



U.S. DEPARTMENT OF
ENERGY

Nuclear Energy

Overview of the DOE-NE Used Fuel Disposition (R&D) Program

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Research & Development**

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UFD Mission

The MISSION of the Used Fuel Disposition Campaign is to identify alternatives and conduct scientific research and technology development to enable storage, transportation and disposal of used nuclear fuel and wastes generated by existing and future nuclear fuel cycles.

UFD Campaign 2009-Present

HISTORY OF THE CAMPAIGN

- FY09 Planning meeting at Argonne National Laboratory, June 2009
- FY10 R&D funding at \$7.1 M
 - Disposal R&D, modest level of effort on Storage R&D, no Transportation R&D
- FY11 R&D funding at \$23.8 M
 - Nine national laboratories participating in UFD
 - Significant R&D program in Storage, including Transportation
 - Disposal R&D not site specific
- FY12 R&D funding at \$24.5 M
 - Uncertainties remain regarding national policy, Yucca Mountain litigation, and budget

Used Fuel Disposition FY11 Campaign Structure

Used Fuel Disposition (1.5.08) (Peter Swift)

- Campaign Management and Integration (1.5.08.01) (Mark Nutt)
- External Interactions and International (1.5.08.02) (Mark Nutt)
- Disposal Research (1.5.08.03) (Kevin McMahon)
- Storage and Transportation Research (1.5.08.04) (Ken Sorenson)

UFD Work Packages: CAMPAIGN
TOTALS

Control Account	ANL	LANL	LLNL	SNL	PNNL	LBNL	INL	SRNL	ORNL	TOTAL
Campaign Management	628	0	0	784	0	0	0	0	0	1412
External & International	256	50	50	266	50	50	50	50	50	872
Storage & Transportation	911	0	235	2219	1218	0	935	800	721	7039
Disposal	2647	2476	1345	4747	425	1702	213	807	200	14562
TOTAL	4442	2526	1630	8016	1693	1752	1198	1657	971	23885

Used Fuel Disposition (1.02.08) managed through seventeen control accounts in three management groups (Peter Swift – NTD, Mark Nutt – Deputy NTD):

Cross-Cutting Control Accounts (Mark Nutt)

1. Campaign Management (1.02.08.01)
2. International (1.02.08.11)
3. Perspectives on NW Management (1.02.08.14)
4. UFD Science Competition (1.02.08.17)

Storage and Transportation Control Accounts (Ken Sorenson)

5. T&E Capability Development (1.02.08.02)
6. R&D Investigation (1.02.08.03)
7. Engineered materials – Experimental (1.02.08.05)
8. Engineering Analysis (1.02.08.10)
9. Transportation (1.02.08.13)
10. Security (1.02.08.15)

Used Fuel Disposition FY12 Campaign Structure (cont.)

Used Fuel Disposition (1.02.08)

Disposal Research Control Accounts (Kevin McMahon)

11. Thermal Load Management & Design Concepts (1.02.08.04)
12. Generic EBS Evaluation (1.02.08.06)
13. Generic Natural Systems Evaluation (1.02.08.07)
14. Generic Disposal System-Level Modeling (1.02.08.08)
15. Inventory (1.02.08.09)
16. LLW Disposition (1.02.08.12)
17. FEPS (1.02.08.16)

CONTROL ACCOUNT	ANL	INL	LANL	LBNL	LLNL	ORNL	PNNL	SNL	SRNL	TOTAL
Cross-Cut	1445	0	100	120	150	100	0	1650	100	3665
Storage and Transportation	950	1075	550	0	300	1465	1390	2480	840	9050
Disposal	833	145	2108	1775	1180	425	400	4073	801	11740
TOTAL	3228	1220	2758	1895	1630	1990	1790	8203	1741	24455

UFD Major Accomplishments to Date

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■ Disposal R&D

- Compilation of reference inventories of used fuel, high-level waste, and low level waste, with volumes, activities, and thermal output for existing and projected fuel cycle alternatives
- Development of a generic list of features, events, and processes potentially relevant to disposal
- Identification of subset of disposal concepts for primary R&D focus
- Development of a Disposal R&D roadmap
- Initiation of R&D on multiple fronts in natural and engineered barrier systems
- Preliminary generic models for disposal system performance in clay, granitic rocks, salt, and deep boreholes

■ Storage and Transportation

- Identification and documentation of R&D needs and opportunities
- Review of storage concepts and options for a test and evaluation facility
- Level 2 deliverable on track for completion September 22, 2011
- Identification of security issues associated with long term storage
- Integration into industry, regulatory, and international efforts

Planned FY12 Major Milestones

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■ CROSS-CUTTING

- Update of the campaign implementation plan
- Waste management integration - interfaces between extended storage and permanent disposal
- Analysis of public and state preferences related to siting, characterization, and operation of radioactive waste management facilities for storage and disposal

■ DISPOSAL

- Thermomechanical properties and model: hot granular salt consolidation
- Evaluation of generic EBS design concepts and process models : implications to EBS design optimization
- Fluid flow model development for fractured or low permeability formations
- Modeling coupled processes in the near field of a clay repository
- Generic Disposal System Model: architecture, implementation, and demonstration

■ STORAGE

- Implementation plan for fielding an operational Test and Validation Complex
- High and medium technical gap priorities report
- Aging management plans for existing dry cask storage designs report
- Proposed strategy to address self-protection/material attractiveness
- Begin clad testing at ORNL HFIR and ring compression tests at ANL

■ TRANSPORTATION

- Criticality analysis and mitigations for degraded UNF in storage canisters
- Compilation of transportation issues and resolutions

UFD Long-term Goals

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■ By 2015

- Develop the licensing basis for extended storage systems for existing LWR fuels
- Develop a plan for a test and evaluation facility for high burnup and advanced fuels
- Develop the licensing basis for transport of high burnup fuels
- Develop the licensing basis for transport of dual purpose casks after storage
- Develop advanced computational models for damage and dispersal events during storage and transportation
- Develop a framework of advanced computational models for disposal system performance
- Conduct experiments to fill data needs and confirm advanced modeling approaches
- Develop a database catalog of potential disposal systems that could be used.

■ By 2020

- Construction of a test and evaluation facility for high burnup and advanced fuels
- Development of a plan to field a commercial-scale long-term interim storage facility for high burnup and advanced fuels
- Robust modeling and experimental basis for evaluation of multiple disposal system options.

Overview of UFD Presentations

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■ DISPOSAL

- Options - Peter Swift
- R&D roadmap – Mark Nutt
- Modeling – Scott Painter & Jens Birkholzer

■ STORAGE AND TRANSPORTATION

- Storage Data Gaps – Brady Hanson
- Transportation R&D – Paul McConnell
- Engineering Analyses – John Wagner