Spent Fuel and Waste Disposition

William Boyle
Director, Office of Spent Fuel & Waste Science and Technology
Office of Nuclear Energy

INMM 32nd Spent Fuel Management Seminar
In Partnership with the US NIC
Washington, DC
January 10, 2017
Deputy Assistant Secretary for Spent Fuel and Waste Disposition, NE-8

DAS for Spent Fuel and Waste Disposition
Andrew Griffith, Deputy Assistant Secretary
Evangeline Chase, Secretary

NE-81
Office of Spent Fuel & Waste Science and Technology
William Boyle, Director

Disposal R&D Team
- Tim Guenter, Team Leader
- J. DeLaGarza, General Engineer
- J. Monroe-Rammsy, General Engineer
- W. Specialetti, General Engineer
- P. Stucker, General Engineer
- J. Price, General Engineer

Storage and Transportation R&D Team
- Ned Larson, Team Leader
- R. Clark, General Engineer
- P. Nair, General Engineer
- M. Tynan, Physical Scientist
- S. Stockinger, General Engineer
- J. Orchard, General Engineer
- C. Macaluso, Physical Scientist

NE-82
Office of Integrated Waste Management
Vacant, Director
M. Bates, General Engineer
J. Wheeler, General Engineer
P. Schwab, General Engineer
M. Reim, Physical Scientist
E. Bickford, Physical Scientist
S. Reeves, General Engineer

NE-83
Office of Program Operations
Kelli Markham, Director
Jay Jones, Physical Scientist
Kim Petry, Physical Scientist
G. Bisconti, Senior Advisor

\( ^{1} \) - Detailed from within NE
Jac Goodman, Sr Advisor—detailed to NNSA
FY17 Funding

<table>
<thead>
<tr>
<th>Subprogram</th>
<th>FY 2016 Enacted</th>
<th>FY 2017 Request</th>
<th>House Mark*</th>
<th>Senate Mark</th>
<th>Continuing Resolution</th>
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<tr>
<td>Used Nuclear Fuel Disp. R&amp;D</td>
<td>62,500</td>
<td>74,338</td>
<td>61,128</td>
<td>57,867</td>
<td>62,500</td>
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<tr>
<td>Int. Waste Mgmt. System (IWMS)</td>
<td>22,500</td>
<td>76,300</td>
<td>0</td>
<td>61,040</td>
<td>22,500</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>85,000</strong></td>
<td><strong>150,638</strong></td>
<td><strong>61,128</strong></td>
<td><strong>118,907</strong></td>
<td><strong>85,000</strong></td>
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* House mark designated $150 million for resumption of YM licensing work
Current Activities Supporting An Integrated System

- Laying the Groundwork for Transportation
- Laying the Groundwork for Consolidated Interim Storage
- High-Burnup Cask Demonstration with Industry
- Disposal R&D (Long Term)
- Deep Borehole Concept
- Evaluating a Separate Defense Repository
- Developing a Consent-Based Siting Process for Waste Facilities in the U.S.
Spent Nuclear Fuel and High-Level Waste in the US

Current Commercial
~75,000 metric tons of heavy metal

Future Commercial
~140,000 metric tons heavy metal**

Defense Waste
~32,000 m³

**Source: Carter, J. and Dennis Vineen, “Nuclear Fuels Storage and Transportation Planning Project Inventory Basis” (2014).
Integrated Waste Management System

