional Administrator - NRC Region I w/ attachments
NRC Senior Resident Inspector - Limerick Generating Station "
NRC Project Manager, NRR - Limerick Generating Station "
Director, Bureau of Radiation Protection - Pennsylvania Department of Environmental Protection "

ATTACHMENT 1

License Amendment Request Supplement

Limerick Generating Station, Units 1 and 2
NRC Docket Nos. 50-352 and 50-353

Application to Implement an Alternate Defense-in-Depth Categorization Process, an Alternate Pressure Boundary Categorization Process, and an Alternate Seismic Categorization Process in Accordance with the Requirements of 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors"

In Reference [1], Exelon Generation Company, LLC (Exelon) submitted an application for amendment of the Renewed Facility Operating License Nos. NPF-39 and NPF-85 for Limerick Generating Station (Limerick), Units 1 and 2, respectively.

The proposed amendments would modify the licensing basis by revising the related License Condition in Appendix C to allow the use of an alternate defense-in-depth categorization process, an alternate pressure boundary categorization process, and an alternate seismic categorization process for implementation of the risk-informed categorization and treatment of structures, systems, and components for Limerick in accordance with the requirements of 10 CFR 50.69.

By email dated October 20, 2021 (Reference [2]), the NRC notified Exelon of their intent to conduct a regulatory virtual audit the week of November 15, 2021 with Exelon staff and associated contractors in support of the license amendment request (LAR) in Reference [1]. The email contained a supplemented regulatory virtual audit plan with attached audit questions. During the audit, questions were raised by the NRC concerning the acceptability of the application of the alternate Seismic Tier 1 categorization process to Limerick. Although Exelon continues to believe that Limerick is a Tier 1 plant based on the guidance provided in Electric Power Research Institute (EPRI) Report 3002017583, "Alternative Approaches for Addressing Seismic Risk in 10 CFR 50.69 Risk-Informed Categorization," dated February 2020 (Reference [3]), Exelon has decided to pursue the alternate Seismic Tier 2 categorization process provided in the same EPRI Report in order to move forward with the review of this LAR.

Therefore, this letter is a supplement to the Reference [1] LAR. This attachment provides the information needed to justify the application of the seismic Tier 2 alternative categorization process for implementation of the risk-informed categorization and treatment of structures, systems, and components for Limerick in accordance with the requirements of 10 CFR 50.69. The information is identified by the Sections within the original Reference [1] LAR that discussed the alternate seismic approach and supersedes that information in its entirety. In addition, the alternate Seismic Tier 1 information provided in Section 2 of Exelon supplement letter dated May 5, 2021 (Reference [4]) is no longer relevant or necessary for this LAR since Exelon is now submitting Limerick as an alternate Seismic Tier 2 site.

Also, because of submitting this supplement to transition to the alternate Seismic Tier 2 approach, a minor change is required to the Facility Operating License (FOL) Appendix C License Condition wording that was proposed in the original Reference [1] LAR. Attachment 2 provides the revised FOL Appendix C License Condition markups.

2.1 REASON FOR PROPOSED CHANGE

(NOTE: The only change in this Section was to replace Tier 1 with Tier 2 and to include the references to the LaSalle Tier 2 NRC issued amendment and safety evaluation (SE) and the EPRI markups provided in Attachment 2 of the LaSalle responses to the NRC Requests for Additional Information.)

During the implementation of 10 CFR 50.69 by various licensees, it was determined that several processes are overly conservative when performing the 10 CFR 50.69 categorization and are resource intensive, without providing a commensurate benefit to the health and safety of the public. For example, when evaluating core damage defense-in-depth, credit cannot be taken for

multiple identical, redundant trains. To address this, an alternate approach has been developed in lieu of the current defense-in-depth categorization process, the current pressure boundary categorization process (previously referred to as passive categorization as discussed in Section 3.5.4 of the Safety Evaluation (SE) that was issued for Limerick, Units 1 and 2, to implement 10 CFR 50.69 (Reference [5]), and the current seismic categorization process. The alternate defense-in-depth categorization process, the alternate pressure boundary categorization process, and the alternate Seismic Tier 2 categorization process are in compliance with 10 CFR 50.69; however, these processes allow additional focus on Risk-Informed Safety Class (RISC) RISC-1 and RISC-2 structures, systems and components (SSCs). The use of the alternate defense-in-depth categorization process, the alternate pressure boundary categorization process, and the alternate Seismic Tier 2 categorization process improves consistency and removes subjectivity while reducing the 10 CFR 50.69 implementation effort to categorize systems.

The alternate seismic categorization process is briefly discussed below (Note: only the alternative seismic information is provided since the alternate defense-in-depth and pressure boundary categorization processes remain unchanged):

3. Alternate Seismic Tier 2 Categorization Process

    a. The current seismic risk assessment method is a Seismic Margins Assessment (SMA). All SSCs included on the SMA Safe Shutdown Equipment List (SSEL), i.e., Success Path Component List (SPCL), conservatively default to HSS. The alternate Seismic Tier 2 categorization process employs a systematic process to evaluate the seismic hazard which is integrated into the categorization process. It considers likelihood and magnitude of the seismic hazard and margin to the site-specific design basis. The alternate Seismic Tier 2 categorization process is described in EPRI 3002017583 (Reference [3]).

    b. EPRI 3002017583 is an update to EPRI 3002012988, "Alternative Approaches for Addressing Seismic Risk in 10 CFR 50.69 Risk-Informed Categorization," July 2018 which was referenced in the NRC issued amendment and SE for Calvert Cliffs Nuclear Power Plant, Units 1 and 2, to implement 10 CFR 50.69 as noted below:

        - Calvert Cliffs Nuclear Power Plant, Units 1 and 2, "Issuance of Amendment Nos. 332 and 310 Re: Risk-Informed Categorization and Treatment of Systems, Structures, and Components (EPID L-2018-LLA-0482)," February 28, 2020. (ADAMS Accession No. ML19330D909) (Reference [6]).

    c. This license amendment request incorporates by Reference the Clinton Power Station, Unit 1 response to request for additional information letter of November 24, 2020 (ML20329A433) (Reference [7]), in particular, the response to the question regarding the differences between the initial EPRI 3002012988 and the current EPRI 3002017583 as well as Exelon’s proposed approach for the 50.69 Seismic Alternative Tier 1.

    d. This license amendment request follows the same categorization approach for Tier 2 seismic risk as approved for LaSalle County Station, Units 1 and 2, as identified in Reference [8] with no deviations.

- The alternative seismic approach described herein is consistent with EPRI 3002017583 (Reference [3]), including the EPRI markups provided in Attachment 2 of Exelon's responses to the NRC Requests for Additional Information in References [9] and [10].

2.2 DESCRIPTION OF THE PROPOSED CHANGE

The license condition in Appendix C currently states:

> "Exelon 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 (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 [1] License Amendment No. [230] dated July 31, 2018.
>
> Exelon will complete the implementation items listed in Attachment 2 of Exelon letter to NRC dated April 23, 2018 prior to implementation of 10 CFR 50.69. All issues identified in the attachment will be addressed and any associated changes will be made, focused-scope peer reviews will be performed on changes that are PRA upgrades as defined in the PRA standard (ASME/ANS RA-Sa-2009, as endorsed by RG 1.200, Revision 2), and any findings will be resolved and reflected in the PRA of record prior to implementation of the 10 CFR 50.69 categorization process.
>
> 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 license condition in Appendix C is proposed to be revised as follows:

> (NOTE: The only change was to add "and associated supplements" to the Exelon letter dated March 11, 2021 in the second paragraph.)
>
> "Exelon 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 (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 [1] License Amendment No. [230] dated July 31, 2018.

