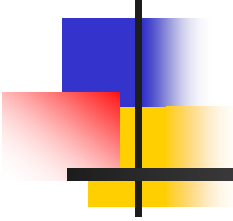


# Risk Informing ECCS Performance Requirements 10 CFR 50.46



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Public Workshop  
February 16, 2006



# Rule Change Objectives

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- Enable licensees to reduce plant risk through optimization of safety systems operation
- Protect against other plant changes that might result in a significant risk increase, loss of margin or loss of defense in depth



# Critical Elements of Rule

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- Provide flexibility for plant changes
- Provide checks/balances on risk
- Define regulatory process



# Flexibility

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- Redefined size for DBA LOCA
- Relaxed requirements for non-DBA LOCA
  - No single failure requirement
  - No loss of offsite power
  - Realistic inputs and models



# Constraints on Flexibility

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- Mitigation capability must be maintained for non-DBA LOCA up to DEGB
- Maintain containment integrity
- Security should not be degraded
- Total risk increase must be small



# Checks and Balances

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- Risk Informed Integrated Safety Performance (RISP) Assessment Process
  - Systematic process to assure that use of authorized flexibility does not inadvertently result in an unacceptable increase in risk or loss of defense in depth or safety margin



# Essential Elements of RISP

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- Consider all potential risk contributors
- Assure that assessments reflect actual plant
- Assure quality evaluations
- Assess net risk impact
- Address uncertainty



# Regulatory Process

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- When a license amendment is required
- Backfit Requirements
- Contents of application
- Reporting Requirements





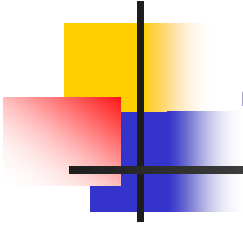
# Summary

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- Three basic elements to the proposed rule
  - Flexibility
  - Checks and Balances
  - Process
- Intended to enable changes to safety system configurations that reduce risk
- Protect against inadvertent risk adverse changes

# Selection of Transition Break Size (TBS)

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# Selection of Transition Break Size (TBS)

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- Selected TBS ultimately based on the sizes of the largest pipes attached to the reactor coolant main loop
  - Starting point of break frequency of about  $1E-5/R-Y$
  - TBS adjusted to account for uncertainties and mechanisms not included in elicitation process.
  - Piping larger than the attached piping is the main loop piping which has a smaller frequency of breaking
  - Staff believes this provides some regulatory stability; future estimates of break frequencies not likely to change TBS



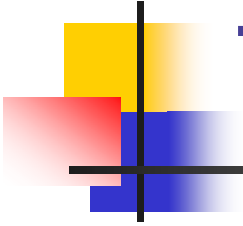
## Selection of TBS (Cont.)

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- Proposed rule requires that TBS be applied to the limiting location in the reactor coolant system
- Proposed rule also requires that TBS be modeled only as a single-ended break.

# Seismic Considerations for the TBS

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# Objectives and Approach

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- **Objectives**

- **To examine likelihood and conditions that would result in seismically-induced breaks in how they affect the proposed TBS**
- **Provide key considerations to facilitate the public review and comments**

- **Approach**

- **Use of hybrid deterministic and probabilistic approaches**
- **Six supporting activities**

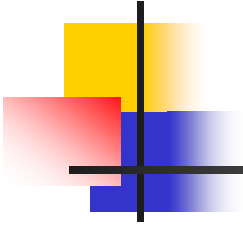
# Key Findings and Public Comments



- **Critical crack depths are larger than 30% to 40% of thickness for seismic stresses associated with 1E-6 and 1E-5/year seismic events**
- **For two cases we analyzed, indirectly induced piping failure attributable to major component support failure has a mean failure probability on the order of 1E-6/year**
- **Comments are solicited on the following points:**
  - **Results of the evaluations contained in the report**
  - **Effects of pipe degradation on seismically-induced LOCA frequencies and the potential affecting the selection of the TBS**
  - **Potential approaches and options to address this issue**

# Thermal-hydraulic Analysis Requirements

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# Acceptable Analysis Methods — ECCS Analysis

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- Breaks  $\leq$  TBS
  - 10 CFR Part 50, Appendix K
  - Realistic with uncertainty determination, Regulatory Guide 1.157
  - Uncertainty demonstrated at high probability level
- Breaks  $>$  TBS
  - Realistic with uncertainty determination, Regulatory Guide 1.157
  - Alternative analytical approach
  - Uncertainty demonstrated at reasonable probability level



# Acceptance Criteria — ECCS Analysis

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- Breaks  $\leq$  TBS
  - Current criteria
- Breaks  $>$  TBS
  - Coolable geometry
  - Long-term cooling



# Risk-Informed Integrated Safety Performance (RISP)

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# Risk-Informed Integrated Safety Performance (RISP)

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- A licensee who wishes to make changes to the facility or procedures or to the technical specifications shall perform a RISP assessment.
  - Rule permits wide scope of design and operational changes
  - Design resulting from mitigating LOCAs provides robustness for other accidents
  - Need to systematically assess integrated impact of proposed changes permitted by the rule
  - May be difficult to distinguish between changes permitted under 50.46a and changes permitted by other sections



# Description of RISP

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- The RISP assessment must demonstrate that all plant changes satisfy the acceptance criteria in the rule:
  - Acceptable changes in risk,
  - Defense-in-Depth is maintained,
  - Adequate safety margins are maintained, and
  - Adequate performance measurement programs are implemented.
- PRA required for initiators and operating modes that would affect the regulatory decision in a substantial manner



# Risk Evaluations

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- Changes not requiring prior approval
  - Satisfy 50.59 requirements and minimal risk increase
  - 50.59 evaluation only includes FSAR analysis and information
  - Minimal risk increase addresses all accident mitigation possibilities and also identifies changes licensees may make without prior staff review
  
- Changes Made under 50.90
  - Licensee may submit a request for a licensing amendment when the RISP assessment demonstrates that the total increases in core damage frequency and large early release frequency are small and the overall risk remains small.
  - Tracking cumulative risk ensures changes do not result in greater change in risk than intended by the Commission.



# RISP Requirements During Operation

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- Adequate performance measuring programs must be implemented
- Licensees must periodically reevaluate and update the risk assessments (both PRA and non-PRA assessments)
  - Address modifications to the plant, operational practices, equipment performance, and plant operational experience
  - Implement revisions in the PRA analysis methods, model scope, data, and modeling assumptions
  - Report significant changes to the NRC.
- Based on the risk assessments, the licensee shall take appropriate action to ensure that facility design and operation continue to be consistent with the risk assessment assumptions used to meet the acceptance criteria.