Evolving Nuclear Fuel Pool Storage Criticality Regulations and Guidance

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Evolving Nuclear Fuel Pool Storage Criticality Regulations and Guidance
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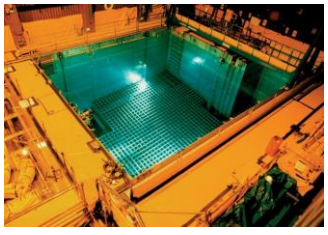
Overview

- Background
- Generic Communication
- Guidance
- Technical Specifications



Picture: Spent Fuel Pool

Background

- High capacity SFP storage designs
- Neutron absorber degradation
- More reactive fuel assemblies
  - Higher enrichment
  - Core design & operating parameters
- SFP NCS analyses & controls more complex
  - Analyses continue to take new approaches
  - More storage configurations

Background

- NRC observed issues
  - NCS analysis used 'blended' approaches
    - Some old aspects, some new aspects
    - Some old aspects did not reflect the changes in core design and operation
    - Synergistic effects of the 'blended' approaches not fully considered
  - Technical errors in SFP NCS analyses
  - Degraded neutron absorbers not modeled conservatively
    - Actual degradation hard to predict and hard to measure
  - Issues revealed gradually

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Path Forward

- NRC Focused on Three Key Objectives
  - Neutron Absorber Degradation
    - Generic Letter
  - NCS Guidance Documents
    - ISG DSS-2010-01
    - Regulatory Guide
  - SFP Related Technical Specification Improvements
    - Improve clarity and consistency
    - Revise Standard Technical Specifications

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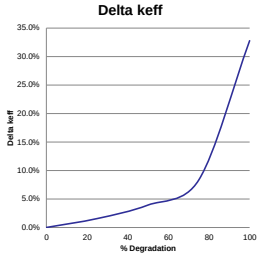
SFP Neutron Absorbers

- As ^{10}B is lost, k_{eff} goes up
- If the neutron spectrum becomes harder, k_{eff} goes up



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SFP Neutron Absorbers

- Background
  - Since the February 27, 2009 public meeting the NRC staff has engaged the industry on numerous occasions regarding SFP neutron absorbers
    - NAUG meetings, NEI Used Fuel Management Conferences, RIC 2010, etc
  - Three cited violations
  - Going forward licensees need to manage the degradation

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Generic Letter

- What neutron absorber is credited?
- What monitoring program is in-place?
  - What are its limitation and accuracy?
- How is compliance assured between monitoring intervals?
- How is the neutron absorber modeled in the SFP NCS AOR?
- How does the surveillance/monitoring ensure the neutron absorber modeling remains bounding?
- How does the neutron absorber behave during design basis events?

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Generic Letter

- Schedule
  - Public comment in summer 2013
  - Final GL in summer 2014

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Guidance Documents

- DSS ISG-2010-01: Staff Guidance Regarding the Nuclear Criticality Safety Analysis for Spent Fuel Pools
  - List of topics that should be covered.
    - Points to NUREG/CRs for additional information.
  - Based on NRC staff lessons learned at the time.
  - ML110620086
- Next step: Regulatory Guide

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Guidance Documents

- NEI is drafting a guidance document for NRC endorsement through a RegGuide
  - Pre-Submittal meeting Jan 23rd
  - Endorses EPRI depletion validation methodology
  - List of topics that should be covered
    - Points to NUREG/CRs for additional information.
  - Resources in place to start the review

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Technical Specifications

- Current SFP TS in the fleet
  - Customized to a specific plant
  - Some are very large
  - Some are very complex

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Technical Specifications

- Future STS
  - Improve consistency
  - Reflect current NCS requirements
  - Neutron absorber surveillance

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Summary

- 2010 RIC issues are still with us
  - There has been improvement
- NRC path forward
  - Generic Letter on neutron absorbers
  - Issue durable Guidance
  - Improve STS

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