In addition, Exelon is approved to implement 10 CFR 50.69 using any of the following alternate processes for categorization of RISC-1, RISC-2, RISC-3, and RISC-4 SSCs: the defense-in-depth approach contained in PWROG-20015-NP; the passive pressure boundary categorization approach described in EPRI 3002015999; and the alternative seismic approach as described in Exelon's submittal letter dated March 11, 2021, and associated supplements, as specified in Unit [1] 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: The implementation items listed in Attachment 2 of Exelon letter to NRC dated April 23, 2018 were completed as required by the original license condition prior to the implementation of the 10 CFR 50.69 categorization process at Limerick which began in October 2018. Therefore, the paragraph specific to the implementation items is no longer applicable and is proposed to be deleted from the revised license condition for this license amendment request and replaced with the new insert paragraph for the alternate categorization processes as indicated above and in the proposed license condition markups in Enclosure 2.

3. TECHNICAL EVALUATION

3.1 CATEGORIZATION PROCESS DESCRIPTION (10 CFR 50.69(b)(2)(i))

3.1.4 Alternate Seismic Tier 2 Categorization Process

(NOTE: This section is a complete re-write.)

The NRC previously issued its Safety Evaluation for Limerick approving the 10 CFR 50.69 process (Reference [5]).

10 CFR 50.69(c)(1) requires the use of PRA to assess risk from internal events. For other risk hazards, such as seismic, 10 CFR 50.69 (b)(2) allows, and NEI 00-04 (Reference [11]) summarizes, the use of other methods for determining SSC functional importance in the absence of a quantifiable PRA (such as Seismic Margin Analysis or IPEEE Screening) as part of an integrated, systematic process. For the Limerick seismic hazard assessment, Exelon proposes to use a risk informed graded approach that meets the requirements of 10 CFR 50.69 (b)(2) as an alternative to those listed in NEI 00-04 sections 1.5 and 5.3. This approach is specified in Reference [3] with the EPRI markups provided in Attachment 2 of References [9] and [10], and includes additional considerations that are discussed in this section.

(Note: The discussion below pertaining to Reference [3] includes the markups provided in Attachment 2 of References [9] and [10].)

The proposed categorization approach for Limerick is a risk informed graded approach that is demonstrated to produce categorization insights equivalent to a seismic PRA. This approach relies on the insights gained from the seismic PRAs examined in Reference [3] and plant specific insights considering seismic correlation effects and seismic interactions.

Following the criteria in Reference [3], the Limerick site meets the EPRI 3002017583 Tier 1 criteria for a "Low Seismic Hazard/High Seismic Margin" site. The Tier 1 criteria are as follows:

> *"Tier 1: Plants where the GMRS [Ground Motion Response Spectrum] peak acceleration is at or below approximately 0.2g or where the GMRS is below or approximately equal to the SSE [Safe Shutdown Earthquake] between 1.0 Hz and 10 Hz. Examples are shown in Figures 2-1 and 2-2. At these sites, the GMRS is either very low or within the range of the SSE such that unique seismic categorization insights are not expected."*

Exelon considers the Limerick site to be a Tier 1 site in accordance with the above EPRI Tier 1 criteria. However, during the NRC Audit conducted November 15 – 17, 2021 for this License Amendment Request (Reference [2]), questions were raised by the NRC concerning the acceptability of the application of the alternate Seismic Tier 1 approach. As a result, Exelon is submitting Limerick as a Tier 2 site. Per Reference [3], for Tier 2 sites, the site Ground Motion Response Spectrum (GMRS) to SSE (Safe Shutdown Earthquake) comparison is above the Tier 1 threshold but not high enough that the NRC required the plant to perform an SPRA to respond to Recommendation 2.1 of the Near-Term Task Force 50.54(f) letter (Reference [12]). Reference [3] also demonstrates that seismic risk is adequately addressed for Tier 2 sites by the results of additional qualitative assessments discussed in this section and existing elements of the §50.69 categorization process specified in NEI 00-04.

The trial studies in Reference [3], as amended by their RAI responses and amendments (References [13], [14], [15], [16], [17], [18], [19], [20], and [21]) show that seismic categorization insights are overlaid by other risk insights even at plants where the GMRS is far beyond the seismic design basis. Therefore, the basis for the Tier 2 classification and resulting criteria is that consideration of the full range of the seismic hazard produces limited unique insights to the categorization process. That is the basis for the following statements in Table 4-1 of Reference [3].

> *"At Tier 2 sites, there may be a limited number of unique seismic insights, most likely attributed to the possibility of seismically correlated failures, appropriate for consideration in determining HSS SSCs. The special seismic risk evaluation process recommended using a Common Cause impact approach in the FPIE PRA can identify the appropriate seismic insights to be considered with the other categorization insights by the Integrated Decision-making Panel for the final HSS determinations."*

At sites with moderate seismic demands (i.e., Tier 2 range), there is no need to perform more detailed evaluations to demonstrate the inherent seismic capacities documented in industry sources such as Reference [22]. Tier 2 seismic demand sites have a lower likelihood of seismically induced failures and less challenges to plant systems than trial study plants. This, therefore, provides the technical basis for allowing use of a graded approach for addressing seismic hazards at Limerick.

Test cases described in Section 3 of Reference [3], as amended by their RAI responses and amendments (References [13], [14], [15], [16], [17], [18], [19], [20], [21]) showed that there are very few, if any, SSCs that would be designated HSS for seismic unique reasons. The test cases identified that the unique seismic insights were typically associated with seismically correlated failures and led to unique HSS SSCs. While it would be unusual even for moderate hazard plants to exhibit any unique seismic insights, it is prudent and recommended by Reference [3] to perform additional evaluations to identify the conditions where correlated failures and seismic interactions may occur and determine their impact in the 10 CFR 50.69 categorization process. The special sensitivity study recommended in Reference [3] uses common cause failures, similar to the approach taken in a FPIE PRA and can identify the appropriate seismic insights to be considered with the other categorization insights by the IDP for the final HSS determinations.

Exelon is using test case information from Reference [3] developed by other licensees. The test case information is being incorporated by Reference into this application; specifically, Case Study A (Reference [13], [14], [15]), Case Study C (Reference [23]), Case Study D (Reference [24]), as well as RAI responses and amendments (References [13], [14], [15], [16], [17], [18], [19], [20], and [21]) that clarify aspects of these case studies.

Basis for Limerick being a Tier 2 Plant

As defined in Reference [3], Limerick meets the aforementioned Tier 1 criteria for a "Low Seismic Hazard / High Seismic Margin" site. However, as previously mentioned, Exelon is submitting Limerick as a Tier 2 site. The Tier 2 criteria are as follows:

