

Challenges for New and Advanced Reactor Licensing and Risk-informed Applications: A Regulatory Perspective

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ANS Winter Meeting
Embedded Topical:

Risk Management for Complex Socio-Technical Systems

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Background

- New and Advanced Reactor Designs Certified under 10 CFR Part 52 are required to have PRA
- COLs are required to have PRA and maintain (and upgrade periodically as appropriate) the PRA

Background

- PRAs can be used to support:
 - Regulatory and Operational Programs
 - Regulatory Treatment of Non-Safety Systems
 - Inspection, Testing, and Analysis Acceptance Criteria
 - Reliability Assurance Program
 - Reactor Oversight Program
 - Significance Determination Process
 - Maintenance Rule
 - Risk-Informed Applications

Background

- From September 2012 through February 2013
Public meetings held to discuss risk-related topics covering:
 - Risk-Informed Inservice Inspection (RI-ISI)
 - Risk-Informed Inservice Testing (RI-IST)
 - Risk-Informed Categorization and Treatment (RI-C&T)
 - Maintenance Rule (MR)
 - Risk-Managed Technical Specifications (RMTS)
 - Risk-Informed Surveillance Frequencies (RI-SF)

Process Issues

- Specific risk-informed applications set requirements that cannot be achieved at the particular design or licensing phase

Process Issues

Examples:

- Expert Panel with minimum plant representation and plant experience, which does not exist pre-ops
- Application states need to meet RG 1.200 endorsed PRA Standard at Capability Category II, many of which require plant-specific performance data and experience that does not exist pre-ops

Technical Issues

- Lack of operational information and experience
 - Cannot fully identify component failure modes, degradation mechanisms, potential cross-system (or cross-unit) common cause failures, and uncertainties
 - New components for which there is no applicable performance data
- Appropriateness/Applicability of method or code relied upon
 - ASME Code Case N-716 for RI-ISI is based on current operating plant experience and may not be applicable to new reactor design

Technical Issues

- New conditions not currently considered
 - Multiple reactors that could have physical interactions and possible simultaneous core melts
- Evolving PRA model as specific component functions and details of design may change from COL to initial operations as further details are developed and modifications incorporated

Strategies to Address Challenges

- Revise endorsed guidance or develop new guidance (and obtain NRC endorsement) to address new reactors in the various pre-operational phases
- Continue work on supplementing current PRA Standard to address PRA technical adequacy for new reactors in the various pre-operational phases
- When considering new risk-informed applications, explicitly consider if it can be applied to, and how to address, new reactors in the pre-operational phase

Strategies to Address Challenges

- Recognize and address PRA model limitations (scope, level of detail, information) for the specific pre-operational phases
- Develop implementation guidance and implementation inspection guidance to ensure application that uses plant-specific PRA is consistent with approved process and reflects the as-built, as-operated plant

Path Forward

- Coming up on a year since last interaction on risk-informed applications
 - Opportunity to revisit this topic and further strategize and develop path forward for the specific risk-informed applications