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Fuel Cycle Technologies

Used Fuel Long Term Storage and Transportation R&D Activities

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Subcommittee on Transportation and Storage

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Outline

- DOE/NE Storage and Transportation Program Overview
- Work Package Activities and Preliminary Findings
- Collaborative Activities

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Program Overview

- **Used fuel storage and transportation activities are part of the Office of Used Nuclear Fuel Disposition R&D that supports the Fuel Cycle Technologies Program within NE.**

- **Used fuel storage and transportation is funded through four Work Packages:**
  - R&D Opportunities
  - Security
  - Concept Evaluations
  - Transportation (new in FY11)

- **Overall objectives of the storage and transportation work packages are:**
  - Identify and prioritize technical gaps (safety and security) associated with the long term storage and subsequent transportation of used fuel.
  - Assess alternatives for gathering needed data.
  - Develop plan for conducting research.
  - Conduct research and develop technical justifications to demonstrate understanding of material degradations mechanisms in storage systems over very long periods of time.

[**NOTE**: This work will be closely coordinated with industry and the NRC to facilitate general agreement on the best path forward to address the technical gaps.]

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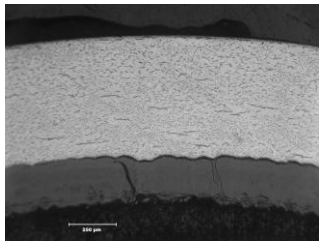
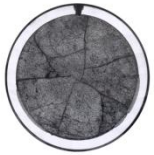
Storage and Transportation Work Packages

How do we resolve technical issues associated with very long term storage and transportation?

- **R&D Opportunities**
  - Data gap analysis
  - Plan to address gaps
  - Development of technical basis
- **Security**
  - Regulatory assessment
  - Identify issues peculiar to long-term storage
  - Evaluate vulnerability analysis methodology improvements
- **Conceptual Evaluation**
  - Design process for development of technical basis
  - Evaluate several alternatives for accomplishing development of technical basis
  - Develop a systems framework for decision-making
- **Transportation**
  - Integrate with above activities





Storage and Transportation Implementation

- **Project Implementation Plan Framework**
- **Project Implementation Plan & Development of Technical Basis**
- **Field Storage Test & Evaluation Facility**

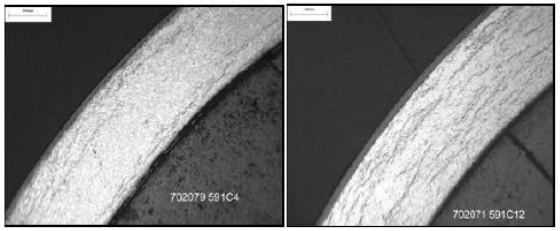
Storage and Transportation Work Packages

Some early results

- **R&D Opportunities: Initial Concerns About Long-term Storage Effects**

(areas identified from meetings with NRC, industry, national labs, and literature searches)

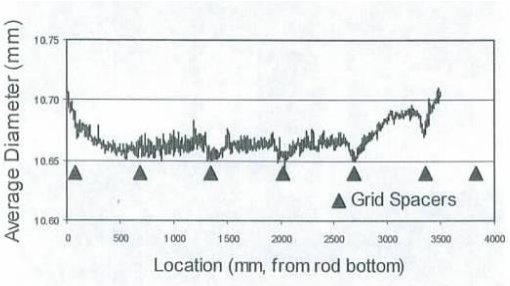
– Fuels
- *Hydride re-orientation*
- *Hydride embrittlement*
- *Delayed hydride cracking*
- *Creep*
- *Corrosion*



Hydride Orientation
In Fuel Clad Wall

EPRI Workshop on Very Long-term Used Fuel and HLW Storage
Washington DC, Nov. 18-19, 2009

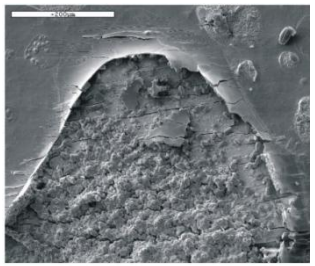
- Casks
  - *Seals*
  - *Bolted and welded closures*
  - *Neutron shields, absorbers*
  - *Concrete degradation*



Clad Profilometry after Storage

EPRI Workshop on Very Long-term Used Fuel and HLW Storage
Washington DC, Nov. 18-19, 2009

- Cask Systems
  - *Concrete degradation*
  - *Salt atmosphere (coastal environments)*



