Spent Fuel Project - Mission

- Receive and store aluminum-based Spent Nuclear Fuel (SNF) from foreign & domestic research reactors
- Operated by Savannah River Nuclear Solutions, LLC (SRNS) for DOE Office of Environmental Management (DOE-EM)
- Support National Nuclear Security Administration's (NNSA's) initiative for removal of Highly Enriched Uranium (HEU) from civilian reactor sites worldwide
- Support ongoing domestic research reactor programs
- Package and ship fuel for disposition
L Basin Inventory

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Assemblies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum-Based Fuels</td>
<td>~13,000</td>
</tr>
<tr>
<td>Higher Actinide Targets</td>
<td>~200</td>
</tr>
<tr>
<td>Non-Al-Based Fuels</td>
<td>~2000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>~15,000</strong></td>
</tr>
</tbody>
</table>

Material Test Reactor (MTR) Fuels

High Flux Isotope Reactor (HFIR)

Forecast Future Fuel Receipts

- **Foreign Research Reactors (FRR)**
  - Authorized through May 2019
  - DOE considering hardship extension
  - Estimated 2,000 additional assemblies
  - Estimated 97 casks

- **Domestic Research Reactors (DRR)**
  - No defined end date
  - 40 - 100 assemblies per year
  - 5 - 20 casks per year
**Underwater Cask Unloading**

- Majority of research reactor fuel casks unloaded underwater
- Assemblies removed one at a time, identification verified, condition inspected
- Assemblies transported to processing area for bundling & storage

**Dry Cask Unloading**

- Used for tall casks
- Shielded (dry) transfer system
  - Cask placed in dry well
  - Lid removed
  - Fuel basket hoisted into shielded tube
  - Tube moved over pool
  - Basket lowered into pool
- Assemblies removed from basket similar to underwater cask unloading process
**Material Test Reactor (MTR) Fuel Storage**

Expanded Basin Storage (EBS) Racks:
- Fixed geometry for criticality control
- Assemblies may be cropped to optimize storage
- 4 to 5 MTR assemblies per bundle
- 3 NRU/NRX assemblies per bundle
- One bundle per storage rack position
- 3650 positions currently installed
- 3016 positions currently filled
- Space to add more racks
- Racks seismically qualified for design basis seismic event
- No active cooling required

**Modifications to Expand Receipt Capability**

- Fuel from the Canadian National Research Universal (NRU) and National Research Experimental (NRX) reactors
- Fuel assemblies approximately 10 feet long; too long for existing system
- Required facility modifications:
  - Shielded Transfer System (STS) modifications to handle new longer and heavier basket (18 assemblies per basket) – In progress
  - New Unloading Station for transferring fuel assemblies from LWT cask basket to L Bundles for storage in racks (3 assemblies per bundle tube) - Complete
  - Criticality block to prevent interaction with other fuels along LWT basket transport route - Complete
  - Underwater handling tools – Complete

*Not to scale*

NRU Fuel Assembly

Loaded tube ready for storage
**Fuel Disposition – Risk Reduction**

- Sodium Reactor Experiment (SRE) Processing
  - Declad thorium-uranium metal fuel
  - Welded cans; single barrier preventing reaction with basin water
  - Processing in H Canyon began FY12; completed FY14
  - Co-processed with selected low-uranium fuels to aid in Canyon process
  - Uranium not recovered

**Fuel Disposition – HEU Blenddown**

Amended Record of Decision (AROD):

- Savannah River Site Spent Nuclear Fuel Management Environmental Impact Statement (EIS) amended March 2013
- Approximately 3.3 MTHM of aluminum based high enriched uranium (HEU) fuel to be processed in H Canyon
  - Approximately 1000 fuel bundles
  - Up to 200 HFIR cores
- Avoids installation of additional fuel storage racks
- Supports anticipated future foreign & domestic fuel receipts
- Down blend HEU to LEU; available for use in commercial power reactors
- Initiated in FY14 following the SRE campaign
Fuel Disposition – FY12 - present

**FY12-FY14 SRE / MTR:**
- Shipments to H Canyon - 18
  - Fuel Bundles
    - SRE - 36
    - MTR - 111
  - Fuel Assemblies
    - SRE - 36
    - MTR - 445
  - Mass – 2.45 MTHM

**FY15 AROD MTR:**
- Shipments to H Canyon - 4
  - Fuel Bundles
    - MTR - 60 of 1000
  - Fuel Assemblies
    - MTR - 261
  - Mass – 0.14 MTHM

---

SRE – Sodium Reactor Experiment
MTR – Material Test Reactor

SNF Shipment to H Canyon

- SRS 70-Ton cask
- Interchangeable inserts for different fuel geometries
- Direct unloading to H Canyon dissolver using remotely operated crane

70-Ton Cask on rail car
Cask with HFIR insert
**Fuel Storage & Disposition Alternatives**

- Continued processing in H Canyon
  - Aluminum-based HEU / LEU
- Fuel exchange with INL coupled with H Canyon processing
  - Stainless steel & zirconium (SS / Zr) clad fuel to INL
  - Equivalent quantity of aluminum-based fuel in return
- Process high actinide targets in SRNL or H Canyon
- Melt & dilute aluminum-based HEU to LEU
- Dry storage
- Extended wet storage in L Basin

SRNL researching advanced technologies for processing non-aluminum fuels; e.g., SS / Zr clad, graphite-based fuels

**Summary**

- SRS continues to safely receive and store spent nuclear fuel to reduce global threat
- Foreign fuel receipt mission continues into 2019 (Potential extension)
- Domestic fuel receipts continue indefinitely
- SNF inventory being dispositioned in stages as directed by DOE-EM
  - Current:
    - H Canyon processing to reduce risks, avoid costly storage expansion, beneficial reuse of U-235
    - Baseline assumes dry storage after currently authorized campaign
  - Future (pending new guidance/direction):
    - Possible continued recovery and recycle using H Canyon capability
    - Possible exchange with INL
    - Potential conversion to dry storage pending final disposition decision