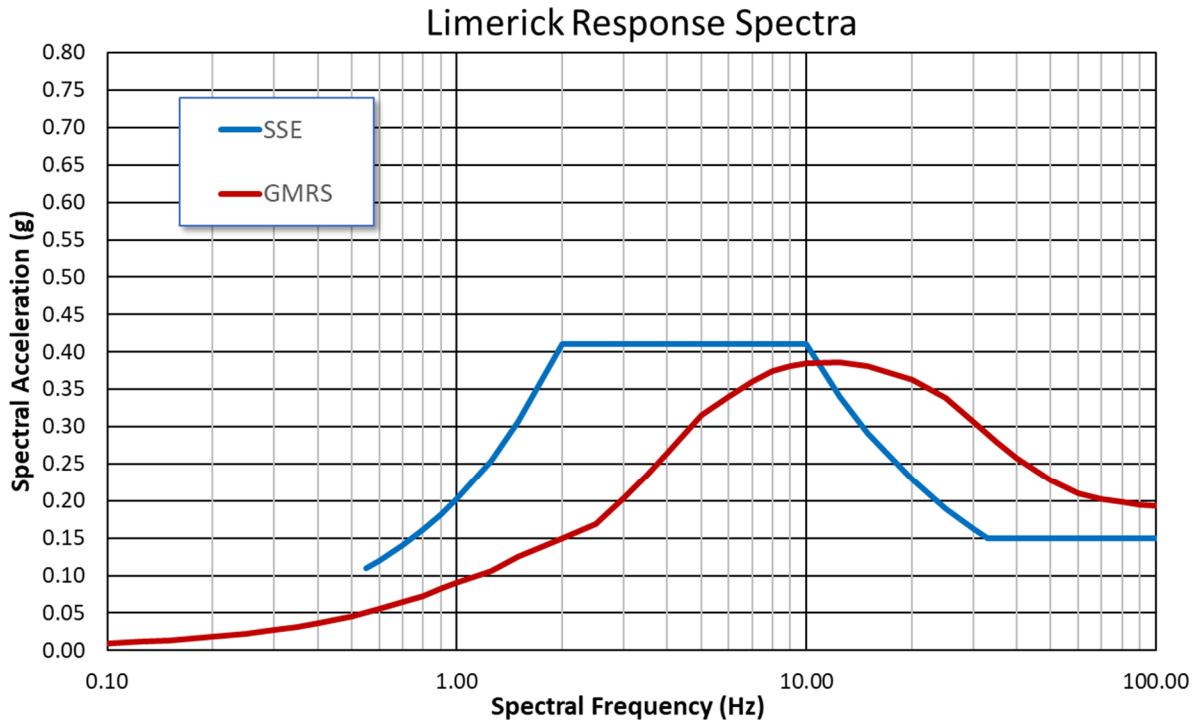
> *"Tier 2: Plants where the GMRS [Ground Motion Response Spectrum] to SSE [Safe Shutdown Earthquake] comparison between 1.0 Hz and 10 Hz is greater than in Tier 1 but not high enough to be treated as Tier 3. At these sites, the unique seismic categorization insights are expected to be limited."*

Note: Reference [3] applies to the Tier 2 sites in its entirety except for Sections 2.2 (Tier 1 sites) and 2.4 (Tier 3 sites).

For comparison, Tier 1 plants are defined as having a GMRS peak acceleration at or below approximately 0.2g or where the GMRS is below or approximately equal to the SSE between 1.0 Hz and 10 Hz. Tier 3 plants are defined where the GMRS to SSE comparison between 1.0 Hz and 10 Hz is high enough that the NRC required the plant to perform an SPRA to respond to the Fukushima 50.54(f) letter (Reference [12]).

As shown in Figure 1, comparing the Limerick GMRS (derived from the seismic hazard) to the SSE (i.e., seismic design basis capability), the GMRS is below the SSE up to approximately 11 Hz and exceeds the SSE above 11 Hz up to 100 Hz (Reference [25]). The NRC screened out Limerick from performing a seismic PRA in response to the NTTF 2.1 50.54(f) letter (Reference [26]). As such, it is appropriate that Limerick is considered a Tier 1 plant; however, as previously mentioned, Exelon is submitting Limerick as a Tier 2 site in order to address NRC concerns. The basis for Limerick being Tier 2 will be documented and presented to the IDP for each system categorized.

Figure 1: GMRS and SSE Response Spectra for Limerick[1]



The following paragraphs describe additional background and the process to be utilized for the graded approach to categorize the seismic hazard for a Tier 2 plant.

Implementation of the Recommended Process

Reference [3] recommends a risk informed graded approach for addressing the seismic hazard in the 10 CFR 50.69 categorization process. There are a number of seismic fragility fundamental concepts that support a graded approach and there are important characteristics about the comparison of the seismic design basis (represented by the SSE) to the site-specific seismic hazard (represented by the GMRS) that support the selected thresholds between the three evaluation Tiers in the report. The coupling of these concepts with the categorization process in NEI 00-04 are the key elements of the approach defined in Reference [3] for identifying unique seismic insights.

The seismic fragility of an SSC is a function of the margin between an SSC's seismic capacity and the site-specific seismic demand. References such as EPRI NP 6041 (Reference [22]) provide inherent seismic capacities for most SSCs that are not directly related to the site-specific seismic demand. This inherent seismic capacity is based on the non-seismic design loads (pressure, thermal, dead weight, etc.) and the required functions for the SSC. For example, a pump has a relatively high inherent seismic capacity based on its design and that

[1] From Reference [27] Table 2.4-1 (GMRS) and Table 3.1-1 (SSE)

same seismic capacity applies at a site with a very low demand and at a site with a very high demand.

There are some plant features such as equipment anchorage that have seismic capacities more closely associated with the site-specific seismic demand since those specific features are specifically designed to meet that demand. However, even for these features, the design basis criteria have intended conservatisms that result in significant seismic margins within SSCs. These conservatisms are reflected in key aspects of the seismic design process. The SSCs used in nuclear power plants are intentionally designed using conservative methods and criteria to ensure that they have margins well above the required design bases. Experience has shown that design practices result in margins to realistic seismic capacities of 1.5 or more.

In applying the Reference [3] process for Tier 2 sites to the Limerick 10 CFR 50.69 categorization process, the IDP will be provided with the rationale for applying the Reference [3] guidance and informed of plant SSC specific seismic insights that the IDP may choose to consider in their HSS/LSS deliberations. As part of the categorization team's preparation of the System Categorization document (SCD) that is presented to the IDP, a section will be included that provides identified plant seismic insights as well as the basis for applicability of the Reference [3] study and the bases for Limerick being a Tier 2 plant. The discussion of the Tier 2 bases will include such factors as:

- The moderate seismic hazard for the plant,
- The definition of Tier 2 in the EPRI study, and
- The basis for concluding Limerick is a Tier 2 plant.

At several steps of the categorization process, (e.g., as noted in Figure 2 and Table 1) the categorization team will consider the available seismic insights relative to the system being categorized and document their conclusions in the SCD. Integrated importance measures over all modeled hazards (i.e., internal events, including internal flooding, and internal fire for Limerick) are calculated per Section 5.6 of NEI 00-04, and components for which these measures exceed the specified criteria are preliminary HSS which cannot be changed to LSS. For HSS SSCs uniquely identified by the Limerick PRA models but having design basis functions during seismic events or functions credited for mitigation and prevention of severe accidents caused by seismic events, these will be addressed using non-PRA based qualitative assessments in conjunction with any seismic insights provided by the PRA.

For components that are HSS due to fire PRA but not HSS due to internal events PRA, the categorization team will review design basis functions during seismic events or functions credited for mitigation and prevention of severe accidents caused by seismic events and characterize these for presentation to the IDP as additional qualitative inputs, which will also be described in the SCD.

The categorization team will review available Limerick plant specific seismic reviews and other resources such as those identified above. The objective of the seismic review is to identify plant specific seismic insights that might include potentially important impacts such as:

- Impact of relay chatter
- Implications related to potential seismic interactions such as with block walls

- Seismic failures of passive SSCs such as tanks and heat exchangers
- Any known structural or anchorage issues with a particular SSC
- Components implicitly part of PRA modeled functions (including relays)

For each system categorized, the categorization team will evaluate correlated seismic failures and seismic interactions between SSCs. This process is detailed in Reference [3] Section 2.3.1 and is summarized in Figure 3.

