DOE Spent Nuclear Fuel Program

"Charting a course for ultimate disposition of DOE-owned Spent Nuclear Fuel"

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

June 6, 1995

Brian Edgerton, Office of Spent Fuel Management
DOE Spent Nuclear Fuel Program

Established in 1993

Program Objectives:

- Provide DOE-wide SNF policy development
- Undertake SNF strategic planning
- Coordinate cross-cutting DOE department-wide SNF issues
- Provide oversight and program integration
- Chart a management course of action for ultimate disposition of all DOE SNF
DOE Spent Nuclear Fuel Program

Mission

The mission of the DOE SNF Program is to safely, reliably, and efficiently manage DOE-owned SNF and to prepare it for permanent disposal.
Core Functions for National SNF Management Program
(Systems Approach)

Manage SNF

Assure Existing Conditions
- Inventory & Characterize
- Resolve Vulnerabilities
- Store SNF
- Transfer SNF
- Release Facilities

Achieve Interim Storage
- Inventory & Characterize
- Stabilize SNF
- Interim Store SNF
- Transfer SNF
- Release Facilities

Prepare for Final Disposition
- Inventory & Characterize
- Condition SNF
- Transfer SNF
- Release Facilities

INEL
TOTAL US SPENT FUEL MTHM

<table>
<thead>
<tr>
<th></th>
<th>1995</th>
<th>2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOE</td>
<td>2646</td>
<td>2742</td>
</tr>
<tr>
<td>Commercial</td>
<td>32300</td>
<td>86200</td>
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<tr>
<td>TOTAL:</td>
<td>34946</td>
<td>88942</td>
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</table>

1995

DOE 8%

Commercial 92%

2035

DOE 3%

Commercial 97%
SPENT NUCLEAR FUEL IN DOE COMPLEX
MAY 1995

HANFORD (80%)
2,133 MTHM
Aluminum
Stainless Steel
Zirconium

INEL (10%)
261 MTHM
Aluminum
Graphite
Hastelloy
Stainless Steel
Zirconium
No Cladding

SAVANNAH RIVER (8%)
206 MTHM
Aluminum
Hastelloy
Nickel
Stainless Steel
Zirconium

WEST VALLEY (1%)
27 MTHM
Zirconium

OAK RIDGE (<1%)
1 MTHM
Aluminum
Stainless Steel
Zirconium
No Cladding

FT. ST. VRAIN (1%)
16 MTHM
Graphite
Laboratories
Domestic Research & Test Reactors
B&W Special Case

OTHER SITES (<1%)
1 MTHM

TOTAL=2,646 METRIC TONS OF HEAVY METAL
WHERE IS DOE SPENT NUCLEAR FUEL?
1995 EIS DATA

SAVANNAH RIVER SITE
206

INEL
261

HANFORD SITE
2,133

METRIC TONS HEAVY METAL
1995 Distribution of DOE SNF

- **Hanford**: 17%
- **INEL**: 54%
- **SRS**: 13%
- **Other**: 16%

### Location Volume (m$^3$)

<table>
<thead>
<tr>
<th>Location</th>
<th>Volume (m$^3$)</th>
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</thead>
<tbody>
<tr>
<td>Hanford</td>
<td>213</td>
</tr>
<tr>
<td>INEL</td>
<td>703</td>
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<tr>
<td>SRS</td>
<td>165</td>
</tr>
<tr>
<td>Other</td>
<td>203</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1284</strong></td>
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</table>

### Other Locations Volume (m$^3$)

<table>
<thead>
<tr>
<th>Other Locations</th>
<th>Volume (m$^3$)</th>
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<tbody>
<tr>
<td>ANL-E</td>
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<tr>
<td>Brookhaven</td>
<td>3.4</td>
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<tr>
<td>LANL</td>
<td>0.6</td>
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<tr>
<td>ORNL</td>
<td>12.0</td>
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<tr>
<td>SANDIA</td>
<td>1.7</td>
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<tr>
<td>West Valley</td>
<td>11.7</td>
</tr>
<tr>
<td>B&amp;W Lynchburg</td>
<td>0.1</td>
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<tr>
<td>Domestic non-DOE</td>
<td>3.4</td>
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<tr>
<td>Universities</td>
<td>9.7</td>
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<td>Fort St. Vrain</td>
<td>160</td>
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Strawman for Top-Level Strategic Path Forward for DOE-Owned SNF

DOE-Owned SNF Inventory

In Storage

Out of Storage

Storage Requirements for Processed SNF

To Disposal

Demosntrations

Backup 1
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Current objective is to develop and implement a clear path for ultimate disposition of all DOE SNF.

