



**RIC 2011
Current Topics in Probabilistic
Risk Analysis**

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Outline

- Topics in Office of New Reactors
 - Status of risk-informed regulatory guidance, SECY-10-0121
 - 50.59-like change process guidance, including ex-vessel severe accidents
 - PRA technical adequacy
 - Screening of external events
 - Reliability Assurance Program: Criteria for selection of in-scope equipment

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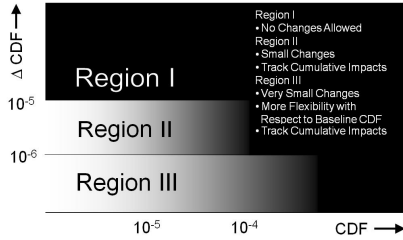
**Current Risk-Informed
Framework**

- Changes to licensing basis with NRC review and approval
- Changes to licensing basis allowed without prior NRC approval through 10 CFR 50.59
- Risk-informed regulations
- Reactor Oversight Process

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Risk-Informed Licensing Basis Change



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Overview of Options Associated with Current Risk-Informed Framework

- 1) No changes to existing risk-informed guidance (status quo)
- 2) Implement enhancements to existing guidance to prevent significant decrease in enhanced safety
- 3) Develop lower numeric thresholds for new reactors

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Status of Commission's Staff Requirements Memorandum on SECY-10-0121

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50.59-like Process for New Reactors

- Staff reviewing revision to NEI 96-07 to address new reactor change processes (new Appendix C)
- Staff has held internal and public workshops regarding “substantial increase” in probability and public consequences from changes to ex-vessel severe accident design features (see Section VIII.B.5.c of each design certification rule)

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Issues with PRA Technical Adequacy

- Per § 50.71(h)(1), Level 1 and Level 2 PRA no later than the scheduled date for initial loading of fuel
 - The PRA must cover those initiating events and modes for which NRC-endorsed consensus standards on PRA exist one year prior to the scheduled date for initial loading of fuel
 - PRAs used to support a regulatory risk-informed application, prior to operation, are expected to meet RG 1.200, as applicable
 - Lack of plant-specific operating experience

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Issues with Screening of External Events

- ASME/ANS RA-Sa-2009 Standard on PRA, Section 6-2 on external events screening
 - If it meets NRC’s 1975 Standard Review Plan (SRP), or
 - If frequency of design-basis hazard < 10^{-5} /yr and conditional core damage probability < 10^{-1} , or
 - Conservative analysis demonstrates < 10^{-6} /yr

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Issues with Screening of External Events (cont)

- Meeting SRP may screen CDF to be $<10^{-6}$ /yr or $<10^{-7}$ /yr (depending on hazard and rigor of analysis), but does not ensure that key contributors to CDF and/or risk are captured
- Regulatory Guide 1.200 Rev. 2 on PRA Technical Adequacy inserted:

"It is recognized that for those new reactor designs with substantially lower risk profiles (e.g., internal events CDF below 10^{-6} /year), the quantitative screening value should be adjusted according to the relative baseline risk value."



Issues with Reliability Assurance Program (RAP) Equipment Selection

- ACRS has noted that equipment selection criteria based on risk importance measures for RAP have not been uniform across the new reactor design centers
- For example, ESBWR, with CDF $\sim 2E-8$ /yr internal events at power used, used RAW > 5 rather than 2, and FV > 0.01 rather than 0.005
- RG 1.174 and SRP 19.2 state that the risk significance criteria should be a function of the baseline CDF/LERF, rather than being fixed for all plants



Issues with RAP Equipment Selection (cont)

- ACRS recommendation on SECY-10-0121: "The staff should expedite the development of interim guidance for the use of numerical risk significance measures for selection of candidate structures, systems, and components (SSCs) in design certification and Combined License (COL) reliability assurance programs."
- Staff will address the issue following Commission direction on SECY-10-0121
