



RIC 2010

Containment and Reactor Coolant System Pressure
Boundary Materials Degradation

Insights from the Pressurized Thermal Shock (PTS) Technical Basis

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Overview of Presentation

- What is PTS?
- Why we developed an alternative rule
- Highlights of the alternative rule
- Lessons learned



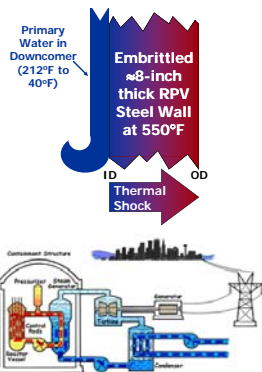
What is PTS?

Primary Side Break

- Inventory (water & steam) lost through the break is replaced by colder (40-70°F) water held in external tanks

Secondary Side Break

- Loss of pressurization in the secondary leaves water boiling (212°F) at atmospheric pressure
- Primary side inventory just across the heat exchanger also approaches 212°F
- Natural circulation in primary draws colder water into downcomer





Why we Developed an Alternative Rule

Technical motivations

- Existing rule (circa 1980s) excessively conservative in many areas
- Conservatism unduly limited operations

Practical motivations

- Conservatism produced more work for
 - NRC
 - Industry
 with no resultant increase in safety

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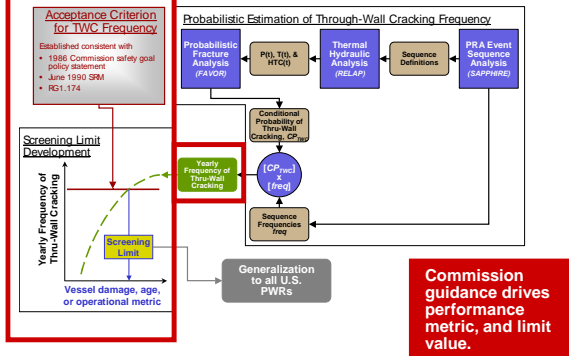
Tech Basis Work Participants



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Tech Basis Work Overall Approach



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Outcome

Less restrictive reference temperature (embrittlement) limits enable longer operations, but gating criteria must be satisfied to use the new rule.

	10 CFR 50.61 <i>REQUIRED</i>	10 CFR 50.61a <i>VOLUNTARY</i>
Reference Temperature Limits	More restrictive	Less restrictive
Plant-specific surveillance data check	Required – 1 test	Required – 3 tests
Plant specific inspection for flaws	Not required	Required

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Lessons Learned

Project Timeframe

- Successful regulatory research program, however, development took a long time
- Review and approval procedures of large integrated analyses need to be created early
 - Decision processes and metrics
 - Review boards
 - Process to move forward absent consensus
- Risk metrics, while originating in policy guidance, do not come pre-defined
 - Define them up front

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Lessons Learned

Data/Information Needs

- If one can measure it, measurement is likely to be done
 - Regardless of its risk-significance, and
 - Especially if measurement has been customary
- If we have data, it is likely to be used
 - Again, regardless of its risk-significance
- Lesson Learned
 - Focus on risk-significance (probabilistic assessment)

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Lessons Learned

Data/Information Needs

- Less realistic models:
 - Make lesser challenges seem important
 - Tend to be “plant specific”
- Inclination is to adopt less realistic models
 - Simplification (especially if conservative)
- Penalty for adopting less-realistic models
 - Less generic regulations
 - Extensive validation requirements
- **Key point:** Mathematical abstractions drive real actions

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