Determination of seismic insights will make use of the full power internal events PRA model supplemented by focused seismic walkdowns. An overview of the process to determine the importance of SSCs for mitigating seismic events follows and is utilized on a system basis:

- Identify SSCs within the system to be categorized
- Group SSCs within the system into the classes of equipment and distributed systems used for SPRAs.
- Refine the list and screen out the following SSCs from consideration of functional correlated seismic failures:
  - Inherently rugged components
  - Components not used in safety functions that support mitigation of core damage or containment performance
  - Components already identified as HSS components from the Internal Events PRA or Integrated assessment
- Perform a seismic walkdown:
  - For SSCs screened IN look for correlation
  - For SSCs screened IN or OUT assess for spatial interaction concerns that could fail multiple components in the system, or could fail a single component in the system due to either seismic interaction or direct component failure modes, that result in total loss of a multi-train system and where there is not another system that independently provides the same function
- Based on the seismic walkdown:
  - Screen out IF SSCs have high seismic capacity AND not included in seismically correlated groups or correlated interaction groups
- Add surrogate events to the FPIE model that simulate spatial interaction or Correlation (for the system being categorized) - set the probability of failure to 1E-04.
- Quantify the FPIE model (for the system being categorized) for LOOP and Small LOCA (SLOCA) initiated accident sequences setting (1) the LOOP initiating event frequency to 1.0/yr, (2) the SLOCA initiating event frequency to 1E-02/yr, and (3) the initiating event frequency for all initiators other than LOOP and small LOCA initiators to 0 (zero), and also removing credit for restoration of offsite power in LOOP/SBO accident sequences as well as other functional recoveries

- Utilize the Importance Measures from this sensitivity study to identify appropriate SSCs (in the system being categorized) that should be HSS due to correlation or seismic interactions

Seismic impacts would be compiled on an SSC basis. As each system is categorized, the system specific seismic insights will be documented in the categorization report and provided to the IDP for consideration as part of the IDP review process (e.g., Figure 2). The IDP cannot challenge any candidate HSS recommendation for any SSC from a seismic perspective if they believe there is a basis, except for certain conditions identified in Step 10 of Section 2.3.1 of Reference [3]. Any decision by the IDP to downgrade preliminary HSS components to LSS will consider the applicable seismic insights in that decision. SSCs identified from the Fire PRA as candidate HSS, which are not HSS from the internal events PRA or integrated importance measure assessment, will be reviewed for their design basis function during seismic events or functions credited for mitigation and prevention of severe accidents caused by seismic events. These insights will provide the IDP a means to consider potential impacts of seismic events in the categorization process.

If the Limerick seismic hazard changes from medium risk (i.e., Tier 2) at some future time, prior NRC approval, under 10 CFR 50.90, will be requested if Limerick's feedback process determines that a process different from the proposed alternative seismic approach is warranted for seismic risk consideration in categorization under 10 CFR 50.69. After receiving NRC approval, Exelon will follow its categorization review and adjustment process to review the changes to the plant and update, as appropriate, the SSC categorization in accordance with 10 CFR 50.69(e) and the EPRI 3002017583 SSC categorization criteria for the updated Tier. This includes use of the Exelon corrective action process (CAP).

If the seismic hazard is reduced such that it meets the criteria for Tier 1 in EPRI 3002017583, Exelon will implement the following process.

a) For previously completed system categorizations, Exelon may review the categorization results to determine if use of the criteria in EPRI 3002017583 Section 2.2, "Low Seismic Hazard / High Seismic Margin Sites," would lead to categorization changes. If changes are warranted, they will be implemented through the Exelon design control and corrective action programs and NEI 00-04, Section 12.

b) Seismic considerations for subsequent system categorization activities will be performed in accordance with the guidance in EPRI 3002017583 Section 2.2, "Low Seismic Hazard / High Seismic Margin Sites."

If the seismic hazard increases to the degree that a seismic probabilistic risk assessment (SPRA) becomes necessary to demonstrate adequate seismic safety, Exelon will implement the following process following completion of the SPRA, including adequate closure of Peer Review Findings and Observations.

For previously completed system categorizations, Exelon will review the categorization results using the SPRA insights as prescribed in NEI 00-04 Section 5.3, Seismic Assessment and Section 5.6, "Integral Assessment". If changes are warranted, they will be implemented through the Exelon design control and corrective action programs and NEI 00-04 Section 12.

Seismic considerations for subsequent system categorization activities will follow the guidance in NEI 00-04, as recommended in EPRI 3002017583 Section 2.4, "High Seismic Hazard / Low Seismic Margin Sites".

Historical Seismic References for Limerick

The Limerick GMRS and SSE curves from the seismic hazard and screening response are shown in Section 2.4 and 3.1, respectively, in the seismic hazard and screening report of Reference [27]. The LG SSE and GMRS curves from Reference [27] are shown in Figure 1. The NRC's Staff assessment of the Limerick seismic hazard and screening response is documented in Reference [26]. In the Staff Confirmatory Analysis (Section 3.4 of Reference [26]), the NRC concluded that the methodology used by Exelon in determining the GMRS was acceptable and that the GMRS determined by Exelon adequately characterizes the reevaluated hazard for the Limerick site.

Section 1.1.3 of Reference [3] cites various post Fukushima seismic reviews performed for the U.S. fleet of nuclear power plants. For Limerick, the specific seismic reviews prepared by the licensee and the NRC's staff assessments are provided here. These licensee documents were submitted under oath and affirmation to the NRC.

1. NTTF Recommendation 2.1 seismic hazard screening (References [27], [26]).

2. NTTF Recommendation 2.3 seismic walkdowns (References [28], [29], [30]).

3. NTTF Recommendation 4.2 seismic mitigation strategy assessment (S-MSA) (References [31], [32]).

The following additional post Fukushima seismic reviews were performed for Limerick:

4. NTTF Recommendation 2.1 seismic High Frequency Evaluation (References [33], [34]).

Summary

Based on the above, the Summary from Section 2.3.3 of Reference [3] applies to Limerick; namely, Limerick is a Tier 2 plant for which there may be a limited number of unique seismic insights, most likely attributed to the possibility of seismically correlated failures, appropriate for consideration in determining HSS SSCs. References [9], [10], and [35][2] are incorporated into this LAR as they provide additional supporting bases for Tier 2 plants. In addition, References [36], [37], and [38] are incorporated into this LAR as they provide additional supporting bases for Tier 1 plants that are also used for Tier 2 plants. The special sensitivity study recommended using common cause failures, similar to the approach taken in a FPIE PRA, can identify the appropriate seismic insights to be considered with the other categorization insights by the Integrated Decision-making Panel (IDP) for the final HSS determinations. Use of the EPRI approach outlined in Reference [3] to assess seismic hazard risk for §50.69 with the additional reviews discussed above will provide a process for categorization of RISC-1, RISC-2, RISC-3, and RISC-4 SSCs that satisfies the requirements of §50.69(c).

[2] Excludes RAI APLC 50.69-RAI No. 12 that addresses a non-seismic topic (external events).

Figure 2: Categorization Process Overview[3]

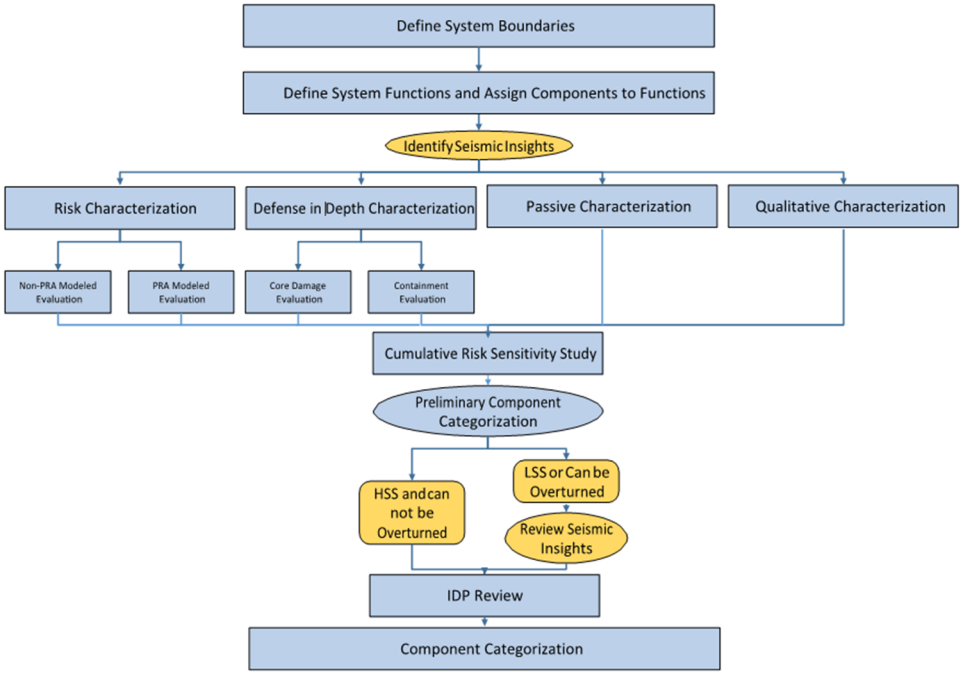


Table 1: Categorization Evaluation Summary[4]

