Presentation to the
Nuclear Waste Technical Review Board
Panel on the Engineered Barrier System

Waste Acceptance Requirements/
DOE Interface

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Purpose

- To provide a brief overview of the Civilian Radioactive Waste Management System
- To identify key regulatory requirements affecting waste forms
- To describe OCRWM Waste Acceptance System Requirements
- To provide an overview of the interface between the Office of Civilian Radioactive Waste Management (RW) and Environmental Management (EM)
OCRWM Program Overview

Yucca Mountain Site Characterization
• Technical Site Suitability determination in 1998
• Initial License Application submittal in 2001
• Begin repository operations in 2010

Waste Acceptance Storage and Transportation
• Deployment of MultiPurpose Canisters to utilities in 1998
• No Monitored Retrievable Storage facility in planning basis

Second Repository Investigations
• No activities being conducted on second repository
• DOE required to report to Congress on need after 2007
Statutory and Regulatory Authority

- Nuclear Waste Policy Act, as amended
  - Statute defines for development of geologic repositories
  - May include other wastes as determined by the Nuclear Regulatory Commission that require permanent isolation
  - Allows DOE to characterize only Yucca Mountain for suitability
  - Limits waste to be placed in first repository to 70,000 MTHM
  - Requires evaluation on need for second repository by 2007

- Disposal of HLW in Geologic Repositories (10 CFR 60)
  - Defines licensing requirements, site criteria, QA requirements
  - Prescribes waste package performance and design criteria
  - Establishes Engineered Barrier System performance objective
  - Provides repository design requirements

- Environmental Radiation Protection Standard* (40 CFR 191)
  - Establishes allowable releases to accessible environment

* Standard remanded in 1987
Key Waste Form Considerations

- **Waste Form Requirements**
  - Waste form must meet criteria defined in 10 CFR 60.135
    - Solidification/Consolidation/Noncombustible
  - Waste form must remain subcritical for long timeframes
  - Plan to exclude RCRA mixed wastes from first repository

- **Waste Package Design**
  - Specific package design criteria must be met
    - No explosive/pyrophoric/chemically reactive materials
    - No free liquids
    - Handling
    - Unique Identification
  - Waste interactions must be evaluated
    - Solubility/redox/hydriding/radiolysis/corrosion/...
Waste Form Performance Allocation

• Waste Form is key physical interface
  – Characteristics help define design of waste, transportation, and repository surface/subsurface facilities and equipment

• Waste Form Performance Allocation as part of EBS and Total System Performance Objectives
  – Substantially complete containment of Waste Packages
    – Not less than 300 years nor more than 1,000 years
  – Release rate after the containment period
    – Can not exceed one part in 100,000 per year of the radionuclide inventory present at 1,000 years after closure
  – Remanded standard sets allowable radionuclide releases to accessible environment for each radionuclide for 10,000 years

• Long-term criticality control must be maintained
OCRWM Requirements in Waste Acceptance System Requirements Document

- Interface/Contractual Requirements
  - Interface Requirements
  - Contractual Requirements
  - Documentation Requirements
  - Training Requirements
  - QA Requirements

- Spent Nuclear Fuel Requirements
  - Waste form Criteria
    - Commercial SNF
    - DOE SNF Specifications (Future Development)

- High-Level Waste Requirements
  - Waste form Criteria
    - Canistered BSi HLW Glass
    - Other Waste Forms (Future Development)
CRWMS Waste Forms

• Waste management system currently planning to dispose of commercial SNF and canistered HLW glass in the first repository
  - Significant data exists for these waste forms

• Evaluating applicability of other waste forms for potential disposal in a geologic repository
  - DOE spent fuel (production reactor SNF, research reactor SNF, naval reactor SNF, etc)
  - surplus weapons materials
  - plutonium residues
  - greater-than-class-C waste
Commercial & DOE SNF Fuel Allocation Comparison

<table>
<thead>
<tr>
<th>Commercial SNF (Projected-2030)</th>
<th>DOE (Defense) SNF (Projected-2030)</th>
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<tbody>
<tr>
<td>85,700 MTHM</td>
<td>2,750 MTHM</td>
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First Repository Planning
(Total Allocation: 70,000 MTU)
(Commercial SNF: 63,000 MTU)
(Defense SNF/HLW: 7,000 MTU)

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Disposition of DOE Spent Nuclear

- **Proposed ultimate disposition strategy**
  - Provide safe, interim storage and management of SNF at specified locations until ultimate disposition
  - All DOE-owned SNF will be stabilized, characterized, and prepared for repository disposal

- **Reassessment of defense waste allocation**
  - Some or all DOE-owned SNF in first repository
  - Quantity of SNF/HLW will not exceed 10% of capacity

- **Considerations for Acceptance**
  - Payment of Fees
  - Compliance with repository waste acceptance criteria
  - Appropriate NEPA review
  - Minimize impact on CRWMS schedule
Qualification of Waste Forms

- **Characterization**
  - Physical, Chemical, Radiological Properties
  - Characterization Testing

- **Performance Assessment**
  - Waste Form Performance under Repository Conditions
  - EBS and Total System Performance
  - Criticality Calculations
  - Validation Testing

- **Design**
  - Engineered Barrier System Design
  - Surface and Subsurface Facility Design

- **NEPA/Environmental Assessment**

- **Licensing/Safety Analysis Report**

- **Quality Assurance**
Evaluating DOE SNF Disposition

• Evaluate DOE SNF for repository disposal
  – Identify key issues affecting the ability to accept, transport, and dispose of DOE SNF
    – Technical, Regulatory, and Programmatic
  – Recommend data needs and activities to allow integration of DOE SNF into CRWMS

• Provide early guidance to EM on acceptability of waste forms for disposal
  – Direct disposal
  – Conditioning or treatment
  – Processing
DOE-Owned Spent Nuclear Fuel Steering Group

• Coordination among Programs facilitated by DOE SNF Steering Group
  - Established July 29, 1994
  - Jointly authorized by Director, Office Of Civilian Radioactive Waste Management (RW) and Assistant Secretary For Environmental Management (EM)

• Responsible for:
  - Identifying issues regarding waste acceptance through emplacement of DOE SNF in a geological repository
  - Recommending tasks and activities for resolution of DOE SNF disposal issues
DOE-Owned Spent Nuclear Fuel Steering Group (continued)

- DOE SNF Steering Group Organization
  - RW
  - EM
  - Chairs and Members
  - Task Teams

- Task Team Organization
  - Program Team
  - Waste Acceptance and Transportation Team
  - Repository Team
Key Issues by Task Team

- Program Task Team
  - Physical Characteristics and Quantity
  - Physical Integrity
  - RCRA Determination
  - NEPA Coordination
  - CRWMS Schedule Impact and Consequences
  - Quality Assurance
  - Future Materials for Repository Disposal
Key Issues by Task Team

- Waste Acceptance and Transportation Team
  - Interagency Agreement / Fees
  - Safeguards and Accounting
  - Management of Classified Information
  - MTHM Equivalence
  - Transportation Design and Operations
  - Canisterization and Standardization
Key Issues by Task Team

• Repository Team
  – Waste Form Constraints
  – Waste Characteristics for Performance Assessment
  – Waste Package and Equipment Design Considerations
  – Corrosion Product Control
  – Radiation Shielding
  – Decay Heat Removal
  – Material Incompatibilities
  – Long-term Criticality Control
Summary

EM-RW have established a close working relationship to develop, control, and resolve waste acceptance requirements and issues.