Metallic Seal Corrosion

D. Wolff, et al., PATRAM 2004

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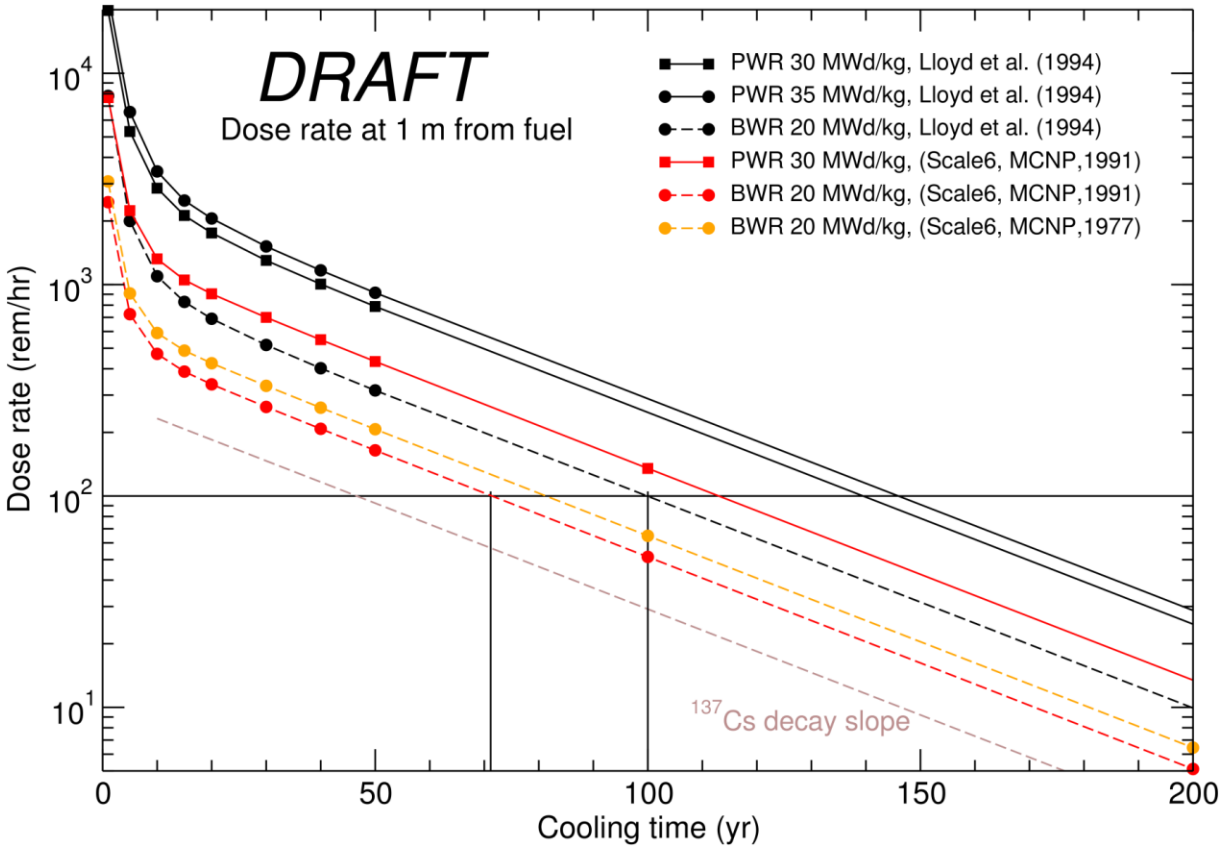
Storage and Transportation Work Packages

Some early results

- **Security – Over long storage periods, used fuel will fall below the "self-protection" standard**



Dose calculations by Richard Wittman, Brady Hanson, and Andy Casella, Pacific Northwest National Laboratory

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Storage and Transportation Work Packages

Some early results

- **Concept Evaluations – Preliminary framework for evaluating alternatives for acquiring identified R&D needs**

PRELIMINARY CRITERIA	*SELECTED ALTERNATIVES FOR A STORAGE TEST AND EVALUATION FACILITY*			
	Existing ISFSI	*Modified ISFSI*	*Facility at DOE Site*	*New Facility*
Siting and licensing				
Spectrum of fuels available				
Transportation requirements				
On-site testing capability				
Construction/operating cost				
Radiological controls				
Waste management				
Security				

FY11 Activity

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Collaborative Activities

DOE/NE

Program Direction, Management

DOE/RW, EM

Collaboration, experience from related programs

Nat'l Labs

ANL, PNNL, INL, LLNL, ORNL, SRNL, SNL

Technical support for the 4 Work Packages

Industry

EPRI, NEI, Utilities, Suppliers

EPRI Extended Fuel Storage Collaboration Program
(Nov 18-19, 2009 Wash DC; May 3, 2010 Baltimore)
NEI Dry Storage Information Forum
(May 4-6,2010 Baltimore)

International

BAM (Germany), CRIEPI (Japan), British Energy

Organizations interested in collaboration – link to EPRI program
IAEA Int'l Conference on Management of Spent Fuel from Power Reactors
(Vienna, May 31-June 4, 2010)
INMM Annual Meeting (Baltimore, July 11-15,2010)
Special session at PATRAM 2010 on Used Fuel Dry Storage (London, Oct. 3-8, 2010)
International High-Level Radioactive Waste Management Conference (Albuquerque, April 10-12, 2011)

Nuclear Regulatory Commission
Supports efforts on a collaborative basis

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Conclusions

- **Initial FY10 activities have established a solid base for addressing the technical issues associated with long term storage and transportation of spent fuel.**
  - Leveraging of past work
  - Good mix of organizations and people with the right background and experience
- **Engagement for FY11 is poised to move this effort forward in a deliberate and meaningful way.**
- **It is clear that the nuclear industry community is engaged and willing to collaborate across organizations and internationally to resolve these technical issues.**