Legislation, Interim Storage, and Alternatives to Yucca Mountain

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Documentation at http://www.state.nv.us/nucwaste/
US Nuclear Waste Policy Overview

- 1957 - National Academy of Sciences proposes geologic disposal in deep salt formation
- 1972 – Lyons, Kansas salt project abandoned
- 1982 - Nuclear Waste Policy Act directs DOE to study many sites and construct 2 repositories (East & West)
- 1986 – DOE decision to drop Eastern site selection
- 1987 - Nuclear Waste Policy Amendments Act directs DOE to study Yucca Mountain only
- 2012 - Blue Ribbon Commission on America’s Nuclear Future recommends consent-based siting, new agency, other major changes in waste program
Blue Ribbon Commission (BRC) on America’s Nuclear Future

- Bipartisan Experts
- Replace DOE
- Consent in Siting
- Interim Storage
- Nuclear Waste Fund
- Transportation
- No opinion on Yucca Mountain site suitability or resumed licensing
Nuclear Waste Informed Consent Act

- S. 95 (Heller & Cortez Masto): January 2017
- Written consent agreement before Nuclear Waste Fund can be used for repository construction
- Secretary of Energy and (1) Governor of the host State; (2) host unit of local government; (3) each contiguous local government affected by transportation; and (4) each affected Indian tribe

**Nuclear Waste Administration Act**

U.S. Senate, Energy and Natural Resources Committee

- S. 854, introduced March 2015, Bipartisan support (Alexander, Murkowski, Feinstein, and Cantwell)

- Generally follows BRC except NWA would be independent federal agency

- Would continue Yucca Mountain

- Expect bill to be reintroduced later in 2017
Nuclear Waste Policy Amendments Act of 2017
U.S. House of Representatives, Energy and Commerce Committee

- H.R. 3053, reported by committee June 2017, Bipartisan support (Shimkus and 100+ co-sponsors)
- Directs DOE, NRC to expedite Yucca Mountain
- Directs DOE start interim storage program
- Offers benefits to Nevada and storage state(s)
- Expect bill to be voted on in October 2017
Congressional Appropriations for FY 2018
(October 1, 2017 – September 30, 2018)

• Current continuing resolution through December 2017 provides no Yucca Mountain funding
• House passed bill in July (235-192) providing $120 million to DOE and $30 million to NRC mainly for Yucca Mountain
• Senate Appropriations Committee in July passed bill (30-1) providing no funding for Yucca Mountain but funding for interim storage
• Outlook for January – September 2018 is uncertain
CIS Proposals in NM & TX

New CISF Proposed in Texas and New Mexico

- Both Holtec International and Waste Control Specialists LLC (WCS) have submitted license applications to construct and operate a CISF to the NRC.
- Both local communities strongly support the construction and operation of a CISF.
- Both locations have been extensively studied by federal agencies and located in arid and geologically stable lands.
- Each location is accessible by rail.
Possible Sites for Repository in Salt

Map of Salt Deposits in U.S.

Figure 1. Salt deposits in the United States (Johnson and Gonzales 1978).
Waste Isolation Pilot Plant (WIPP)
Near Carlsbad, New Mexico

Figure 3. Disposal operations for TRU waste at the WIPP
Possible Sites for Repository in Crystalline Rock
Repository Candidate Areas in Wisconsin - 1986
Canadian Research on Crystalline Rock

Canadian Underground Research Laboratory

The Underground Research Laboratory (URL) was awarded the Certificate of Engineering Achievement for 1990 by the Association of Professional Engineers of Manitoba. The award, given for excellence in engineering, recognizes the leadership role AECL Research played in planning and coordinating all phases of the URL engineering design and construction.

Over 100 Canadian engineering consultants and contractors, Ontario Hydro, and ten international agencies assisted AECL with the project.

Le Laboratoire de Recherche Subterraine (LR) a été lauréat du Prix de Réalisation Technique 1990, de l'Ordre des Ingénieurs du Manitoba. Cette reconnaissance précise l'engagement d'AECL Research dans la planification et la coordination de toutes les phases de conception et de construction du LR. Plus de 100 consultant canadiens et contractors ont contribué à ce projet. Canadian Research on Crystalline Rock

Canadian Underground Research Laboratory
Finland Repository Under Construction in Crystalline Rock
Clay/Shale Repository Concepts
France, Belgium, Switzerland, U.S.