- DOE policy directs placement of DOE SNF in repository
  - Recent Secretarial Action Memorandum (March 31, 1995)
  - Utilize 10% allocation for defense high level waste

- Disposition of DOE SNF in repository using screening criteria identifies
  1. SNF likely to go directly to repository
     - MPC preparation
  2. SNF requiring minor conditioning
     - Simple canning, surface passivation
  3. SNF likely requiring processing
     - Mechanical or chemical stabilization
Strawman for Top-Level Strategic Path Forward for DOE-Owned SNF

Plan for Geologic Disposal Without Conditioning
NPI Fuel: DOE Commercial type fuels, e.g., Shippingport, Port Bt. Vaein, etc.
ID Commercial
SRP Commercial

Start R&D for Conditioning
Process N-Reactor Fuels; Reactive Fuels, e.g., LOFT, TMI, EBR-II
Safety Analysis
Report to NRC

Preparation for Disposal

DOE SNF to Repository

WAC approved by category of fuel

Repository Operations Begin
DOE Spent Nuclear Fuel Program

- Direct disposition of some DOE SNF appears likely

- Balance of DOE SNF may require conditioning prior to final disposition in repository
SNF STRATEGY/LOGIC

SNF

Yes

Interim Storage

Meet Repository Acceptance Criteria

Yes

Prepare For Disposal

Repository or MRS

No

Stabilize

No

Process To Meet Acceptance Criteria
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Broad spectrum of DOE SNF types and conditions will determine specific path to repository.

- Metal fuels are unlikely to qualify without some conditioning
- Sodium bonded fuels may have RCRA characteristics requiring conditioning
- Damaged fuels may require conditioning
- Aluminum fuels may be processed to meet HLW form (borosilicate glass logs/canisters)
- Some fuels will require additional characterization to determine a path forward for repository acceptance and disposition
SCREENING RESULTS

METAL (N-REACTOR) 23%
PROCESS AL SNF AT SRS 29%
CHARACTERIZE CAN 5%
LIKELY 40%
PROCESS SODIUM BONDED 3%

DATA IS PRESENTED IN MPC BASIS
DOE Spent Nuclear Fuel Program

DOE SNF Program is closely coupled with the Office of Civilian Radioactive Waste Management (OCRWM) to ensure successful acceptance and disposition in a repository.

- Management Steering Group now functioning

- Key issues being addressed
  - Waste Acceptance Criteria
  - License application
  - MTHM equivalence and fee payments
  - NEPA integration
  - Transportation
  - NRC interface
  - Regulatory and quality framework
DOE Spent Nuclear Fuel Program

DOE Programmatic SNF Management and INEL Environmental Restoration and Waste Management Program

Record of Decision

- Addresses
  - Where DOE should best locate interim SNF management activities
  - Capabilities, facilities, and technologies needed for SNF management
  - Research and development capabilities needed to support SNF management
DOE Spent Nuclear Fuel Program

Key Elements of DOE SNF Programmatic Decision

- Environmental impact is not discriminating among management alternatives
  - Impacts are small overall
  - Relative impacts among alternatives are small

- Cost is not a significant discriminator
  - Continued use of existing SNF facilities drives near term costs
  - Cost uncertainties yield overlap with all alternatives
  - No clear cost "winner"
SRS SNF INCREASES THRU 2035

(EIS 4a Alternative)

HEAVY METAL MT

TOTAL MASS MT

FISSILE MASS kg

VOLUME m3

1995 VALUES

150%

100%

50%

7

66

206

549

8424

10195

213

186

1995 VALUES
### INEL SNF INCREASES THRU 2035

#### INEL 1995 TOTALS

<table>
<thead>
<tr>
<th></th>
<th>LITCO</th>
<th>ANL-W</th>
<th>NRF</th>
<th>Total</th>
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<tr>
<td>MTHM</td>
<td>225</td>
<td>20</td>
<td>5</td>
<td>251</td>
</tr>
<tr>
<td>TMASS MT</td>
<td>1114</td>
<td>110</td>
<td>208</td>
<td>1432</td>
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<tr>
<td>FMASS MT</td>
<td>15</td>
<td>1</td>
<td>4</td>
<td>20</td>
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<tr>
<td>VOLUME M3</td>
<td>483</td>
<td>149</td>
<td>71</td>
<td>703</td>
</tr>
</tbody>
</table>

- **HEAVY METAL MT**
- **TOTAL MASS MT**
- **FISSILE MASS MT**
- **VOLUME m3**

**NOTE:** INCREASES INCLUDE ON SITE GENERATION

5/15/95
DOE Spent Nuclear Fuel Program

Key Elements of DOE SNF Programmatic Decision (continued)

- Establishing and supporting a path forward for ultimate disposition remains a dominating decision factor
  - Fuel type regionalization supports a reasoned path forward
  - Best balance of factors (infrastructure, technology, cost, transportation)

- Ability of DOE and Navy to accomplish established missions is an important factor
  - Defense, national security mission of Navy
  - Reactor (research, safety, medical) operations
  - Management path for safe interim storage and ultimate disposition
DOE Spent Nuclear Fuel Program

Summary

- Management path for disposition of DOE SNF will closely parallel commercial program

- Where feasible, DOE SNF Disposition will model equivalent commercial solutions/approaches:
  - Singular regulatory framework
  - Comparable repository performance assessment
  - Comparable engineered barrier system
  - Comparable interim storage and transportation system
    - Multi-Purpose Canisters
    - "Road Ready" preparation for ultimate disposition