Element	Categorization Step - NEI 00-04 Section	Evaluation Level	IDP Change HSS to LSS	Drives Associated Functions
Risk (PRA Modeled)	Internal Events Base Case – Section 5.1	Component	Not Allowed	Yes
	Fire, Seismic and Other External Events Base Case		Allowable	No
	PRA Sensitivity Studies		Allowable	No

[3] Figure 2 is an update to Figure 5-1 in Reference [39].
[4] Table 1 is an update to Table 1 in Reference [1]. Specifically, the "EPRI Tier 2 Seismic" item is new for this Limerick application.

Table 1: Categorization Evaluation Summary[4]

Element	Categorization Step - NEI 00-04 Section	Evaluation Level	IDP Change HSS to LSS	Drives Associated Functions
	Integral PRA Assessment – Section 5.6		Not Allowed	Yes
Risk (Non-modeled)	Fire, Seismic, and Other External Hazards	Component	Not Allowed	No
	EPRI Tier 2 Seismic	**Function/Component**	**Allowed (Note 2)**	**No**
	Shutdown Section 5.5	Function/Component	Not Allowed	No
Defense-in-Depth	Core Damage – Section 6.1	Function/Component	Not Allowed	Yes
	Containment – Section 6.2	Component	Not Allowed	Yes
	PWROG Alternate DID	**Function/Component**	**Not Allowed**	**Yes**
Qualitative Criteria	Considerations – Section 9.2	Function	Allowable (Note 1)	N/A
Passive	Passive – Section 4	Segment/Component	Not Allowed	No
	EPRI Enhanced Passive	**Segment/Component**	**Not Allowed**	**No**

Notes

Note 1: The assessments of the qualitative considerations are agreed upon by the IDP in accordance with NEI 00-04 Section 9.2. In some cases, a 50.69 categorization team may provide preliminary assessments of the seven considerations for the IDP's consideration; however, the final assessments of the seven considerations are the direct responsibility of the IDP.

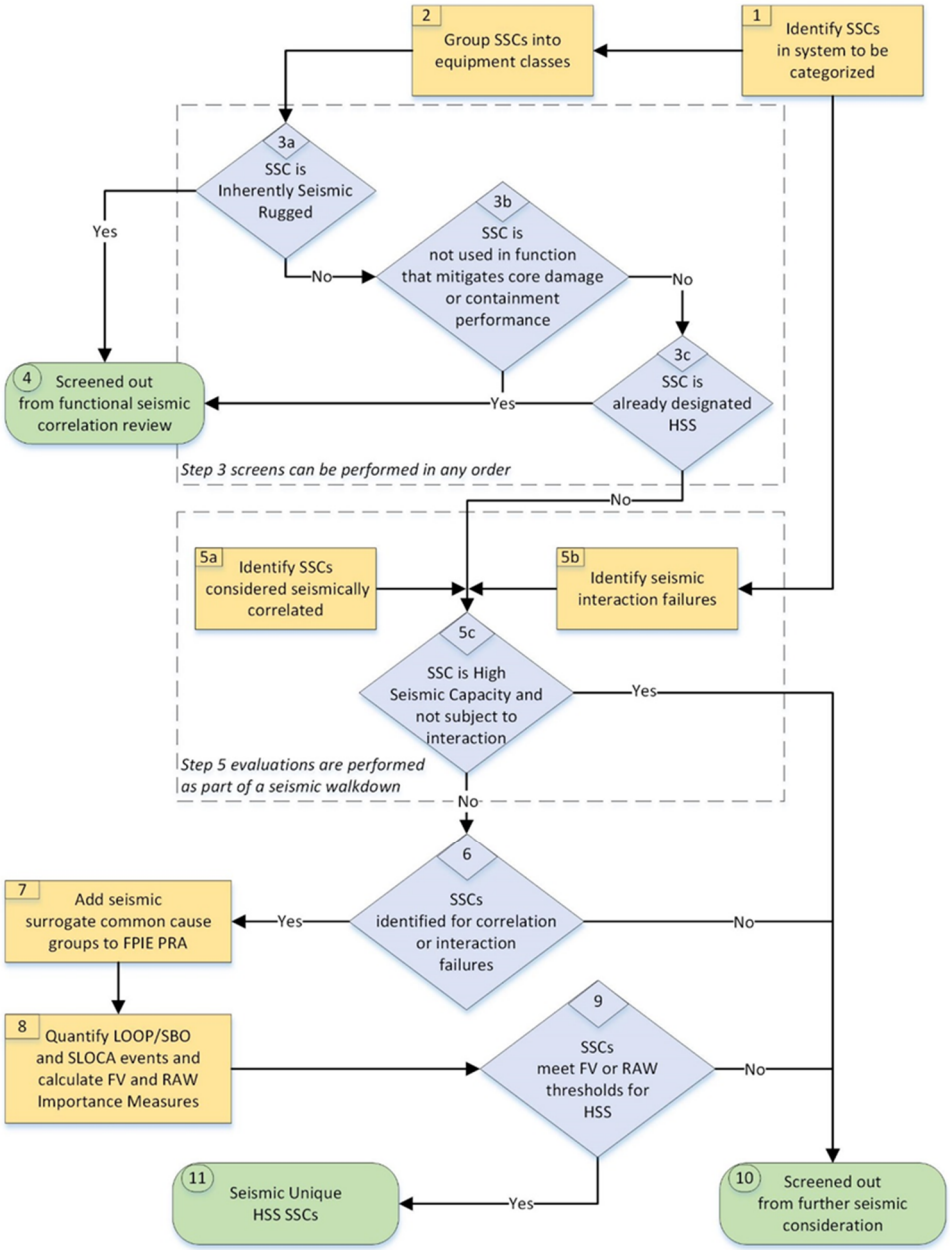
The seven considerations are addressed preliminarily by the 50.69 categorization team for at least the system functions that are not found to be HSS due to any other categorization step. Each of the seven considerations requires a supporting justification for confirming (true

response) or not confirming (false response) that consideration. If the 50.69 categorization team determines that one or more of the seven considerations cannot be confirmed, then that function is presented to the IDP as preliminary HSS. Conversely, if all seven considerations are confirmed, then the function is presented to the IDP as preliminary LSS.

The System Categorization Document, including the justifications provided for the qualitative considerations, is reviewed by the IDP. The IDP is responsible for reviewing the preliminary assessment to the same level of detail as the 50.69 team (i.e., all considerations for all functions are reviewed). The IDP may confirm the preliminary function risk and associated justification or may direct that it be changed based upon their expert knowledge. Because the Qualitative Criteria are the direct responsibility of the IDP, changes may be made from preliminary HSS to LSS or from preliminary LSS to HSS at the discretion of the IDP. If the IDP determines any of the seven considerations cannot be confirmed (false response) for a function, then the final categorization of that function is HSS.

Note 2 : IDP consideration of seismic insights can also result in an LSS to HSS determination.

