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Office of Used Fuel Disposition Activities FY 2012 and FY 2013

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FCT Emphasize an Integrated Nuclear Energy System

Front End

Uranium Resources

- Conventional production
- Innovative approaches
  - U Seawater

Fuel Fabrication

- Safety enhanced LWR fuel
  - Accident tolerance
- Higher performance
  - Improved burnup

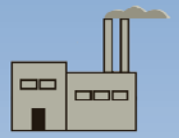
Reactors

Interim Storage

- Evaluating extended time frames
- Transport after storage

UFD

Back End



Recycle

- Separations
- Recycled fuel
- Secondary waste treatment

Disposal

- Alternative geologies
- Alternative waste forms

UFD

Optimize through systems analysis, engineering, and Integration

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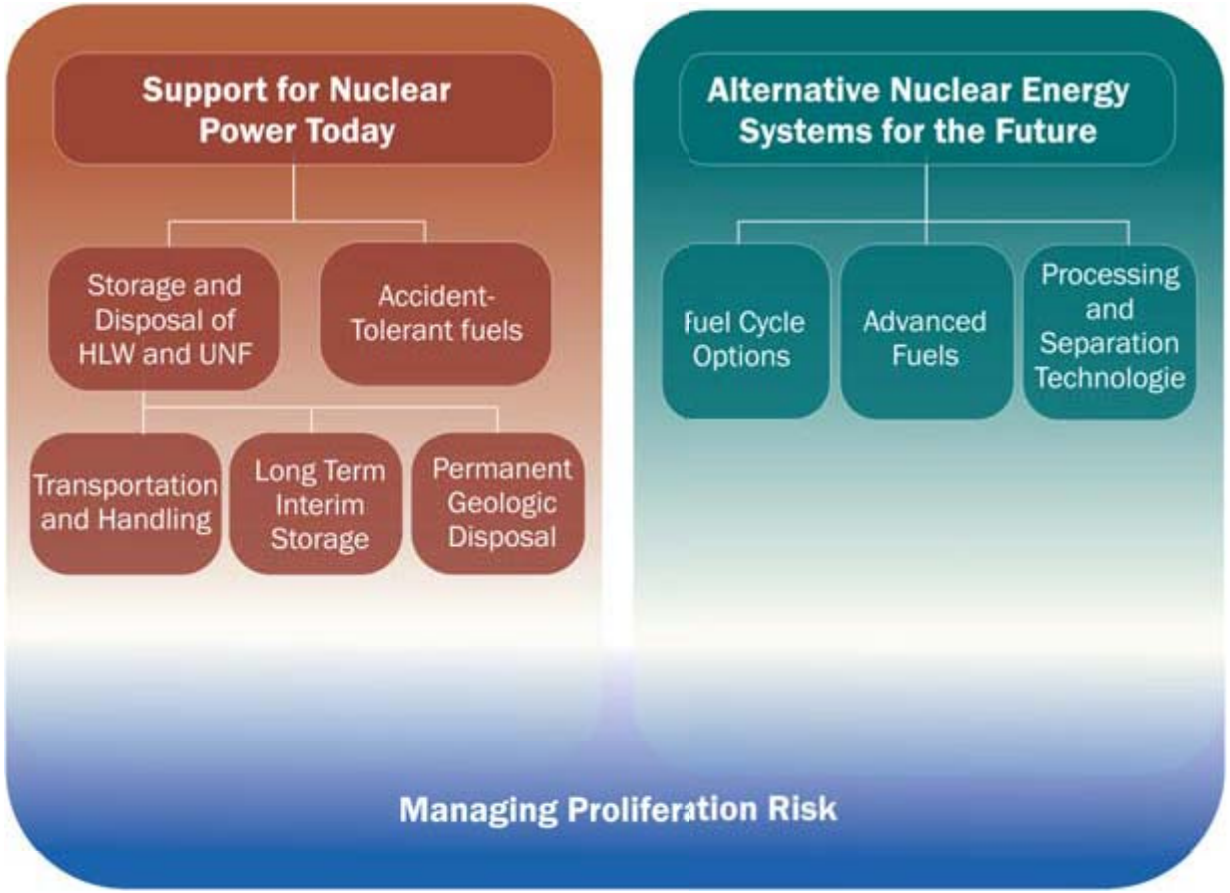
Fuel Cycle Technologies (FCT) Balances Near-Term and Long-Term Objectives



