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Subject: Limerick Application to Modify 50.69 Categorization to Implement an Alternate Defense-In-Depth Categorization Process, an Alternate Pressure Boundary Categorization Process, and an Alternate Seismic Tier 1 Categorization Process
Date: Tuesday, April 20, 2021 5:10:00 PM
Attachments: [Limerick supplemental request_PRA.pdf](#)

By letter dated March 11, 2021, (Agencywide Documents Access and Management System (ADAMS) Accession No. [ML21070A412](#)), Exelon Generation Company, LLC (Exelon, the licensee) submitted a license amendment request (LAR) for the Limerick Generating Station, Units 1 and 2. The proposed amendments would revise the licensing basis by modifying the license condition related to implementation of the provisions of Title 10 of the Code of Federal Regulations (10 CFR) Section 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors". The proposed revision would implement an alternate defense-in-depth categorization process, an alternate pressure boundary categorization process, and an alternate seismic tier 1 categorization process.

The purpose of this letter is to provide the results of the U.S. Nuclear Regulatory Commission (NRC) staff's acceptance review of this amendment request. The acceptance review was performed to determine if there is sufficient information in scope and depth to allow the NRC staff to complete its detailed technical review. The acceptance review is also intended to identify whether the application has any readily apparent information insufficiencies in its characterization of the regulatory requirements or the licensing basis of the plant.

Consistent with Section 50.90 of Title 10 of the *Code of Federal Regulations* (10 CFR), whenever a holder of a license, including a construction permit and operating license under this part, or an early site permit, combined license, and manufacturing license under part 52 of this chapter, desires to amend the license or permit, application for an amendment must be filed with the Commission, as specified in §§ 50.4 or 52.3 of this chapter, as applicable, fully describing the changes desired, and following as far as applicable, the form prescribed for original applications. Sections 50.34 or 52.79 of 10 CFR, as applicable, addresses the content of technical information required, and stipulates that the submittal address the design and operating characteristics, unusual or novel design features, and principal safety considerations.

In order to ensure sufficient information is in the application for a detailed technical review, the NRC staff requests that Exelon supplement the application to address the information requested below within 13 days of the date of this email. This will enable the NRC staff to begin its detailed technical review. If the information responsive to the NRC staff's request is not received by the above date, the application will not be accepted for review pursuant to 10 CFR 2.101, and the NRC will cease its review activities associated with the application. If the application is subsequently accepted for review, you will be advised of any further information needed to support the staff's

detailed technical review by separate correspondence.

Please find enclosed the Information Needed (i.e., Sufficiency Item) document to this request. The information requested and associated time frame in this letter were discussed with you on April 20, 2021. If you have any questions regarding this matter, please contact me at (301) 415-2597 or V.Sreenivas@nrc.gov.

Attachment-1

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Limerick Application to Modify 50.69 Categorization to Implement an Alternate Defense-In-Depth Categorization Process, an Alternate Pressure Boundary Categorization Process, and an Alternate Seismic Tier 1 Categorization Process

Information Needed (i.e., Sufficiency Items)

1. Alternate defense-in-depth Categorization Process

Section 50.69 (c)(1)(iii) requires that defense-in-depth be maintained as part of the categorization requirements. Section 6 of NEI 00-04 as endorsed by RG 1.201 provides guidance for assessing defense-in-depth. It includes considerations for core damage and containment defense-in-depth. For core damage, the guidance provides a table generally requesting multiple trains or systems, depending on the frequency of the initiating events, “without credit for any identical, redundant SSCs within the systems that are also classified as low safety-significant.” Similar considerations are provided for containment defense-in-depth regarding containment bypass, isolation, early hydrogen burns and long-term integrity. The currently endorsed NEI 00-04 categorization guidance evaluates defense-in-depth independently from the PRA results, thus ensuring that SSCs that otherwise might be considered low safety significant, but are important to defense-in-depth, will be categorized as high safety significant (and will remain subject to special treatment requirements). This process follows the intent of 10 CFR 50.69 and the tenets of integrated decision-making as outlined in RG 1.174 which preserves the required separate evaluation of PRA results from that of deterministic defense-in-depth.

Section 2.1.1.3 of RG 1.174, states how defense-in-depth should not be based exclusively on the PRA:

“to address the unknown and unforeseen failure mechanisms or phenomena, the licensee’s evaluation of this defense-in-depth consideration should also address insights based on traditional engineering approaches. Results and insights of the risk assessment might be used to support the conclusion; however, the results and insights of the risk assessment should not be the only basis for justifying that this defense-in-depth consideration is met. The licensee should consider the impact of the proposed licensing basis change on each of the layers of defense.”

In its LAR, the licensee is proposing to replace the NEI 00-04 defense-in-depth methodology with an alternate defense-in-depth methodology, as documented in PWROG-20015-NP, Revision 1, “Alternate 10 CFR 50.69 Defense-in-Depth Categorization Process” (ADAMS Accession Nos. ML21082A521 and ML21082A522). According to PWROG-20015-NP Section 2.2.3,

“the alternate core damage [or containment] defense-in-depth categorization process uses the [Full Power Internal Events] FPIE PRA model assumptions and success criteria to allow for defense-in-depth categorization of systems with only the PRA model assumptions and success criteria.”

PWROG-20015-NP Section 2.2.3 further states

“In the alternate core damage defense-in-depth categorization process, replacement of NEI 00-04 [...] with identification of risk significant cutsets is based on the success criteria used in the PRA.”