Sources: France: www.andra.fr; Switzerland: www.nagra.ch; Belgium: www.sckcen.be.

Figures 2.1.1 Schematic of Clay/Shale Disposal Concepts.
French Reprocessing Fuel Cycle

PWR fleet & Nuclear fuel cycle in France

- Natural Uranium
- Concentration Conversion
- Enrichment
- Depleted Uranium

- Storage
- Vitrified HLW
- Compacted MLW
- Interim storage
- FMA-VC

- Reprocessed Uranium

- Plutonium
- Fabrication Of MOX fuel

- Used fuel reprocessing plant

- Used fuel

- Interim storage
- Used MOX

58 PWRs ~63 GWe

IAEA - INPRO meeting - International aspects of reprocessing and recycling - 4-7 octobre - D GRENECHE
French Reprocessing Facilities

The AREVA La Hague plant
Steps in Reprocessing - AREVA

Main steps of reprocessing

- Arrival on the site
- Fuel éléments
- Receipt storage
- Reprocessing steps (Shearing, dissolution, separation, purification)
- Recyclables material + waste
- Uranium (nitrate)
- Plutonium (UO2 powder)
- Waste of the process

- Each step has its own process
- There is a « nuclear material control and accounting » system (MC&A) at each step, under the control of EURATOM and IAEA
- Customers (utilities) keep the ownership of their nuclear materials and waste are sent back to the customers
# World Commercial Reprocessing Capacity 2016
**(World Nuclear Association)**

<table>
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<tr>
<th>(tonnes per year)</th>
<th>Country/Plant</th>
<th>Capacity</th>
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<tbody>
<tr>
<td><strong>LWR fuel</strong></td>
<td>France, La Hague</td>
<td>1700</td>
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<tr>
<td></td>
<td>UK, Sellafield (THORP)</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Russia, Ozersk (Mayak)</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Japan (Rokkasho)</td>
<td>800*</td>
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<tr>
<td></td>
<td><strong>Total LWR (approx)</strong></td>
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<tr>
<td><strong>Other nuclear fuels</strong></td>
<td>UK, Sellafield (Magnox)</td>
<td>1500</td>
</tr>
<tr>
<td></td>
<td>India (PHWR, 4 plants)</td>
<td>330</td>
</tr>
<tr>
<td></td>
<td>Japan, Tokai MOX</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td><strong>Total other (approx)</strong></td>
<td>1870</td>
</tr>
<tr>
<td><strong>Total civil capacity</strong></td>
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<td>5370</td>
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* now expected to start operation in 2018
Reprocessing Pro & Con

- Fuel recovery and reuse in reactors
- Isotopes for non-fuel uses
- Reduced volume, hazard, and cost of radioactive waste requiring geologic disposal
- National security technology considerations
- Capital cost for facilities and product cost compared to other sources of uranium
- Process hazards and environmental impacts
- Increased volume of total radioactive waste
- Proliferation of weapons and weapons technology
Yucca Mountain Site
Unsuitable for Reprocessing

- No Rail Access – Reprocessing facility would require about 2,900 truck shipments per year, using routes through Las Vegas metro area; trucks would likely be required for shipping out recovered uranium/plutonium and/or new MOX fuel
- Inadequate Water Resources – Reprocessing facility would require 1,000 acre/feet per year or more; water resources would also constrain collocation of new fuel fabrication facilities
- Seismic Hazards to Surface Facilities – Major concern for NRC licensing and operation: 2008 USGS maps show moderate to high ground acceleration area; 10 miles from Little Skull Mountain (5.6 magnitude) earthquake epicenter; 10 – 30 miles from 3 active faults with potential earthquake magnitude of 6.5-7.9
- Lack of previous reprocessing experience - U.S. sites with past reprocessing experience would almost certainly compete for new facilities and be selected over Yucca Mountain