Savannah River Site L-Basin Spent Nuclear Fuel Program Update

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Savannah River Site
Savannah River Site Citizens Advisory Board
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Overview of L-Basin

- L-Basin was expanded from the original reactor basin in the 1990s
  - ~3.4 Million gallons of water
  - Pool Depth 17 to 50 feet
  - One transfer bay for receipts/shipments
L-Basin Water Purification System

All water passes through sand filters every 32 hours.

All water passes through the ion exchange every 13 days.

DEIONIZED WATER MAKEUP

L Basin Water Facts
- ~3.4 Million Gallons
- Pool depths of 17 to 50 feet
- Concrete walls 2.5 to 7 feet thick
- A Deionizer Resin Train is used to remove and replace unwanted ions

Water Chemistry Control

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Normal Value</th>
<th>Operating Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conductivity</td>
<td>&lt;1.5 mS/cm</td>
<td>10 mS/cm</td>
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<tr>
<td>pH</td>
<td>6.1</td>
<td>5.5 to 8.5</td>
</tr>
<tr>
<td>Chloride</td>
<td>&lt;0.05 ppm</td>
<td>0.1 ppm</td>
</tr>
<tr>
<td>Mercury</td>
<td>&lt;0.014 ppm</td>
<td>0.014 ppm</td>
</tr>
<tr>
<td>Copper</td>
<td>&lt;0.05 ppm</td>
<td>&lt;0.1 ppm</td>
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</table>
Inventory at Savannah River Site

- Approximately 3,050 bundles of fuel
  - Aluminum Based & Stainless Steel/Zirconium Based Spent Nuclear Fuel (SNF) (~90%)
  - Highly Enriched & Low Enriched Spent Nuclear Fuel (75% vs 25%)
  - Various shapes, sizes, burn-up percentage, degradation

- Safely and Securely Stored in Reinforced Concrete Facility, Underwater Basin (L-Area)

- Continuous Surveillance and Maintenance – 50 additional years of safe storage
L-Basin Stored Fuels and Capacities

- **L-Bundled fuel**
  - ~90% full
  - 3045 bundles
  - Amended Record of Decision (AROD) processing decision eliminates need for new racks

- **High Flux Isotope Reactor (HFIR) Fuel Racks**
  - 100% full
  - 120 Cores
  - Amended Record of Decision (AROD) processing decision eliminates need for new racks

- **Isolation Cans**
  - Over 400 individual isolation cans stored in 12 oversized cans
Forecast EBS Bundle Positions Filled by FRR/DRR Receipts with H-Canyon Processing

FY14 Completed L to H: 11 of 1000 MTR bundles

EBS Current Capacity 3650

Assumption:
- 1176 bundles In FY15 - FY33:
  - 228 DRR
  - 307 FRR
  - 325 Japan 2020 to 2029
  - 272 NRU (3/bundle)
  - 44 NRX (3/bundle)

Inventory at the End of each Fiscal Year

- Bundles In
- Bundles Out
- Forecast Inventory with L to H-Canyon, 1 Dissolver

FY – Fiscal Year
EBS – Expanded Basin Storage
NRX – National Research Experimental
DRR – Domestic Research Reactor
FRR – Foreign Research Reactor
MTR – Material Test Reactor
NRU – National Research Universal
HFIR Storage Capacity, Receipts, Canyon Processing

HFIR Cores

<table>
<thead>
<tr>
<th>Year</th>
<th>HFIR HEU Received L Basin</th>
<th>HFIR HEU Canyon Processing</th>
<th>HFIR HEU Inventory L Basin</th>
<th>HFIR HEU Capacity L Basin</th>
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<td>2018</td>
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<td>2031</td>
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HFIR – High Flux Isotope Reactor
HEU – High Enriched Uranium
Canadian Nuclear Laboratories has National Research Universal/National Research Experimental (NRU/NRX) fuel that is longer and heavier than typical Material Test Reactor Fuel.

- Contract signed in 2012 where prepayment of $10 Million made for the modifications to be made for receipt of the fuel in L-basin.

- Modifications to the Shielded Transfer System (STS) are required to remove the fuel from the legal weight truck (LWT) cask.

- New unloading station developed to remove the fuel from the basket and load it into bundles for storage in L-basin.

- Fabrication of the Shielded Transfer System (STS) modifications are expected by end of Calendar Year 2014 but now projected by end of February 2015.

- Multi-year shipping campaign

- No other modifications are expected for typical Material Test Reactor Fuels.

- All non-typical Material Test Reactor fuels will be evaluated on a case-by-case basis.
Current Management Approach

- Continue Safe Wet Storage
- Process up to 1000 bundles and 200 High Flux Isotope Cores
- Continue Operations of L-Basin evaluated by Savannah River National Laboratory for safe usage of L-Basin up to an additional 50 years
Successful completion of the Sodium Reactor Experiment Fuel Campaign in August 2014:
- 147 bundles of Sodium Reactor Experiment and High Aluminum Fuels
- No recovery of Uranium due to U-232

Amended Record of Decision allows:
- Processing up to 1000 bundles and 200 High Flux Isotope Cores
- 40 bundles completed through December 31, 2014

H-Canyon continued processing of the Aluminum Cladded Fuel in L-Basin is possible but no decision has been made to pursue this at this time.

H-Canyon cannot process the Stainless and Zircaloy cladded fuels stored in L-Basin (~ less than 10% of the inventory)
Dry Storage

• Savannah River Site lifecycle assumes dry storage
  • No decision on processing
  • It is the more costly option for capturing liability costs

• Dry Storage Study was conducted in 2012
  • Included information from both Hanford and Idaho
  • Direction was to include as much “commercially available” options as possible
  • Direction was also to assume the final configuration of the fuel was “road ready” (ready for shipment to a repository)

• Concerns regarding the drying of Aluminum Fuel need to be addressed:
  • How long to dry, how fast to dry to ensure no generation of hydrogen or hydrides
Dry Storage (continued)

• Storage Pad
  • Dry Storage Report envisioned the pad located in L-area
  • Another report is evaluating the use of a multi-use storage pad

• Multi-use storage Pad
  • Very preliminary study
  • Storage of both Vitrified Glass logs in concrete overpacks as well as dry
    fuel in concrete overpacks
  • Considers a Central location within the site
  • Major driver for multi-use pad is potentially reduced transportation costs
    and shared storage costs
  • Difficult to determine any cost savings due to the potential need for fuel
    drying in a different location from L-Area.
Summary

- Fuel is Safely Stored in L-Basin
- Some processing of Fuel is occurring in H-Canyon
- Alternatives to wet storage have been evaluated
- Departmental Decision needed on future direction of fuel storage versus processing