U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Briefing on Alternative Risk Metrics for New Light-Water Reactors

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Speakers and Topics

- Bill Borchardt, EDO: Introduction
- Mike Johnson, NRO: Agenda and Opening Remarks
- Charles Ader, NRO: Background, Options, Staff's Recommendation
- Fred Brown, NRR: Current Framework for Regulatory Response
- Mike Mayfield, NRO: Advanced Reactors

Agenda

- Risk-informed guidance for new light-water reactors (LWRs)
  - Background
  - Options
  - Staff's recommendation and basis
- Progress on advanced reactor policy issues

Background

NRC Staff white paper (2/2009)

- New plants estimated to have lower risk profiles
- Current framework could allow large relative changes in risk
- Several potential options identified
- Intention to engage stakeholders

Commission Policy: Expectations vs. Requirements

- Safety Goals
  - Establishes acceptable level of risk
- Severe Reactor Accidents
  - Expects a higher standard of severe accident performance

Commission Policy: Expectations vs. Requirements

- Advanced Nuclear Power Plants
  - Expects enhanced margins of safety
  - Does not state that designs must be safer than current generation
- Design Certification Rulemakings
  - Expectations realized and codified in rulemakings

ABWR Certification Final Rule

"The Commission will deny a request for an exemption . . . if it finds that the design change will result in a significant decrease in the level of safety otherwise provided by the design." (Rule)

Expects that "the level of enhanced safety believed to be achieved with this design will be reasonably maintained" (SOC)