Figure 3: Seismic Correlated Failure Assessment for Tier 2 Plants[5]



[5] Reproduced from Reference [3] Figure 2-3 including the markups provided in Attachment 2 of References [9] and [10].

3.3 RISK EVALUATIONS (10 CFR 50.69(b)(2)(iv))

(NOTE: The only change was to replace Tier 1 with Tier 2 in first paragraph.)

Exelon may implement the alternate defense-in-depth categorization process, the alternate pressure boundary categorization process, and/or the alternate Seismic Tier 2 categorization process discussed in Section 3.1. The processes identified in the current license condition may continue to be used.

The overall risk evaluation process discussed in PWROG-20015-NP, EPRI 3002015999, EPRI 3002017583 addresses both known degradation mechanisms and common cause interactions and meets the requirements of 10 CFR 50.69(b)(2)(iv).

The sensitivity studies discussed in Section 8 of NEI 00-04, will be used to confirm that the categorization process results in acceptably small increases to CDF and LERF.

The SSC failure rates and initiating event frequencies used in the Limerick PRA include the quantifiable impacts from known degradation mechanisms, as well as other mechanisms (e.g., design errors, manufacturing deficiencies, human errors, etc.).

Subsequent performance monitoring and PRA updates as required by 10 CFR 50.69 will continue to include this data and provide timely insights into the need to account for any important new degradation mechanisms.

3.4 FEEDBACK AND ADJUSTMENT PROCESS

(NOTE: The only change was to replace Tier 1 with Tier 2 in second paragraph.)

If significant changes to the plant risk profile are identified, or if it is identified that a RISC-3 or RISC-4 SSC can (or actually did) prevent a safety significant function from being satisfied, an immediate evaluation and review will be performed prior to the normally scheduled periodic review. Otherwise, the assessment of potential equipment performance changes and new technical information will be performed during the normally scheduled periodic review cycle.

To address the feedback and adjustment more specifically (i.e., performance monitoring) process as it pertains to the proposed Seismic Tier 2 approach discussed in section 3.1.4 above, implementation of the Exelon design control and corrective action programs will ensure the inputs for the qualitative determinations for seismic continue to remain valid to maintain compliance with the requirements of 10 CFR 50.69(e).

The performance monitoring process is described in Exelon's 10 CFR 50.69 program documents. The program requires that the periodic review assess changes that could impact the categorization results and provides the Integrated Decision-making Panel (IDP) with an opportunity to recommend categorization and treatment adjustments. Station personnel from engineering, operations, risk management, regulatory assurance, and others have responsibilities for preparing and conducting various performance monitoring tasks that feed into this process. The intent of the performance monitoring reviews is to discover trends in component reliability; to help catch and reverse negative performance trends and take corrective action if necessary.

The Exelon configuration control process ensures that changes to the plant, including a physical change to the plant and changes to documents, are evaluated to determine the impact to drawings, design bases, licensing documents, programs, procedures, and training. The configuration control program has been updated to include a checklist of configuration activities to recognize those systems that have been categorized in accordance with 10 CFR 50.69, to ensure that any physical change to the plant or change to plant documents is evaluated prior to implementing those changes.

The checklist includes:

- A review of the impact on the System Categorization Document (SCD) for configuration changes that may impact a categorized system under 10 CFR 50.69.
- Steps to be performed if redundancy, diversity, or separation requirements are identified or affected. These steps include identifying any potential seismic interaction between added or modified components and new or existing safety related or safe shutdown components or structures.
- Review of impact to seismic loading, safe shutdown earthquake (SSE) seismic requirements, as well as the method of combining seismic components.
- Review of seismic dynamic qualification of components if the configuration change adds, relocates, or alters Seismic Category I mechanical or electrical components.

Exelon has a comprehensive problem identification and corrective action program that ensures that issues are identified and resolved. Any issue that may impact the 10 CFR 50.69 categorization process will be identified and addressed through the problem identification and corrective action program, including seismic-related issues.

The Exelon 10 CFR 50.69 program requires that SCDs cannot be approved by the IDP until the panel's comments have been resolved to the satisfaction of the IDP. This includes issues related to system-specific seismic insights considered by the IDP during categorization.

Scheduled periodic reviews no longer than once every two refueling outages will evaluate new insights resulting from available risk information (i.e., PRA model or other analysis used in the categorization) changes, design changes, operational changes, and SSC performance. If it is determined that these changes have affected the risk information or other elements of the categorization process such that the categorization results are more than minimally affected, then the risk information and the categorization process will be updated. This scheduled review will include:

- A review of plant modifications since the last review that could impact the SSC categorization.
- A review of plant specific operating experience that could impact the SSC categorization.
- A review of the impact of the updated risk information on the categorization process results.
- A review of the importance measures used for screening in the categorization process.

- An update of the risk sensitivity study performed for the categorization.

In addition to the normally scheduled periodic reviews, if a PRA model or other risk information is upgraded, a review of the SSC categorization will be performed.

The periodic monitoring requirements of the 10 CFR 50.69 process will ensure that these issues are captured and addressed at a frequency commensurate with the issue severity. The 10 CFR 50.69 periodic monitoring program includes immediate and periodic reviews, that include the requirements of the regulation, to ensure that all issues that could affect 10 CFR 50.69 categorization are addressed. The periodic monitoring process also monitors the performance and condition of categorized SSCs to ensure that the assumptions for reliability in the categorization process are maintained.

4. REGULATORY EVALUATION

4.2 NO SIGNIFICANT HAZARDS CONSIDERATION ANALYSIS

(NOTE: The only change was to delete "Tier 1" from the discussion and responses below.)

In accordance with the provisions of 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors," and 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," Exelon Generation Company, LLC (Exelon) is requesting a revision to the license condition in Appendix C in the Renewed Facility Operating License Nos. NPF-39 and NPF-85 for Limerick Generating Station (Limerick), Units 1 and 2, respectively.

The NRC issued Amendments Nos. 230/193 and the Safety Evaluation for Limerick Units 1 and 2, respectively, to implement the requirements of 10 CFR 50.69 in Reference [5]. The amendments added a new license condition to the Renewed Facility Operating Licenses to allow the implementation of risk-informed categorization and treatment of structures, systems, and components for Limerick in accordance with Title 10 of the Code of Federal Regulations Section 50.69.

The proposed amendments would modify the licensing basis by revising the license condition in Appendix C to allow the use of an alternate defense-in-depth categorization process, an alternate pressure boundary categorization process, and an alternate seismic categorization process.

Exelon has evaluated whether a significant hazards consideration is involved with the proposed amendments by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

The proposed change will permit the use of the alternate defense-in-depth categorization process, the alternate pressure boundary categorization process, and the alternate seismic categorization process for the 10 CFR 50.69 risk-informed categorization process to modify the scope of SSCs subject to NRC special treatment requirements and to implement alternative treatments per the regulations. The process used to evaluate structures, systems, and components (SSCs) for changes to NRC special treatment requirements and the use of alternative requirements ensures the ability of the SSCs to perform their design function. The potential change to special treatment requirements does not change the design and operation of the SSCs. As a result, the proposed change does not significantly affect any initiators to accidents previously evaluated or the ability to mitigate any accidents previously evaluated. The consequences of the accidents previously evaluated are not affected because the mitigation functions performed by the SSCs assumed in the safety analysis are not being modified. The SSCs required to safely shut down the reactor and maintain it in a safe shutdown condition following an accident will continue to perform their design functions.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed change will permit the use of the alternate defense-in-depth categorization process, the alternate pressure boundary categorization process, and the alternate seismic categorization process for the 10 CFR 50.69 risk-informed categorization process to modify the scope of SSCs subject to NRC special treatment requirements and to implement alternative treatments per the regulations. The proposed change does not change the functional requirements, configuration, or method of operation of any SSC. Under the proposed change, no additional plant equipment will be installed.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The proposed change will permit the use of the alternate defense-in-depth categorization process, the alternate pressure boundary categorization process, and the alternate seismic categorization process for the 10 CFR 50.69 risk-informed categorization process to modify the scope of SSCs subject to NRC special treatment requirements and to implement alternative treatments per the regulations. The proposed change does not affect any Safety Limits or operating parameters used to establish a safety margin. The safety margins included in analyses of accidents are not affected by the proposed change. The regulation requires that there be no significant effect on plant risk due to any change to the special treatment requirements for SSCs and that the SSCs continue

to be capable of performing their design basis functions, as well as to perform any beyond design basis functions consistent with the categorization process and results.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, Exelon concludes that the proposed change presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

