



RIC 2011 Implementation of PRA-Based Seismic Margin Assessments for New Reactors

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U.S. Nuclear Regulatory Commission
March 9, 2011

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Presentation Outline

- Regulatory Perspectives
- PRA- based SMA Method
- Process for its Implementation
- Challenges and Insights

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Regulatory Perspectives

- Regulations related to PRA of new reactors
 - 52.47(a)(27), 52.79(a)(46) and 52.79(b)(1) require applicants of DCs and COLs to submit PRA information for the evaluation of standard plant risks
 - 50.71 (h) requires licensees to develop and update detailed plant specific PRAs
- RG 1.206 defines scope of PRA:
 - Level 1 & 2
 - Includes internal and external events and all plant operating modes
- SECY-93-087 and SRM
 - PRA-based SMA can be used to demonstrate seismic safety by ensuring plant-level margin of 1.67 times SSE
- ISG 20 provides guidance for implementation process for performing PRA-based SMA (ML1004912330)

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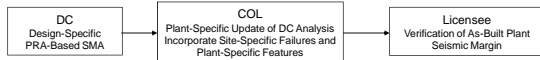
PRA-Based SMA

- All seismic-induced initiators (transients, LOCA of various sizes, or others appropriate to the standard design)
- Complete logic structures – enhanced from internal event/fault trees to capture seismic failures and non-seismic failures
- Fully developed sequences important for CDF and LRF
- Determination of sequence-level HCLPFs (margins)

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Implementation Process



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| <ul style="list-style-type: none"> •Design-specific seismic sequences •Fragility analysis •Equipment qual. including procurement specs to ensure the goal for plant-level HCLPF will be met •Plant-level/sequence-level HCLPF capacities to satisfy Commission expectation in SECY-93-087 (1.67 times CSDRS) •Instructions to COLA and Licensee •Staff reviews DCD to ensure information provided address the above items | <ul style="list-style-type: none"> •Update DC PRA-based SMA to incorporate site-specific effect and plant-specific features •Evaluation of site-specific weak links •Establish plant-specific plant-level HCLPF to be 1.67 times GMRS •Instruction to Licensee •Staff reviews FSAR to ensure information provided address the above items | <ul style="list-style-type: none"> •Perform seismic walkdown to verify as-built plant-level seismic margin of 1.67 times GMRS •Staff inspections to ensure the verification is adequate |
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Challenges

- Accident sequences developed for DC should only be based on design information and postulated site parameters
- COL update of sequences needs to consider the effects of site-specific characteristics
- Fragility developments
 - Scarcity of expertise
 - Require substantial experience and judgment
 - Guidance needs to be updated
 - Justify existing data and tests applicable to new reactor designs

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Solutions

- Staff developed ISG-20 provides a systematic process for implementation and relies on consensus ASME PRA standard for technical elements
- Development of expertise for seismic fragility analyses including knowledge transfers

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Conclusion

- Provided overview of issues related to staff review of PRA-based SMA for new reactors
- Discussed challenges confronting both the industry and the staff, especially with respect to the expertise for seismic fragility analyses

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Acronym

- ASME – American Society of Mechanical Engineers
- CDF – Core damage frequency
- COL – Combined license
- DC – Design certificate
- HCLPF – High-confidence of low probability of failures
- ISG – Interim staff guidance
- LOCA – Loss of coolant accidents
- LRF – Large release frequency
- PRA – Probabilistic risk assessment
- SMA – Seismic margin assessment
- SRM – Staff requirement memoranda
- SSE – Safe shutdown earthquake

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