- **Satisfy increasing demand for near-term action on used nuclear fuel storage (transportation) and disposal.**
- **Maintain the momentum for long-term R&D activities with the potential for game-changing improvements.**

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FCT FY13 Budget Request

FCT Mission

- **Develop used nuclear fuel management strategies and technologies**
- **Develop sustainable fuel cycle technologies and options.**

Budget Summary
$ in thousands

Program Element	FY 2012 Enacted	FY 2013 Request
Separations and Waste Forms	32,224	38,778
Advanced Fuels	58,656	40,378
Systems Analysis & Integration	17,029	22,882
Materials Protection, Accounting & Control Technology	5,152	7,353
Used Nuclear Fuel Disposition	**59,650**	**59,968**
Fuel Resources	3,607	6,679
Used Nuclear Fuel Storage	9,942	-
Total:	**186,260**	**176,038**

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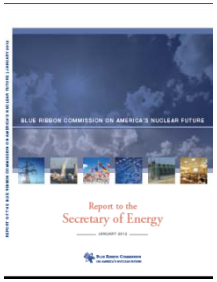
BRC Assessment of Current DOE-NE UFD Program

(Section 7.8 Near-Term Steps)



Confirms the importance for:

"DOE to keep the program moving forward through non-site specific activities, including R&D on geological media and work to design improved engineered barriers"

Recommends the continuation of activities currently conducted under the DOE-NE Used Nuclear Fuel Disposition Campaign

"Identify alternatives"

"R&D on transportation, storage, and disposal options for SNF from existing and future fuel cycles"

"Other non-site specific generic activities, such as support for and coordination with states and regional state government groups on transportation planning"

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Department of Energy Strategy
-- Work in Progress --

The Department acknowledges that: ***"the specifics of a new strategy for managing our nation's used nuclear fuel will need to be addressed in partnership with Congress".***

The Department ***"will work in parallel to begin implementing the new strategy"*** **by taking sensible steps toward the implementation of near-term recommendations.**

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Used Fuel Disposition (UFD) Key Objectives

- Address BRC near term recommendations
- Develop technical and scientific basis for extended used nuclear fuel storage
- Partner with industry to develop and demonstrate integrated solutions for storage of used nuclear fuel
- Prepare for large-scale transport of spent nuclear fuel, emphasis on decommission sites
- Develop the scientific basis for multiple disposal options for used nuclear fuel and high-level waste

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Used Fuel Disposition Key Activities

"Extended"
- **Develop technical & scientific basis**
- **Lay ground work to develop consolidated storage facility (CSF)**

- **R&D to support transport of high-burn up fuel for CSF**
- **Prepare for first shipment of fuel**

- **Evaluate Engineered and Natural Barrier Systems**
- **Develop Generic Disposal System-Level Model**

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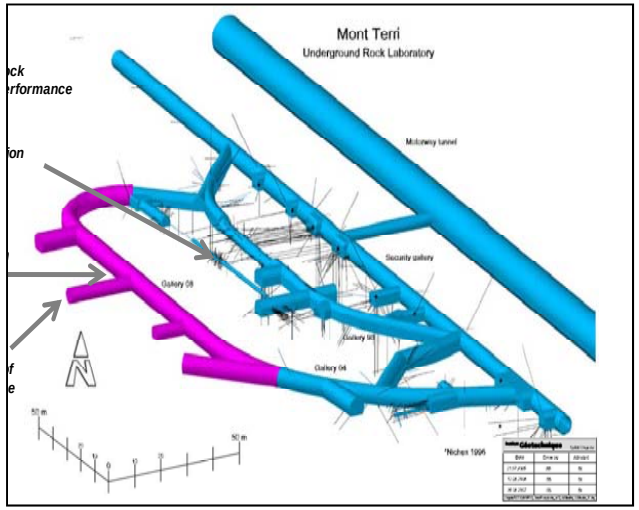
Strategic Activities: International Collaborations

Primary goal for FY12 Disposal - Establish formal collaborative R&D arrangements with three ongoing European programs