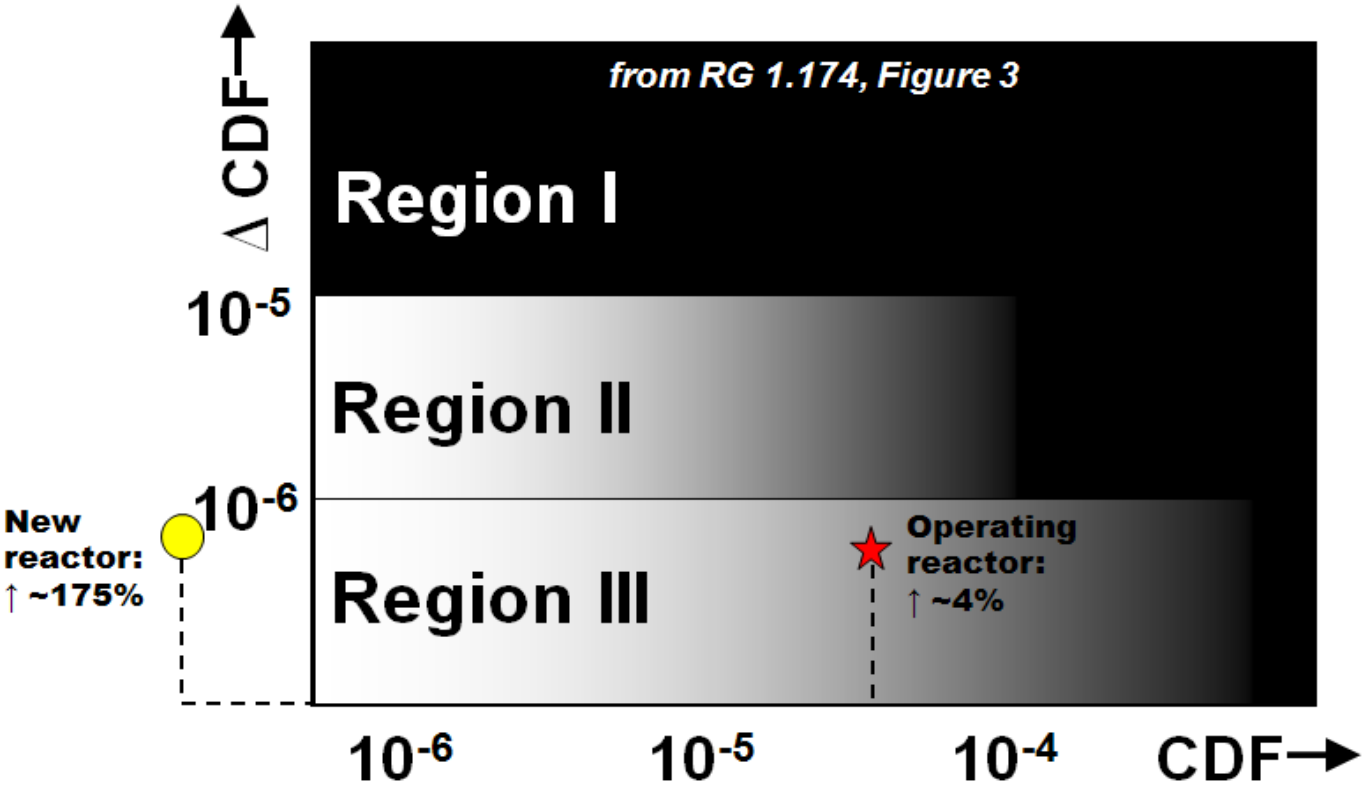
Current Risk-Informed Framework

- 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

Changes To Licensing Basis With NRC Review and Approval

- Current RG 1.174 provides basic framework for risk-informed guidance
- Includes qualitative and quantitative considerations
- Allows increases in risk that are small relative to safety goals
- Does not address enhanced severe accident features

Example: Risk-Informed Licensing Basis Change



Changes To Licensing Basis Without Prior NRC Approval

- Each Design Certification Rule (Section VIII) includes a “50.59 like process”
  - Includes a new change process for ex-vessel severe accident features
- Staff developing guidance for “50.59 like process”

Risk-Informed Regulations

Guidance Derived from RG 1.174 Supports:

- Maintenance rule - 50.65(a)(4)
- Risk-informed categorization and treatment of SSCs - 50.69
- LOCA technical requirements - 50.46a (proposed)

Current Framework for Regulatory Response

Potential differences in response to:

- Recurring equipment failures
- Operational events
- Performance degradation
- Passive safety system performance

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

Option 1 – Status Quo

Advantages

- Provides greater operational and regulatory flexibility for safer designs

Disadvantages

- Would allow significant decrease in enhanced safety

Implementation

- Minimal resources

Option 3 – Lower numeric thresholds

Advantages

- Reaffirms and strengthens Commission's expectation of enhanced safety

Disadvantages

- Inconsistent with the underlying policy and technical basis of RG 1.174 (i.e., de facto new safety goals)
- Less operational and regulatory flexibility for safer designs

Option 2 – Augment existing framework

Advantages

- Reaffirms Commission's expectation on enhanced safety
- Acknowledges safety margins and defense in depth in addition to quantitative thresholds

Disadvantages

- Some stakeholders view <u>any</u> change to the thresholds in RG 1.174 as inconsistent with their underlying policy and technical basis

Option 2 (cont.)

Implementation

- Continue to engage stakeholders
- Modify guidance to prevent a significant decrease in safety
- Evaluate potential ROP changes
- Ensure no unintended consequences

Staff Recommendation

The staff recommends Option 2.

- Option 2 provides assurance that "the level of enhanced safety believed to be achieved with new reactors will be maintained"
- Preserves intent of Commission policy; margin and flexibility
- Endorsed by ACRS

Summary

- Near term considerations
- Considered stakeholder views when developing options
- Proceed consistent with Commission direction
- Continue to engage stakeholders

Advanced Reactor Program

- Update on identification & resolution of advanced reactor policy issues
- Ongoing interactions
  - Interoffice & interagency
  - Industry working groups (NEI)
  - ANS special committee
  - Vendors and other stakeholders

Advanced Reactor Program

- Selected Policy Issues
  - Risk-Informed Licensing
  - NRC Annual Fees
  - Emergency Preparedness
  - Security
  - Multi-Module Facilities
- Future Commission Updates and Interactions

List of Acronyms

- ABWR – Advanced Boiling-Water Reactor
- ACRS – Advisory Committee on Reactor Safeguards
- ANS – American Nuclear Society
- CDF – Core Damage Frequency
- EDO – Executive Director for Operations
- ISI – In-service Inspection
- LOCA – Loss-of-coolant accident
- LWRs – Light-Water Reactors

List of Acronyms (cont.)

- NEI – Nuclear Energy Institute
- NRC – Nuclear Regulatory Commission
- RG – Regulatory Guide
- ROP – Reactor Oversight Process
- SOC – Statement of Considerations
- SSCs – Structures, Systems and Components