"PRA Quality"

Session: Risk-Informed Regulation and Codes and Standards

Mary Drouin
Senior Program Advisor
U.S. Nuclear Regulatory Commission
June 27-29, 2006

Workshop – Nuclear Codes and Standards Needs
ASME Board Nuclear Codes and Standards
Nuclear Research Institute – Czech Republic

Commission PRA Policy Statement

- Increase use in all regulatory matters to the extent supported by the state-of-the-art
- To reduce unnecessary conservatism and to support proposal for additional regulatory requirements
- PRA evaluations to be as realistic as practicable
- Safety Goals and subsidiary objectives to be used with appropriate consideration of uncertainties

Risk-Informed Regulatory Activities

- Rulemakings; examples
  - 50.69 – Special treatment requirements
  - 50.44 – Combustible gas control
  - 50.48(c) – Fire Protection (National Fire Protection Association Standard 805)
  - 50.46a – Emergency Core Cooling
- Licensing Actions
  - Risk-informed licensing actions using Regulatory Guide 1.174
  - Risk-informed technical specification initiatives (e.g., flexible completion times)
- Reactor Oversight Process
  - Risk-Informed Baseline Inspections
  - Significance Determination Process
  - Performance Indicators
  - Mitigating Systems Performance Index (MSPI)

Issue: PRA Quality

- Need to understand what is meant by “PRA Quality” with regard to its relationship to risk-informed decision-making
- Regulatory Guide 1.174: the PRA only needs to be as good as necessary to support the decision being made
- Fundamental issue is how to judge the elements relating to the baseline PRA
- Establishing an acceptable baseline PRA quality is needed

Issue: PRA Quality (cont'd)

- Two sets of elements characterizing "PRA Quality"
- PRA baseline elements: address the accuracy of the baseline risk; e.g., core damage frequency and large early release frequency
  - These elements include such items as: PRA scope, level of detail, data, realism, treatment of uncertainties
- Risk-informed decision-making elements: are used to assess the effects of a change to the facility
  - Elements more difficult to define: safety significance of proposed changes vary widely

PRA Phased Approach

- "A phased approach to PRA quality allows the continued practical use of risk-informed methods and continued progress towards adoption of state-of-the-art methodologies."
- Phase 1- Current situation: regulatory guidance and/or PRA standards not comprehensive for current and anticipated applications
- Phase 2 - regulatory guidance available for specific applications and PRA standards available for risk-significant contributors
- Phase 3 - PRA standards and regulatory guidance available for all current and anticipated applications
- Phase 4 - PRAs fully developed to the state-of-the-art

Standards

- ASME has issued PRA standard on Level 1 and LERF addressing full-power operation and internal events (excluding internal fire)
- US NRC has issued Regulatory Guide 1.200
  - Describes an approach to determine if quality of PRA is sufficient to support the regulatory decision-making
  - Endorses standards and industry related guidance
  - Obviates the need for an in-depth review of the PRA by the staff
- ASME "integrated standard" will integrate the Level 1- LERF, external events, internal fire and low power shutdown standards into one standard

Guidance and Training

- Standards provide requirements on what is needed
  - Supporting technical guidance needed for the “how to”
- Additional guidance documents being issued and under development; examples include:
  - US NRC: Data Analysis Handbook, HRA Good Practices, Treatment of Uncertainties and Use of Alternate Methods
  - NRC/EPRI: Fire PRA Methodology, Verification and Validation of Fire Models
- Training: US NRC with ASME, PWR/BWR Owner’s Groups, EPRI, NEI developing detailed training courses on the PRA standards

The Future

- Current standards and guidance developed for operating light water reactors
- Do not address such items as:
  - PRA scope for plant design and construction
  - Passive systems
  - Living PRA
- Additional standards will be needed to support new designs and a fully risk-informed regulatory structure