1. **Mont Terri: International underground research laboratory (URL) in clay in Switzerland - joining the URL will give DOE access to data and opportunity to conduct new experiments**
2. **Colloid Formation and Migration Project - Grimsel granite URL in Switzerland**
3. **DECOVALEX: (Development of Coupled Models and their Validation against Experiments) – international research organization focusing on mathematical modeling in geological systems (coupled thermo-hydro-mechanical - chemical processes)**

Mont Terri



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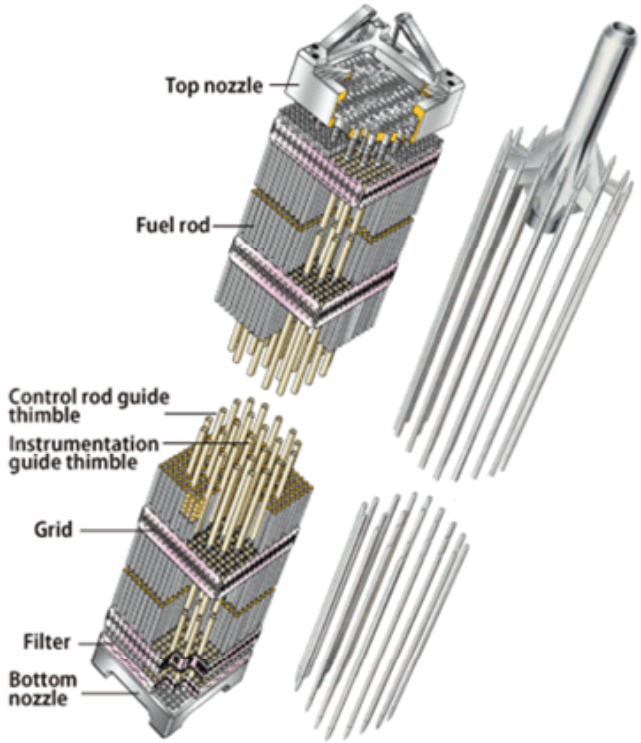
Strategic Activities: University R&D - Innovative Concepts in Storage and Disposal

- **Integrated Research Projects:**
  - **In FY 2012** awarded $4.5 M to understand the behavior of high burn up fuel during storage
  - **In Process -** focuses on degradation of SNF canisters and a more efficient packaging system
- **Individual Research Projects:**
  - **In FY 2011** awarded $3 M to four three year projects; three in storage and one in disposal
  - **In FY 2012** awarded $6.5 M to eight three year projects; five in storage and three in disposal



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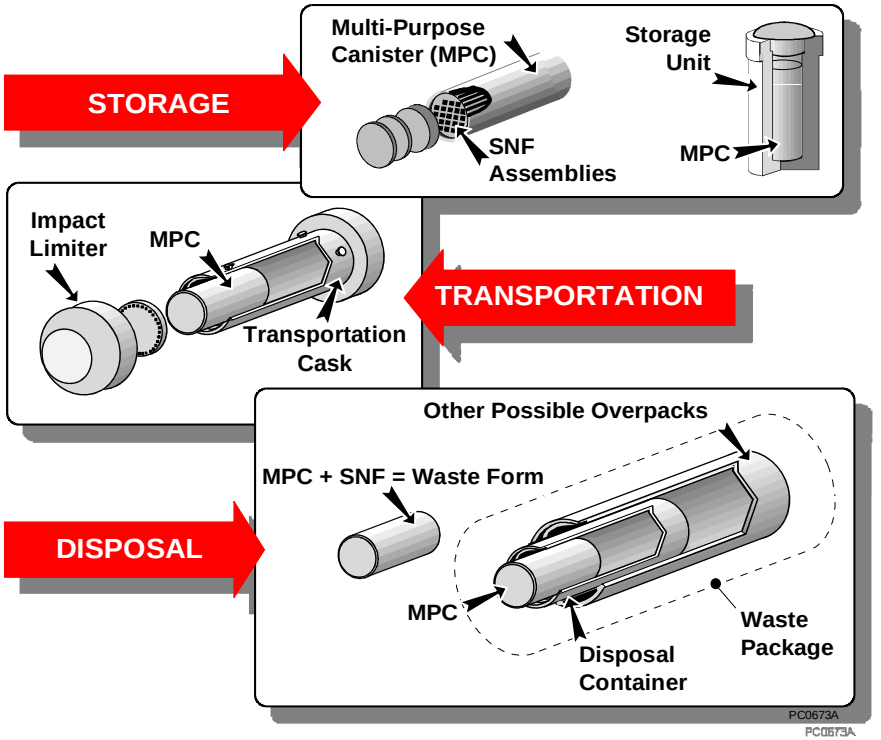
Strategic Activities: System Architecture

