



U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Management of Spent Fuel Pool Neutron Absorbing Material Degradation

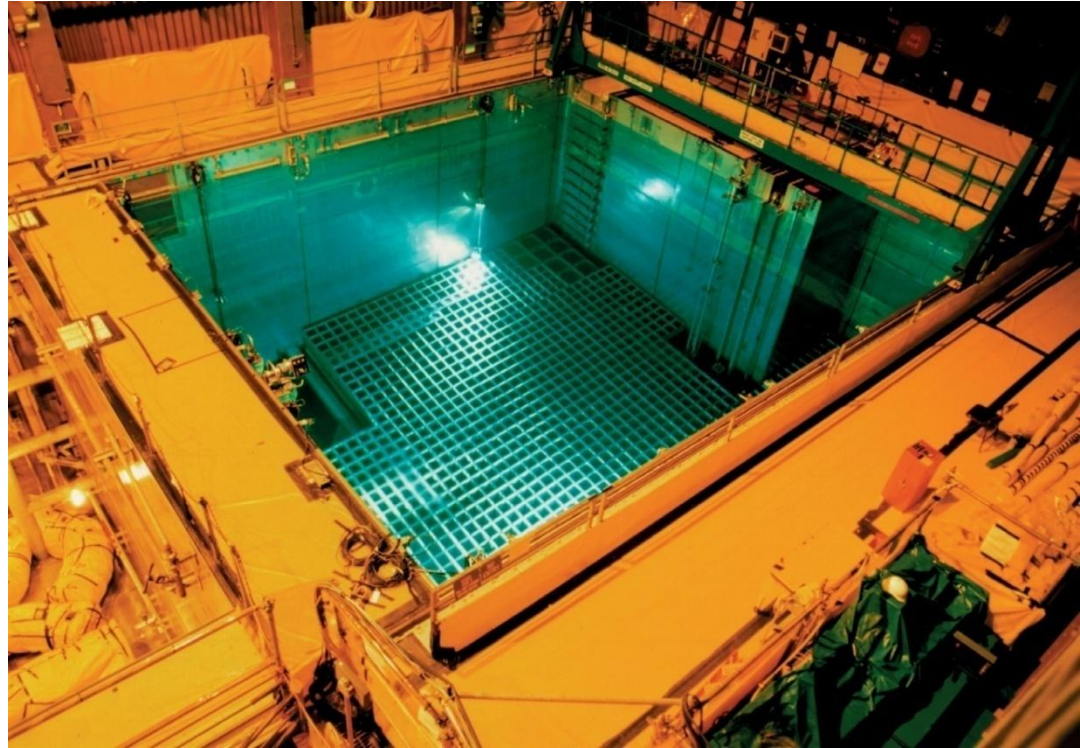
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NEI Used Fuel Management Conference

May 9, 2013

- Safety Significance
- Recent NRC Documents
- Topics of Interest
- Timeline
- Summary



Safety Significance

- Neutron absorbing materials have a direct impact on safety
- Prevent the occurrence of inadvertent criticality events in the SFP
 - Unidentified and unmitigated degradation poses a criticality and safety concern
 - Could challenge compliance with NRC subcriticality requirements: 10 CFR 50.68 and GDC 62
- NRC staff has identified this issue as potentially safety significant

Recent NRC Documents

- IN 09-26, LR-ISG 2009-01, update to GALL (NUREG 1801 Rev 2), and IN 12-13
- Technical Letter Reports (TLRs) published
 - Database TLR: ML113550241 and ML121090500
 - TLR on Boraflex, RACKLIFE, and BADGER methodologies: ML12216A307
 - TLR on BADGER tool: ML12254A064
 - TLR on Phenolic Resins (expected May 2013)

Topics of Interest

- Material properties and configuration
- Surveillance program methodologies
- Surveillance program frequencies
- Criticality analysis modeling of the material and degraded material
- Design basis event effects



Properties & Configuration

- Manufacturer and dates
- Material specifications
 - Materials of construction
 - Qualification testing
 - Current credit in analysis
- Configuration in the SFP
- Current condition of the material in the SFP
 - Areal density
 - Recorded degradation/deformation



Surveillance Methodologies

- Basis of method to confirm that the material is performing its intended function
- Description of methods used
 - Procedures
 - Parameters
 - Monitoring and trending
 - Acceptance criteria



Surveillance Methodologies

- Visual inspection
- Coupon monitoring
 - Representative of the rack panel material in situ
 - Test methods/procedures and acceptance criteria
 - Re-insertion of coupons into SFP
 - Number of coupons remaining and frequency
- Predictive modeling methodology (RACKLIFE)
 - Inputs
 - Confirmatory testing
 - Calculation of areal density



- In-situ testing methodology
 - Sample size and statistics
 - Calibration of instrument
 - Material selection, degraded materials, frequency
 - Cell geometry
 - Documentation
 - Qualification test report
 - BADGER
 - Plant specific procedures, standards, practices
 - Operating conditions, uncertainties, QA/QC, data analysis, interference factors, control points, head alignment

Surveillance Frequencies

- Material degradation mechanisms and rate
- Confirmation of material properties during the surveillance interval
- Frequency modification
- Indicators of degradation between surveillances

Criticality Aspects

- Modeling of the material
- Potential affect of degradation of the material on the criticality analysis of record
 - Loss of material – neutron absorbing capability
 - Deformation – blistering, bulging, pitting, warping
 - Gaps, cracks, shrinkage, densification
 - Voids
 - Structural integrity
 - Wear/mechanical damage
- Propagation of biases and uncertainties

Design Basis Event

- Examples include: seismic, loss of cooling
- Effect on degradation mechanisms
- Effect on material configuration
- Limiting material and mechanical properties to maintain functionality
- Impact on surveillance intervals
- Criticality analysis impact

Timeline

- Technical Specifications Task Force meeting – May 2, 2013
- NEI Used Fuel Management Conference - May 9, 2013
- Phenolic Resin TLR – Mid-2013
- Public Comment period on the potential generic communication - Mid-2013
- Public Meeting on the potential generic communication – 30 days after issuance for public comment

Summary

- Additional public dialogue with industry
- Additional research underway
 - Materials
 - Surveillance methods and intervals
- Potential generic communication
 - May be used to gather plant-specific information
 - Determine if any additional NRC actions necessary
- Regulatory guidance, as necessary
- Other generic communications, as necessary