West Valley Demonstration Project

High-Level Waste Canister Storage Evaluation and Recommendation

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West Valley High-Level Waste Canisters

- 2 feet outside diameter
- 10 feet tall
- Reversed-dish bottom end
- Welded lid after filled
- Grappling pintle on top
- Avg. canister fill height > than 90%
- Avg. weight = 5,500 pounds
- Avg. contact dose = ~2,600 R/hr

275 HLW Canisters in Safe Storage in Main Plant Process Building

Step 1: Evaluate options and recommend a storage system to provide optimum, safe, economical future storage of HLW canisters outside the Main Plant Process Building
**Evaluation Summary**

- Review scope and review historical documents
- Independent siting evaluation
- Options developed
  - Spent fuel technology: three vendor presentations (horizontal / vertical)
  - Single canister container design
  - Above- and below-grade vault: SRS, Ft St. Vrain, WVES model
  - Spent fuel shipping cask for storage
- Site visits
  - Ginna Nuclear Power Plant, Webster NY (horizontal SNF)
  - Palo Verde, Arizona (vertical SNF)
  - James A. Fitzpatrick Nuclear Power Plant, Oswego NY (vertical SNF)
- Functional requirements developed
- Options evaluated to criteria / requirements

**Historical Document Review**

- Historical Document Review
- Most reports did not make recommendations but provided comparative options
- Above-ground, shielded storage was the only consistent storage recommendation developed
Siting Evaluation

- Evaluation was independent of other reports/conclusions
  - Historical documents do not analyze where but focus on what the system should be
    - Area was to be valid for all options considered
    - Least overall impact on current and future work
    - Least potential environmental impact
- Siting Recommendation:
  - Area in the southwest corner of WMA #6 bordered by the rail line and access road
  - Geotechnical Work can begin now to define area needs for construction of any option

Spent Fuel Designs Adaptable to HLW

- HLW Canisters:
  - generate less heat
  - have no neutron dose
  - have no criticality concerns
  - do not require inert gas
  - have withstood a 23 foot drop without breaching

Commercial Spent Nuclear Fuel

West Valley High Level Waste Canister
**HLW Canister Storage Options**

<table>
<thead>
<tr>
<th>Options</th>
<th>Horizontal SNF</th>
<th>Vertical SNF</th>
<th>Single Canister Container</th>
<th>Above-Ground Vault</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store the canisters for a minimum of 50 years</td>
<td>Licensed on 20 year cycle</td>
<td>Licensed on 20 year cycle</td>
<td>Design could accommodate based on spent nuclear fuel</td>
<td>Design could accommodate</td>
</tr>
<tr>
<td>Ability for the selected storage system to remain uncontaminated</td>
<td>Clean overpack used</td>
<td>Clean overpack used</td>
<td>Requires clean canister</td>
<td>Requires clean canister</td>
</tr>
<tr>
<td>Minimization of future operational costs</td>
<td>Surveillance &amp; maintenance low</td>
<td>Surveillance &amp; maintenance low</td>
<td>Surveillance &amp; maintenance similar to spent nuclear fuel</td>
<td>Design would minimize maintenance</td>
</tr>
<tr>
<td>Removal and disposition of uncontaminated storage system after canisters have been shipped off site</td>
<td>Modular unit disassembly and disposal of concrete and steel</td>
<td>Modular unit disassembly and disposal of concrete and steel</td>
<td>Same as spent nuclear fuel but more units</td>
<td>Building demolition requires all canisters shipped prior to demolition</td>
</tr>
</tbody>
</table>

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**Horizontal Spent Fuel Storage System**

**Considerations Relative to Other Options**

- **Advantages**
  - Proven licensed design for spent nuclear fuel
  - Current designs accommodate up to five canisters
  - Solid low profile
  - Passive storage function
  - Overpacks same as spent nuclear fuel used in shipping cask designs
  - Decommissioning modular (can be done one unit at a time as emptied)

- **Disadvantages**
  - Only one vendor has current licensed design – limits competition
  - Overpack decreases accessibility to single canister
Vertical Spent Fuel Storage Systems

Considerations Relative to Other Options

--- Advantages
- Proven licensed design for spent nuclear fuel
- Current designs accommodate up to five canisters
- Solid, low profile
- Passive storage function
- Overpacks same as spent nuclear fuel used in shipping cask designs
- Decommissioning modular (can be done one unit at a time as emptied)
- Two vendors can provide competitive designs

--- Disadvantages
- Overpack decreases accessibility to single canister

Single Canister Container

Considerations Relative to Other Options

--- Advantages
- Single canister easily retrievable
- Could shift to multiple units if required
- Many construction vendors available to compete
- Single canister loads easier to transport
- Decommissioning modular (can be done one unit at a time as emptied)
- Could adapt current licensed spent nuclear fuel design

--- Disadvantages
- Transfer 275 loads versus 55
- Decontamination of canister essential to contamination control
Above-Grade Vault

Considerations Relative to Other Options

Advantages
- Savannah River high-level waste / Fort St. Vrain designs in use
- Single canister easily retrievable
- Many construction vendors available to compete
- Single canister loads easier to transport

Disadvantages
- Not Modular
  - Must be completely constructed prior to operation
  - Shipping must be complete to start demolition
- Transfer 275 loads versus 55
- Extended schedule associated with construction
- Decontamination of canister essential to contamination control
- Potential for additional maintenance (passive HEPA ventilation)

HLW Storage System Summary

Summary
- Below-grade options not technically viable for WVDP
- Spent fuel shipping casks are not viable economically
- All reviewed above-grade options are viable
- Above-grade vault did not meet project schedule and mission objectives

Viable options remaining
- Spent fuel storage container designs using multiple canister overpack designated for high-level waste
  - Single canister container
- Both of the remaining are competitive based on conceptual models
Path Forward

To meet project objectives and provide optimal, safe and economical storage, WVES recommended proceeding with the conceptual design of the single canister container and vendor options for spent nuclear fuel storage systems designed for high-level waste storage.