- **Update Transportation & Storage System Model – with current data**
- **Initiated work on standardized cask systems**



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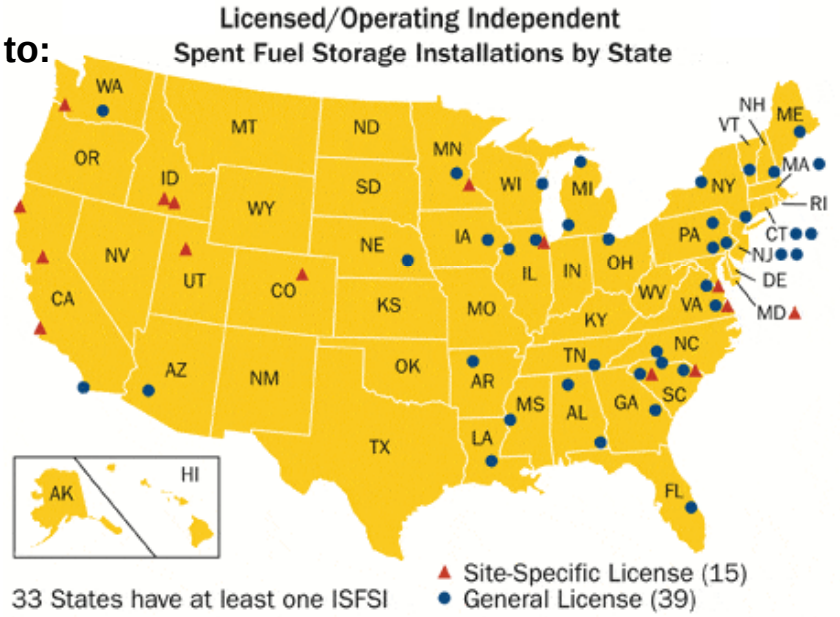
Strategic Activities: Accomplishments and Future Actions

Accomplishments

- Implementation Plan for the development and licensing of standardized transportation, aging, and disposal canisters and the feasibility of direct disposal of dual purpose canisters
- Provided technical support for on-going DOE strategy responding to BRC recommendations

Continuing & Future Activities:

- Continue to provide technical support related to:
  - Development and Implementation of Strategy Addressing BRC recommendations
  - Planning for consent-based siting efforts
  - Addressing National Environmental Policy Act (NEPA) requirements
- Continue System Architecture Evaluations (e.g. develop costs for various operating scenarios)



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Storage Activities

- **Develop the Technical and Scientific Bases:**
  - **Demonstrate used fuel integrity for <u>extended storage periods and retrievability</u>**
  - **Supporting R&D**
    - **Continue material testing to support modeling and simulation of used fuel and canister degradation;**
    - **Complete the identification and prioritization of data gaps to support license amendments beyond 40 years for dry storage;**
    - **Define facilities needed to conduct the required additional testing of irradiated nuclear fuel. Data with respect to high burn-up fuel is particularly needed.**
- **Initiate Planning for Consolidated Fuel Storage.**
  - **Building on previous DOE work and industry storage licensing efforts, evaluation of design concepts for consolidated storage**

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Storage: Accomplishments and Future Actions

- **Accomplishments**
  - **UNF Storage and Transportation Research, Development, and Demonstration Plan**
  - **UNF Storage and Transportation Data Gap Prioritization**
  - **Final sampling of Alloy 22 immersion experiments**
  - **Complete phase 1 of the cladding ring compression tests**
  - **Clad testing begin at HFIR**
  - **Industry and NRC collaboration through the EPRI/ESCP (Extended Storage Collaboration Program)**