Section 2.2.5 of PWROG-20015-NP, Revision 1 provides description of how the proposed alternative categorization meets key principle 3 of RG 1.174 of maintaining defense-in-depth. It references back to the language in paragraph 50.69(d)(2) which requires the licensees ensure, with reasonable confidence, that RISC-3 SSCs (those with alternative treatments) remain capable of performing their safety-related functions under design basis conditions. The NRC staff notes that, according to the Statements of Consideration in the Federal Register Notice (FRN) Vol. 69, No. 224, dated November 22, 2004, the rule does not specify alternative treatments for RISC-3 SSCs, because the low safety significance of these SSCs supports allowing licensees to establish treatment without prior NRC review. Further, in the FRN, the NRC notes that for low safety significant (RISC-3) SSCs, the 50.69 rule language provides an acceptable, though reduced, level of confidence that these SSCs will satisfy functional requirements.

The LAR references a pilot categorization that was performed at Limerick on ten systems, and states that “the pilot results were found to be reasonable and consistent”, however the staff finds neither the LAR, nor the PWROG document, provide sufficient supporting evidence to support the staff safety conclusions regarding the acceptability of the alternate defense in depth approach. LAR Section 3.1.2 acknowledges that “the pilot resulted in fewer HSS functions from defense-in-depth and fewer HSS components overall.”

In order to facilitate its review, the NRC staff is requesting further justification on the robustness and adequacy of the proposed alternate defense-in-depth categorization process. Such information could include:

- i. Discussion of the Limerick ten system pilot categorization, including discussion of the systems categorized.
- ii. Comparison and justification of results of the defense-in-depth categorization of the ten pilot systems between existing NEI 00-04 and PWROG-2015-NP methodologies.
- iii. Discussion of the categorization results and justification that support the licensee’s conclusion that the “pilot results are “reasonable”.
- iv. Discussion of the number and types of SSCs identified as HSS by the alternate defense-in-depth categorization process at Limerick.
- v. Percentages of SSCs categorized in LSS and HSS category.
- vi. Further justification how use of the PRA success criteria for defense in depth conclusions can ensure that unforeseen failure mechanisms or phenomena are addressed in the categorization process.
- vii. Justification that the potential increased number of LSS SSCs that would result from the alternate defense-in-depth categorization ensure that plant safety is maintained, including how it is ensured that sufficient safety margins are maintained by the proposed categorization, as required by 50.69(c)(1)(iv).

2. Alternate Seismic Tier 1 Categorization Process

Section 50.69(c)(1) requires that SSCs be categorized using a categorization process that determines if an SSC performs one or more safety significant functions and identifies those functions. In its LAR, the licensee is proposing an alternative to the NEI 00-04 methodology as endorsed by RG 1.201 for consideration of seismic risk in the categorization process. The proposed alternative seismic categorization approach is based on the information in EPRI 3002017583, “Alternative Approaches for Addressing Seismic Risk in 10 CFR 50.69 Risk-Informed Categorization” for Tier 1 – Low Seismic Hazard/High Seismic Margin Sites. Section 2.2.2.1, “Integral Assessment,” of EPRI 3002017583 describes the integral importance measure

determination from NEI 00-04 and explains how the importance from each risk contributor to the total risk can result in an HSS determination.

Upon review of the appropriateness of the proposed alternative seismic categorization approach (the so-called "Tier 1" approach) for meeting the requirements in 10 CFR 50.69 includes an evaluation of the relative contribution of the plant-specific seismic risk to the overall plant risk. The relative contribution is important due to the use of the integrated importance measures for categorization in the licensee's approved 10 CFR 50.69 program. The staff identified the most recent docketed seismic CDF and seismic LERF estimates from the licensee's risk-informed completion times (RICT) LAR and supplements as documented in the staff's corresponding safety evaluation (ADAMS Accession No. ML20034F637). Based on these estimates, the staff has identified challenges to the use of the proposed alternative seismic approach with respect to Section 2.2.2.1, "Integral Assessment," in EPRI 3002017583. Specifically, the staff has identified a relatively large contribution of seismic risk to overall plant risk, especially for LERF. This would challenge the determination that seismic risk will not solely result in HSS determination based on integrated importance measures and therefore, challenge the use of the predominantly qualitative consideration of seismic risk in the proposed approach.

The staff is aware that the docketed information on seismic CDF and seismic LERF may be a conservative estimate that was provided to meet the particular needs of the RICT program. The licensee stated in their 50.69 application that for "Tier 1 sites, the seismic risk (CDF/LERF) will be low such that seismic hazard risk is unlikely to influence an HSS decision." However, this statement is based on the premise that the relative contribution of seismic risk is low when compared with the overall plant risk. Therefore, in order to facilitate its acceptance review, the NRC staff is requesting that the licensee provide supporting information to show that the relative contribution of seismic risk is low when compared with the overall plant risk. This information would provide support for the basis to accept the LAR for a detailed review of the proposed alternative seismic approach in its approved 10 CFR 50.69 program. The NRC staff will evaluate detailed justifications provided by the licensee (e.g., conservatisms in the seismic CDF and seismic LERF estimates) as part of its review of the LAR. If the staff's review determines that the relative seismic risk contribution cannot be justified to be low compared to the overall plant risk, the staff may not have adequate technical justification to approve the proposed alternative seismic approach for use in the licensee's approved 10 CFR 50.69 program.