Integrated Waste Management System

Commercial Nuclear Power Plants

Shutdown Reactor Sites

Consolidated Interim Storage Facilities

Pilot Interim Storage Facilities

Geologic Repositories

Parallel Path

Defense Nuclear Materials Production Sites

Transport by rail, road, or barge

Transport by rail or road
Laying the Groundwork for Transportation

• DOE is developing a railcar to comply with the Association of American Railroads Standard S-2043
• Visiting shutdown sites to evaluate transportation infrastructure and logistics
• Developing a routing tool – Stakeholder Transportation and Routing Tool (START)
• Commissioning industry analyses on removing fuel from sites
• Evaluating SNF canister transportability
• DOE’s National Transportation Stakeholders Forum
  • Ad Hoc Working Groups – Exploring options for:
    • Route selection criteria and safety inspections
    • Training program for public safety officials (Section 180(c))
    • Information and communications
• Cooperative Agreements with Tribes and States
Laying the Groundwork for Consolidated Interim Storage

- Evaluating interim storage design concepts, with input from industry contractors
  - Generic Design Alternatives for Dry Storage of Used Nuclear Fuel (CB&I)
- Preparing to develop a generic pilot Interim Storage Facility (ISF) design and Topical Safety Analysis Report
  - Procurement underway
- Private Initiatives in Spent Fuel Storage
  - Request for Information on how to best engage
- Continuing efforts related to Aging Management at an ISF
  - Participation in Electric Power Research Institute (EPRI) Extended Storage Collaboration Program (ESCP)
  - ASME code case: Examination Requirements and Acceptance Standards for Spent Fuel Storage and Transportation Canisters
High-Burnup Cask Demonstration with Industry

- Loading a commercial storage cask with high-burnup fuel in a utility storage pool
  - Well understood fuel
  - Cask outfitted with additional instrumentation
- Drying of the cask contents using typical process
- Cask housed at the utility’s dry cask storage site
  - Continuously monitored and externally inspected until the first internal inspection at 10 years
- A second cask could be loaded ~5 years following the first with a focus on additional scientific data on fuel behavior
Disposal R&D (Long Term)

- Provide a sound technical basis for multiple viable disposal options in the US
- Increase confidence in the robustness of generic disposal concepts
- Develop the science and engineering tools needed to support disposal concept implementation
- Leverage international collaborations
Deep Borehole Concept

- Disposal concept consists of drilling a borehole or array of boreholes into crystalline basement rock to about 5,000 m depth (~3 miles)
- Approximately 400 waste canisters would be emplaced in the lower 2,000 m of the borehole
- Upper borehole would be sealed with compacted bentonite clay and cement plugs
- Several factors suggest the disposal concept is viable and safe:
  - Crystalline basement rocks are common in many stable continental regions
  - Existing drilling technology permits dependable construction at acceptable cost
  - Low permeability and long residence time of high-salinity groundwater in deep continental crystalline basement at many locations suggests very limited interaction with shallow fresh groundwater resources
Evaluating a Separate Defense Repository

- Evaluating the option of establishing a separate repository for defense high level radioactive waste would:
  - Make progress toward meeting Federal commitments and cleanup from the Cold War legacy
  - Support national security objectives
  - Benefit from simpler design and implementation, leading to a faster and less expensive facility
  - Isolate the waste materials safely and permanently
  - Inform the design, siting, licensing, and successful development of a repository for commercial spent nuclear fuel through lessons learned

![Waste Origin Diagram]

- Volume (m³)
  - Savannah River HLW glass, existing through macrobatch 8
  - Savannah River tank HLW, projected glass, macrobatch 9 and up
  - Hanford tank waste, projected glass
  - Calcine waste, projected after hot isostatic pressing with additives
  - Sodium-bearing waste at INL, projected after treatment by FBSR
  - Cs-Sr capsules at Hanford - untreated
  - Federal Republic of Germany glass at Hanford, existing
  - Naval SNF
  - DOE-Managed Production/Research SNF (approximate)
Steps in Consent-Based Siting

- Learning from past U.S. and global experience; receiving input from broad range of stakeholders and the public; developing a durable process for the future
  - Phased and adaptive
  - Building relationships/partnerships based on a common understanding of the risks and benefits

Ensure Safe and Secure Operations

Earn Trust Among Stakeholders

Adapt Operations Based on Lessons Learned
Questions?