- **Continuing & Future Activities:**
  - **Initiate testing of pins and spent fuel assemblies**
  - **Conduct full scale demonstration program**
  - **Provide technical support for**
    - **Design of consolidated storage facility**
    - **Develop materials to communicate with volunteers and stakeholders**

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Transportation Activities

- **Develop the technical basis for transportation of high burn-up fuel following extended storage**
- **Support planning for eventual large-scale transport of used nuclear fuel and high-level waste to consolidated storage and disposal facilities**
- **Focus initially on shut down reactor sites**

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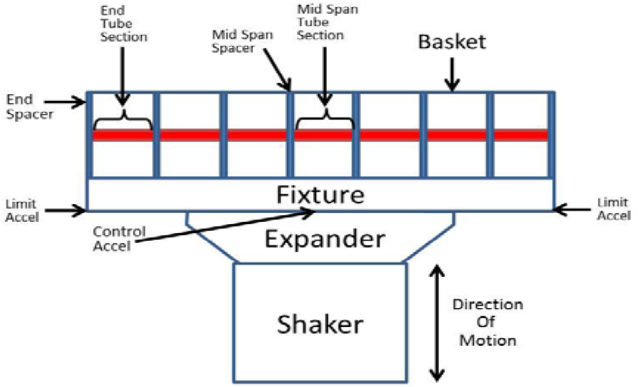
Transportation: Accomplishments and Future Actions

Accomplishments

- Completed identification of transportation key data gaps

Continuing & Future Activities:

- Begin conducting evaluations of transportation from the decommissioned sites
- Continue analyses and testing to support transport of high burn-up used fuel
- Continue data analysis to support planning for transport of fuel
- Re-engage the regional transportation groups to understand stakeholder issues
- Finalize the policy and procedures for providing technical assistance and funds to States and tribes for training local public safety officials



Vibration test frame concept: SNL

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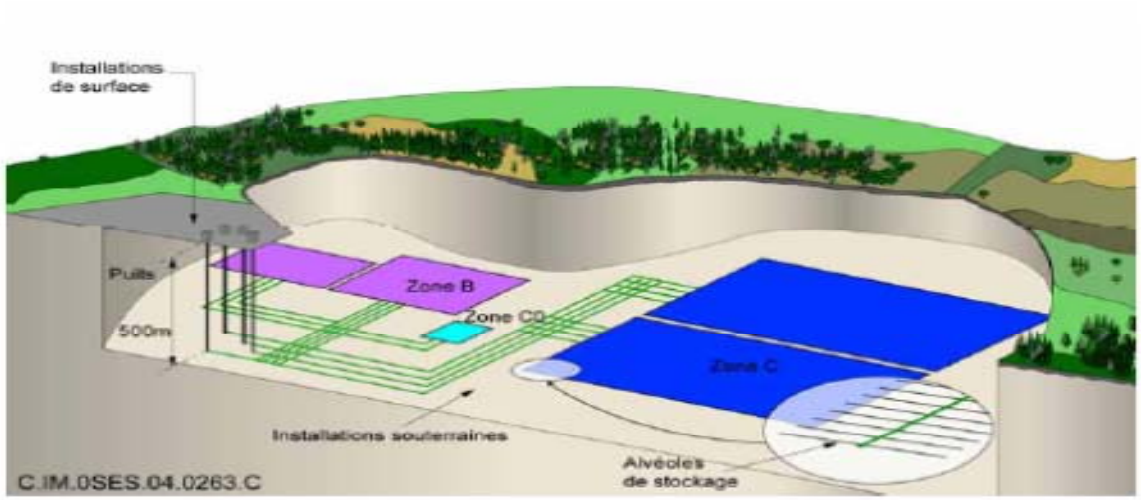
Disposal Activities

- Provide a sound technical basis for multiple viable disposal options
- Identify and research the generic sources of uncertainty that will challenge the viability of disposal concepts
- Increase confidence in the robustness of generic disposal concepts to reduce the impact of unavoidable site-specific complexity
- Develop a near term plan for taking the borehole disposal concept to the point of a licensed demonstration (BRC near-term action)



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Disposal: Accomplishments and Future Actions

Accomplishments

- Disposal R&D Roadmap completed
- Completed salt R&D study plan
- Expanded work with our international partners for disposal in granite and clay rocks.
- Initiated work with industry to develop an RD&D plan and roadmap for the borehole disposal