6. REFERENCES

[1] Exelon Generation Company, LLC letter to the U.S. Nuclear Regulatory Commission, Limerick Generating Station, Units 1 and 2, "Application to Implement an Alternate Defense-in-Depth Categorization Process, an Alternate Pressure Boundary Categorization Process, and an Alternate Seismic Tier 1 Categorization Process [...]," dated March 11, 2021 (ADAMS Accession No. ML21070A412).

[2] Email from A. Klett (U.S. Nuclear Regulatory Commission) to G. Stewart (Exelon Generation Company, LLC), "Supplement to Limerick 50.69 Audit Plan dated October 1, 2021 (L-2021-LLA-0042)," dated October 20, 2021 (ADAMS Accession No. ML21295A036).

[3] Alternative Approaches for Addressing Seismic Risk in 10 CFR 50.69 Risk-Informed Categorization, EPRI, Palo Alto, CA: 2020. 3002017583.

[4] Exelon Generation Company, LLC letter to the U.S. Nuclear Regulatory Commission, Limerick Generating Station, Units 1 and 2, "Supplement - Application to Implement an Alternate Defense-in-Depth Categorization Process, an Alternate Pressure Boundary Categorization Process, and an Alternate Seismic Tier 1 Categorization Process [...]," dated May 5, 2021 (ADAMS Accession No. ML21125A215).

[5] Limerick Generating Station, Units 1 And 2 - Issuance of Amendment Nos. 230 and 193 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 Reactors," (CAC NOS. MF9873 AND MF9874; EPID L-2017-LLA-0275), July 31, 2018 (ML18165A162).

[6] Calvert Cliffs Nuclear Power Plant, Units 1 and 2 - Issuance Of Amendment Nos. 332 and 310, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors," (EPID L-2018-LLA-0482) February 28, 2020, ADAMS Accession No. ML19330D909.

[7] Clinton Power Station, Unit 1, "Response to Request for Additional Information Regarding License Amendment Requests to Adopt TSTF-505, Revision 2, and 10 CFR 50.69," November 24, 2020, ADAMS Accession No. ML20329A433.

[8] LaSalle County Station, Unit Nos. 1 and 2 - Issuance of Amendment Nos. 249 and 235 to Adopt 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components For Nuclear Power Reactors" (EPID L-2020-LLA-0017), May 27, 2021 (ADAMS Accession No. ML2108A422).

[9] Exelon Generation Company, LLC. Letter to NRC, LaSalle County Station, Units 1 and 2, Renewed Facility Operating License Nos. NPF-11 and NPF-18, NRC Docket Nos. 50-373 and 50-374, Response to Request for Additional Information [...], "LaSalle License Amendment Request to Renewed Facility Operating Licenses to Adopt 10 CFR 50.69, Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors," (EPID L-2020-LLA-0017), October 16, 2020 ADAMS Accession No. ML20290A791.

[10] Exelon Generation Company, LLC. Letter to NRC, LaSalle County Station, Units 1 and 2, Renewed Facility Operating License Nos. NPF-11 and NPF-18, NRC Docket Nos. 50-373 and 50-374, "Response to Request for Additional Information Regarding the License Amendment Request to Adopt 10 CFR 50.69 (EPID L-2020-LLA-0017)," January 22, 2021 ADAMS Accession No. ML21022A130.

[11] Nuclear Energy Institute (NEI) 00-04, "10 CFR 50.69 SSC Categorization Guideline," Revision 0, July 2005.

[12] NRC letter to all Power Reactor Licensees, "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(F) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," March 12, 2012, ADAMS Accession No ML12053A340.

[13] Peach Bottom Atomic Power Station, Units 2 and 3, Seismic Probabilistic Risk Assessment Report, "Response to NRC Request Regarding Recommendation 2.1 of the Near Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," August 28, 2018 (RS-18-098) (ML18240A065).

[14] Peach Bottom Atomic Power Station, Units 2 and 3 - Staff Review of Seismic Probabilistic Risk Assessment, "Associated with Reevaluated Seismic Hazard Implementation of the Near-Term Task Force Recommendation 2.1: Seismic," (EPID NO. L-2018-JLD-0010), June 10, 2019, ADAMS Accession No. ML19053A469.

[15] Peach Bottom Atomic Power Station, Units 2 and 3 - Correction Regarding Staff Review of Seismic Probabilistic Risk Assessment, "Reevaluated Seismic Hazard Implementation of the Near-Term Task Force Recommendation 2.1: Seismic," (EPID NO. L-2018-JLD-0010), October 8, 2019, ADAMS Accession No. ML19248C756.

[16] Plant C Nuclear Plant, Units 1 and 2, "License Amendment Request to Modify Approved 10 CFR 50.69 Categorization Process," June 22, 2017, ADAMS Accession No. ML17173A875.

[17] Plant C Nuclear Plant, Units 1 and 2, "Issuance of Amendments Regarding Application of Seismic Probabilistic Risk Assessment Into the Previously Approved 10 CFR 50.69 Categorization Process (EPID L-2017-LLA-0248)," August 10, 2018 (ML18180A062).

[18] Seismic Probabilistic Risk Assessment for Plant D Nuclear Plant, Units 1 and 2, "Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the NTTF Review of Insights from the Fukushima Dai-ichi Accident," June 30, 2017 (ML17181A485).

[19] Plant D Nuclear Plant, Units 1 and 2, Seismic Probabilistic Risk Assessment Supplemental Information, April 10, 2018, ADAMS Accession No. ML18100A966.

[20] Plant D Nuclear Plant, Units 1 and 2 - Staff Review of Seismic Probabilistic Risk Assessment Associated With Reevaluated Seismic Hazard Implementation of the NTTF Recommendation 2.1, Seismic (CAC NOS. MF9879 AND MF9880; EPID L-2017-JLD-0044) July 10, 2018, ADAMS Accession No. ML18115A138.

[21] Plant D Nuclear Plant, Units 1 And 2 - Issuance of Amendment Nos. 134 And 38 Regarding Adoption of 10 CFR 50.69, "Risk-Informed Categorization and Treatment Of Structures, Systems, and Components For Nuclear Power Plants" (EPID L-2018-LLA-0493) April 30, 2020 NRC ADAMS Accession No. ML20076A194.

[22] Electric Power Research Institute (EPRI) NP-6041-SL, "A Methodology for Assessment of Nuclear Power Plant Seismic Margin", Revision 1, August 1991.

[23] Southern Nuclear Operating Company, Inc. letter to NRC, "Vogtle Electric Generating Plant, Units 1 & 2, "License Amendment Request to Incorporate Seismic Probabilistic Risk Assessment into 10 CFR 50.69, Response to Request for Additional Information (RAIs 4-11)," February 21, 2018, ADAMS Accession No. ML18052B342.

[24] Plant D Nuclear Plant, Units 1 and 2,Application to Adopt 10 CFR 50.69, "Risk-informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors," November 29, 2018 ADAMS Accession No. ML18334A363.

