



Spent Nuclear Fuel Receipt, Storage and Disposition at Savannah River Site (SRS)

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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

	<u>Assemblies</u>
Aluminum-Based Fuels	~13,000
Higher Actinide Targets	~200
Non-Al-Based Fuels	~2000
TOTAL	~15,000



Material Test Reactor (MTR) Fuels



High Flux Isotope Reactor (HFIR)

Forecast Future Fuel Receipts

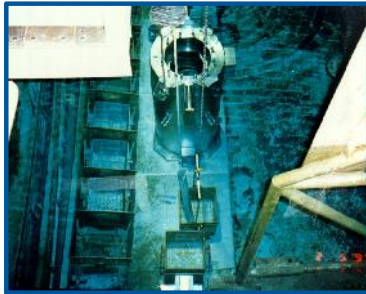
- Foreign Research Reactors (FRR)
 - Authorized through May 2019
 - DOE considering hardship extension
 - Estimated 2,000 additional assemblies
 - Estimated 97 casks

- 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

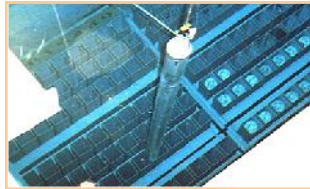
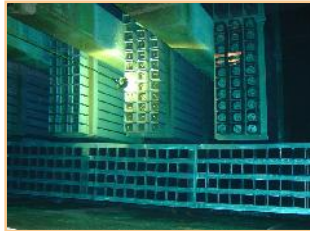


Material Test Reactor (MTR) Fuel Storage

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

Submerged 3 x 10 and 4 x 10 EBS racks



Loaded tube ready for storage

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



NRU Fuel Assembly

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

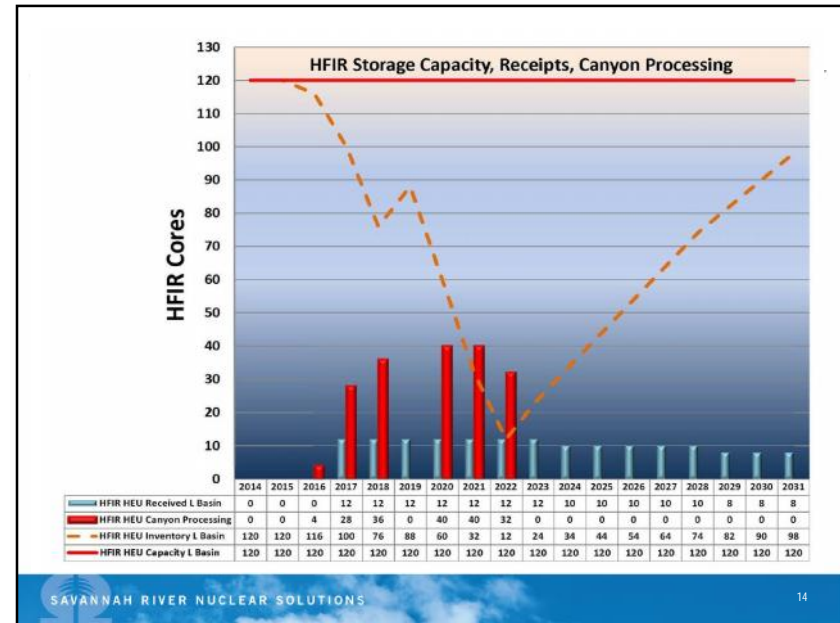
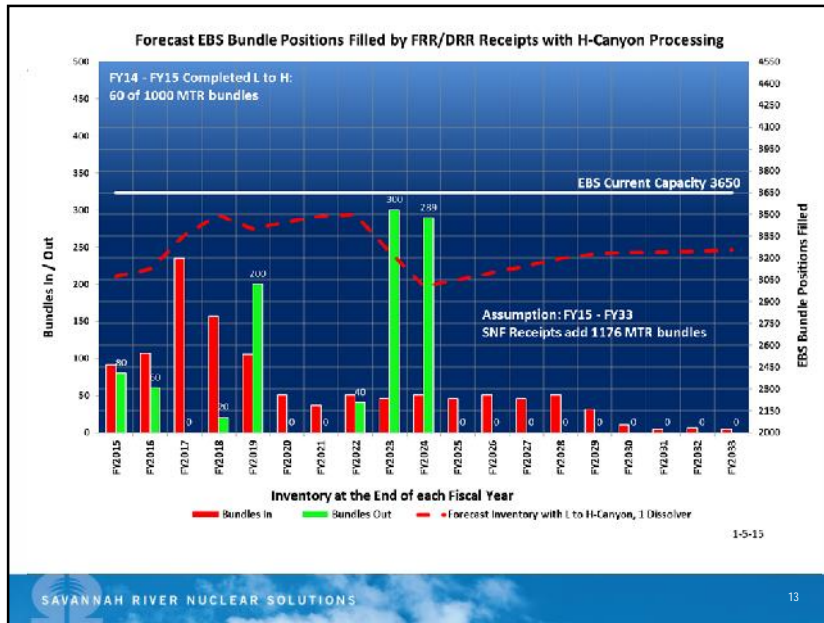
- SRS 70-Ton cask
- Interchangeable inserts for different fuel geometries
- Direct unloading to H Canyon dissolver using remotely operated crane



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