Continuing & Future Activities:

- Generic Safety Case for Geologic Disposal of Nuclear Waste
- Evaluation of Generic Engineered Barrier System (EBS) Design Concepts
- Modeling of coupled processes in clay near field environment
- Integration of EBS models with Generic Disposal System Models
- Coupled Thermal-Hydrological-Mechanical Processes in Salt
- Update to Thermal Load Management Analyses

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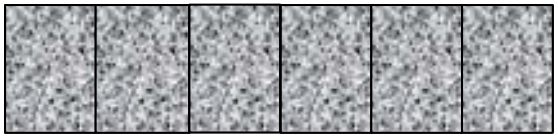
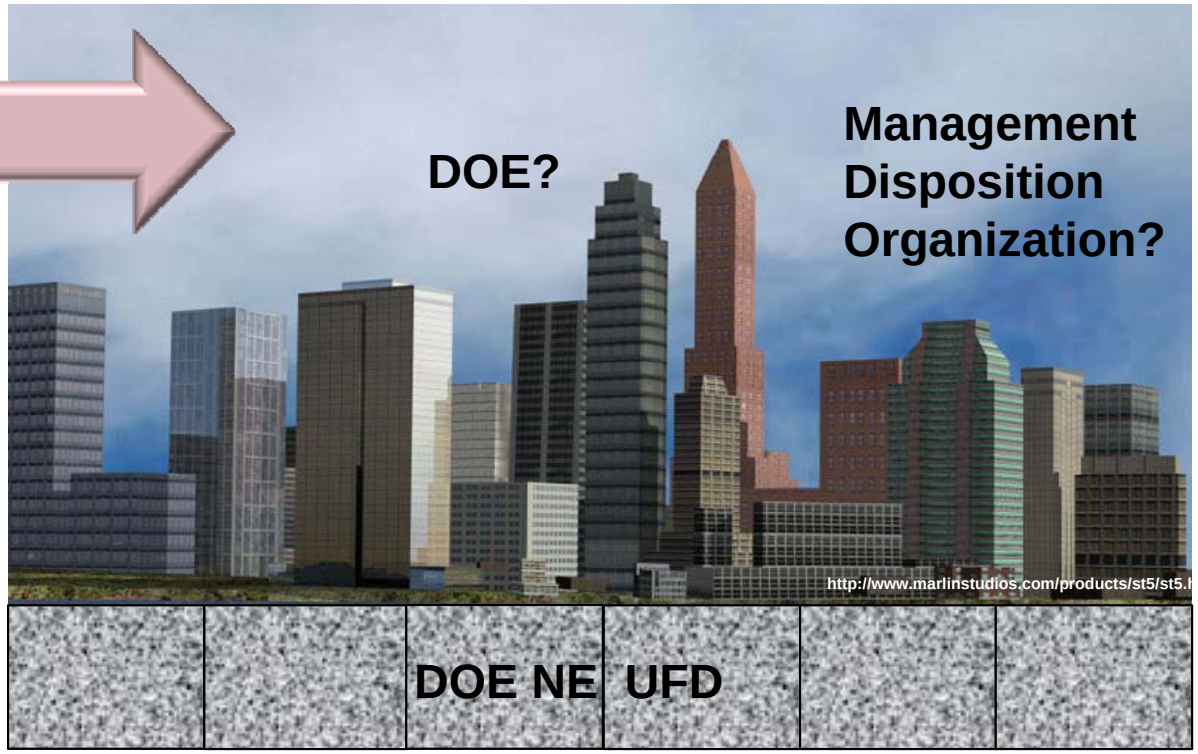
Building the Foundation to Support the Potential New Waste Management Organization

DOE- NE
UFD Campaign





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QUESTIONS ?

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Congressional Marks: FY 2013

House Report 112-462 (accompanying H.R. 5325, 5/2/12)

- No funding to support BRC recommendations
- Prohibits using funds to close Yucca Mountain
- Includes additional $25 M in Nuclear Waste Disposal to continue YM activities.

Senate Report 112-164, accompanying S. 2465, 4/26/12

- Strongly supports the BRC recommendations
- Provides statutory authority and funding for consolidated interim storage
- Directs implementation for consolidated interim storage