[25] NRC Memorandum, "Support Document for Screening and Prioritization Results Regarding Seismic Hazard Re-Evaluations for Operating Reactors in the Central and Eastern United States," May 21, 2014 ADAMS Accession No. ML14136A126.

[26] Limerick Generating Station, Units 1 and 2 - Staff Assessment of Information Provided Pursuant to 10 CFR 50.54(f), "Seismic Hazard Reevaluations for Recommendation 2.1 of the NTTF Review of Insights from the Fukushima Dai-Ichi Accident," (TAC NOS. MF3864 and MF3865), November 6, 2015 (ML15296A492).

[27] Limerick Generating Station, Units 1 and 2, Exelon Generation Company, LLC, Seismic Hazard and Screening Report (Central and Eastern United States (CEUS) Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.54(f), Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, March 31, 2014 (ML14090A236).

[28] Limerick, Units 1 and 2, 180-Day Response to NRC Request for Information Pursuant to 10 CFR 50.54(f), "Seismic Aspects of Recommendation 2.3 of the NTTF Review of Insights from the Fukushima Dai-ichi Accident," Release Date December 17, 2012 (ADAMS Package ML123420141).

[29] Limerick Generating Station, Unit 1- Staff Assessment of the Seismic Walkdown Report Supporting Implementation of Near-Term Task Force Recommendation 2.3, Related to the Fukushima Dai-Ichi Nuclear Power Plant Accident (TAC NO. MF0138), April 14, 2014 (ML14058B156).

[30] Limerick Generating Station, Unit 2- Staff Assessment of the Seismic Walkdown Report Supporting Implementation of Near-Term Task Force Recommendation 2.3, Related to the Fukushima Dai-Ichi Nuclear Power Plant Accident (TAC NO. MF0139), April 14, 2014 (ML14058B120).

[31] Limerick Generating Station, Units 1 and 2, Mitigating Strategies Assessment (MSA) Report for the Reevaluated Seismic Hazard Information - NEI 12-06, Appendix H, Revision 2, H.4.2 Path 2: GMRS < 2x SSE with High Frequency Exceedances, December 1, 2016 (ML16336A442).

[32] Limerick Generating Station, Units 1 And 2 - Staff Review of Mitigation Strategies Assessment Report of the Impact of the Reevaluated Seismic Hazard Developed In Response to the March 12, 2012, 50.54(f) Letter , April 12, 2017 (ML17087A066).

[33] Limerick Generating Station, Units 1 and 2, High Frequency Supplement to Seismic Hazard Screening Report, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f), "Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," November 28, 2016 (ML16333A084).

[34] Limerick Generating Station, Units 1 and 2 - Staff Review of High Frequency Confirmation Associated With Reevaluated Seismic Hazard Implementing Near-Term Task Force Recommendation 2.1 , February 6, 2017 (ML17031A415).

[35] Exelon Generation Company, LLC. Letter to NRC, LaSalle County Station, Units 1 and 2, Renewed Facility Operating License Nos. NPF-11 and NPF-18, NRC Docket Nos. 50-373 and 50-374, "Response to Request for Additional Information Regarding the License Amendment Request to Adopt 10 CFR 50.69 (EPID L-2020-LLA-0017)," October 1, 2020, ADAMS Accession Number ML20275A292.

[36] Calvert Cliffs Nuclear Power Plant, Units 1 and 2, Renewed Facility Operating License Nos. DPR-53 and DPR-69, Docket Nos. 50-317 and 50-318, "Response to Request for Additional Information Regarding the Application to Adopt 10 CFR 50.69, 'Risk-informed categorization and treatment of structures, systems, and components for nuclear power reactors'," July 1, 2019, ADAMS Accession No. ML19183A012.

[37] Calvert Cliffs Nuclear Power Plant, Units 1 and 2, Renewed Facility Operating License Nos. DPR-53 and DPR-69, Docket Nos. 50-317 and 50-318, "Response to Request for Additional Information Regarding the Application to Adopt 10 CFR 50.69, 'Risk-informed categorization and treatment of structures, systems, and components for nuclear power reactors'," July 19, 2019, ADAMS Accession No. ML19200A216.

[38] Calvert Cliffs Nuclear Power Plant, Units 1 and 2, Renewed Facility Operating License Nos. DPR-53 and DPR-69, Docket Nos. 50-317 and 50-318, "Revised Response to Request for Additional Information Regarding the Application to Adopt 10 CFR 50.69, 'Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors,' July 19, 2019," August 5, 2019, ADAMS Accession No. ML19217A143.

[39] Limerick Generating Station, Units 1 and 2, Response to Request for Additional Information: Application to Adopt 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components (SSCs) for Nuclear Power Plants," January 19, 2018 (ML18019A091).

Attachment 2

License Amendment Request Supplement

Limerick Generating Station, Units 1 and 2
Docket Nos. 50-352 and 50-353

Application to Implement an Alternate Defense-in-Depth Categorization Process, an Alternate Pressure Boundary Categorization Process, and an Alternate Seismic Categorization Process in Accordance with the Requirements of 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors"

Revised Proposed FOL Appendix C License Condition Mark-Ups

APPENDIX C

ADDITIONAL CONDITIONS
OPERATING LICENSE NO. NPF-39

Exelon Generation Company, LLC shall comply with the following conditions on the schedule noted below:

Amendment No.	Additional Conditions
~~230~~[XXX]	Exelon 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 (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 1 License Amendment No. 230 dated July 31, 2018. ~~Exelon will complete the implementation items listed in Attachment 2 of Exelon letter to NRC dated April 23, 2018 prior to implementation of 10 CFR 50.69. All issues identified in the attachment will be addressed and any associated changes will be made, focused-scope peer reviews will be performed on changes that are PRA upgrades as defined in the PRA standard (ASME/ANS RA-Sa-2009, as endorsed by RG 1.200, Revision 2), and any findings will be resolved and reflected in the PRA of record prior to implementation of the 10 CFR 50.69 categorization process.~~ 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).

Replace with UNIT 1 FOL INSERT

UNIT 1 FOL INSERT

In addition, Exelon is approved to implement 10 CFR 50.69 using any of the following alternative processes for categorization of RISC-1, RISC-2, RISC-3, and RISC-4 SSCs: the defense-in-depth approach contained in PWROG-20015-NP; the passive pressure boundary categorization approach described in EPRI 3002015999; and the alternative seismic approach as described in Exelon's submittal letter dated March 11, 2021, and associated supplements, as specified in Unit 1 License Amendment No. [XXX] dated [DATE].

APPENDIX C

ADDITIONAL CONDITIONS
OPERATING LICENSE NO. NPF-85

Exelon Generation Company, LLC shall comply with the following conditions on the schedule noted below:

Amendment No.	Additional Conditions
~~193~~ [YYY]	Exelon 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. 193 dated July 31, 2018. ~~Exelon will complete the implementation items listed in Attachment 2 of Exelon letter to NRC dated April 23, 2018 prior to implementation of 10 CFR 50.69. All issues identified in the attachment will be addressed and any associated changes will be made, focused-scope peer reviews will be performed on changes that are PRA upgrades as defined in the PRA standard (ASME/ANS RA-Sa-2009, as endorsed by RG 1.200, Revision 2), and any findings will be resolved and reflected in the PRA of record prior to implementation of the 10 CFR 50.69 categorization process.~~ 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).

Replace with UNIT 2 FOL INSERT

UNIT 2 FOL INSERT

In addition, Exelon is approved to implement 10 CFR 50.69 using any of the following alternative processes for categorization of RISC-1, RISC-2, RISC-3, and RISC-4 SSCs: the defense-in-depth approach contained in PWROG-20015-NP; the passive pressure boundary categorization approach described in EPRI 3002015999; and the alternative seismic approach as described in Exelon's submittal letter dated March 11, 2021, and associated supplements, as specified in Unit 2 License Amendment No. [YYY] dated [DATE].