

# Limerick 10 CFR 50.69 Alternative Categorization LAR

Pre-submittal Meeting

February 23, 2021



Exelon Generation®

# Agenda and Objective

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- Introductions
- Objective: Discuss Limerick license amendment request (LAR) as a pilot for the 10 CFR 50.69 alternative categorization process
- Background – Model Adequacy
- Proposed Alternate 10 CFR 50.69 Categorization
- Limerick Pilot LAR – References and License Condition
- Summary and Conclusions
- Open Discussion

## Background – Model Adequacy

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- Limerick PRA models used for 10 CFR 50.69 meet ASME/ANS RA-Sa-2009 PRA standard high-level requirements for initiating events, accident sequences, system analysis, and success criteria
- Limerick PRA model adequacy has been previously demonstrated for 50.69 and TSTF-505 (RICT) applications
- Previous NRC approval of 10 CFR 50.69 for Limerick via Amendment Nos. 230 and 193, dated July 31, 2018
- Common Cause modeling sufficiency is demonstrated by addressing Peer Review findings related to
  - Accident Sequence Analysis and Success Criteria
  - Initiating Event Frequencies and Truncation
  - Common Cause Groupings

# Defense-in-Depth: Current Guidance in NEI 00-04

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- Core Damage Defense-in-Depth
  - Utilizes PRA success criteria and initiating event frequencies
  - Multiple (identical) redundant trains cannot be credited
  - Does not acknowledge defense-in-depth within same system
- Containment Defense-in-Depth
  - Uses assumptions and documentation from PRA model without using the quantitative results
  - Most considerations could be evaluated using LERF insights

# Proposed Approach for Core Damage Defense-in-Depth

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- Replaces NEI 00-04, Section 6.1
- Uses FPIE PRA Model to identify only those cutsets with an initiating event and a single basic event
  - Based on success criteria in the PRA model
  - Single point vulnerabilities captured
  - Cutsets with initiating events  $< 1E-04$ /yr excluded
  - Associated SSCs retained as high safety significant
- Pressure boundary failure events that lead to internal flooding screened out (addressed in the pressure boundary analysis)
- Functions/SSCs outside scope of the PRA are not evaluated
- Does *not* replace IDP defense in depth evaluation
- Meets Rule and RG 1.174 Risk-Informed Principles

# Proposed Approach for Containment Defense-in-Depth

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- Replaces NEI 00-04, Section 6.2
  - Process analogous to that used for core damage
  - Based on success criteria in the Level 2 FPIE PRA model
  - Captures single point vulnerabilities
  - Associated SSCs retained as high safety significant
- Retains NEI 00-04, Section 6.2, Long-Term Containment Integrity consideration (not evaluated in the PRA)
  - “Does SSC support a system function not considered in CDF and LERF, but would be only means for preserving long-term containment integrity post-core damage (e.g., containment heat removal)?”
- Does *not* replace IDP defense in depth evaluation
- Meets Rule and RG 1.174 Risk-Informed Principles

# Pressure Boundary Categorization

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- Current pressure boundary (passive) categorization requires a significant amount of effort to complete the analysis
- Propose using new approach in EPRI Report 3002015999, “Enhanced Risk-Informed Categorization Methodology for Pressure Boundary Components”
- Discussed with the NRC in December 2019 Public Meeting
- Improved guidance addresses gaps and inconsistencies
- LAR will demonstrate three prerequisites for Limerick:
  - Robust internal events model, including internal flooding
  - Robust programs for localized corrosion, FAC and erosion
  - Protective measures for internal flooding events

# Seismic Tier 1 Approach

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- Limerick currently uses an IPEEE Seismic Margins Assessment (SMA) equipment list where all SSCs on list are HSS
- Propose use of EPRI 3002017583, “Alternative Approaches for Addressing Seismic Risk in 10 CFR 50.69 Risk-Informed Categorization,” February 2020.
  - Employs a systematic process to evaluate the seismic hazard which is integrated into the categorization process
  - Considers likelihood and magnitude of the seismic hazard
  - Considers margin to the site-specific seismic design basis
- Reference NRC approval of Seismic Tier 1 alternative for Calvert Cliffs (Amendment Nos. 332 and 310), February 28, 2020



## Limerick Pilot LAR - References

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- Limerick 50.69 Alternative Categorization LAR will reference following Topical Reports (available for NRC audit)
  - PWROG-20015-NP, “Alternate 10 CFR 50.69 Categorization Process”
  - EPRI 3002015999, “Enhanced Risk-Informed Categorization Methodology for Pressure Boundary Components”
  - EPRI 3002017583, “Alternative Approaches for Addressing Seismic Risk in 10 CFR 50.69 Risk-Informed Categorization”

# Limerick Pilot LAR – Proposed License Condition

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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 alternative processes for categorization of RISC-1, RISC-2, RISC-3, and RISC-4 SSCs: the defense-in-depth approach contained in Section 2.1 of PWROG-20015-NP; the passive pressure boundary categorization approach described in EPRI Topical Report 3002015999; and the seismic approach as described in Exelon's submittal letter dated March XX, 2021, 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).

## Summary and Conclusions

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- LGS PRA model adequacy has been previously demonstrated
- Considerable experience with implementation of 50.69 at LGS
- The alternate defense-in-depth approach takes advantage of the improved PRA modeling in place and use of model logic:
  - Improves consistency and removes subjectivity
  - Assures that key safety functions are still maintained by redundant SSCs
- Pilot results using the proposed alternative approaches
  - Demonstrate that existing methods are conservative
  - Represent process improvements
  - SSC's previously categorized won't necessarily be reevaluated
- Exelon will be submitting pilot LGS LAR in early March 2021

# Proposed Alternate 10 CFR 50.69 Categorization

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Open Discussion