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Implementation of PRA Policy at the US Nuclear Regulatory Commission

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Regulatory Context

- Traditional regulatory environment
  - Design basis accidents
  - Single failure criterion
  - Defense in depth
  - Safety margins
- Regulations
- Conservatism
- Incremental use of risk assessment
- Policy
  - Safety goals
  - PRA
- Realism

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PRA Policy Statement

- Background
  - "NRC has generally regulated the use of nuclear material based on deterministic approaches… A probabilistic approach to regulation enhances and extends this traditional, deterministic approach, by: (1) allowing consideration of a broader set of potential challenges to safety, (2) providing a logical means for prioritizing these challenges based on risk significance, and (3) allowing a broader set of resources to defend against these challenges."

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PRA Policy Statement

- Increase use of PRA technology in all regulatory matters to the extent supported by the state-of-the-art in PRA methods and data and in a way that complements the deterministic approach and supports the traditional defense-in-depth philosophy.

- Use PRA, where practical within the bounds of the state-of-the-art, to reduce unnecessary conservatism in current regulatory requirements, regulatory guides, license commitments, and staff positions and to support proposals for additional regulatory requirements in accordance with 10 CFR 50.109 (Backfit Rule).

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PRA Policy Statement

- PRAs used in regulatory decisions should be as realistic as practicable and supporting data should be publicly available.
- Safety goals and subsidiary numerical objectives are to used with appropriate consideration of uncertainties in making regulatory judgments on the need for new generic requirements.

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Policy Implementation: Rule Changes

- Risk-informed requirement additions
  - Station blackout (10CFR50.63)
  - Anticipated transients without scram (50.62)
  - Maintenance (50.65)
- Risk-informed requirement reductions
  - Combustible gas control (50.44)
- Risk-informed alternatives
  - 50.48(c) “National Fire Protection Association Standard NFPA 805”
  - 50.61a “Fracture toughness requirements for protection against pressurized thermal shock events”
  - 50.46a “Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors” [proposed rule]
  - 50.69 “Risk-informed categorization and treatment of systems, structures and components for nuclear power reactors”

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Policy Implementation: Licensing Basis Changes (Regulatory Guide 1.174)

- Expectations
  - Safety impacts evaluated in integrated manner
  - Scope, level of detail, and technical acceptability of engineering analyses should be
    - appropriate for scope of change
    - based on as-built, as-operated plant
    - reflect operating experience
  - PRA quality assurance and quality control
  - Appropriate consideration of uncertainty

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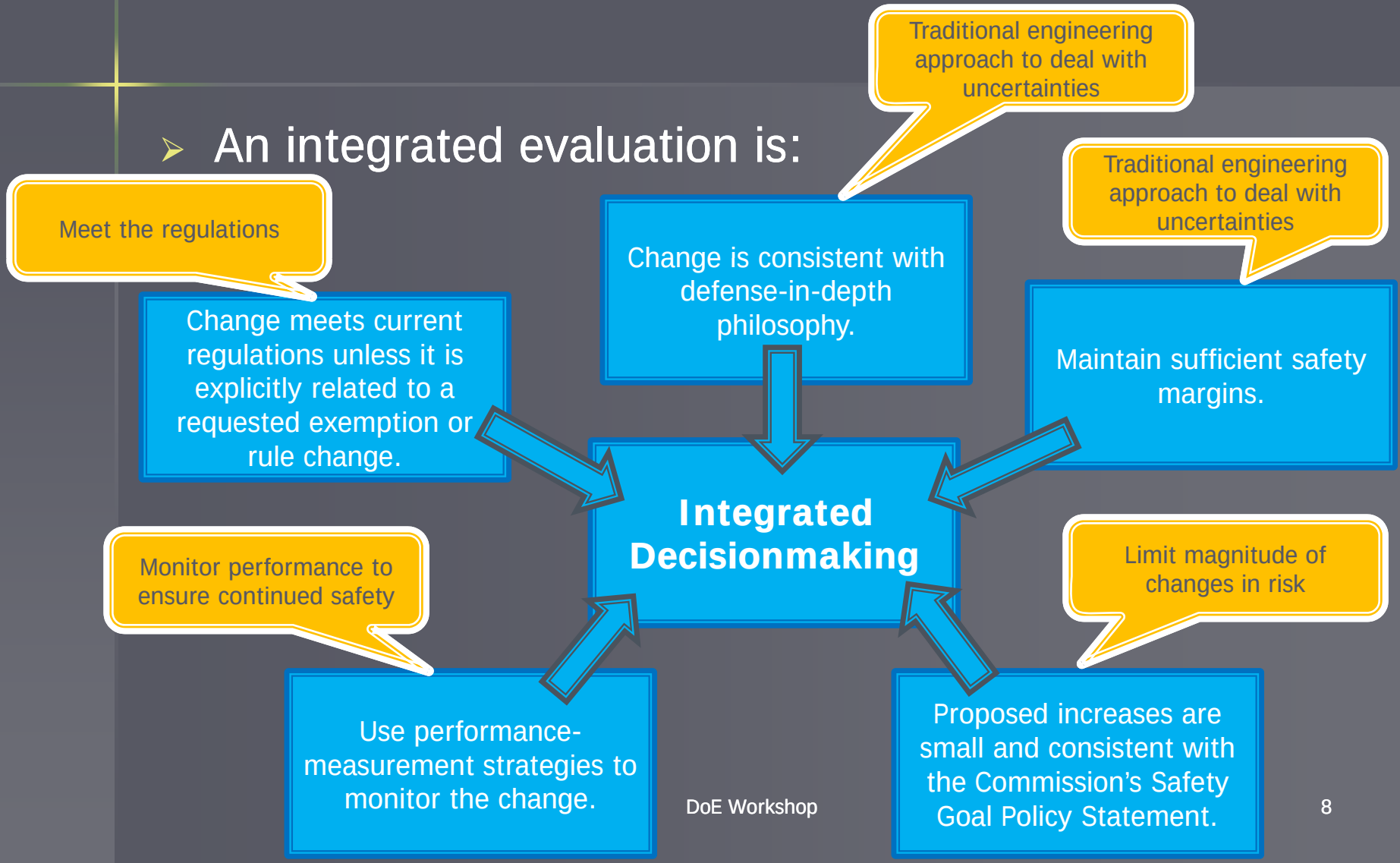
Policy Implementation: Licensing Basis Changes

- An integrated evaluation is:



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Summary

- NRC's Safety Goal and PRA Policy Statements include mechanisms to manage uncertainty
  - PRA as an alternative, realistic, view
  - Consideration of safety margins and defense in depth
  - Monitoring of performance
  - Use of mean values
- NRC has successfully implemented these policies
  - Rule changes
  - Licensing basis changes