H Canyon Background

• Has operated since 1955

• SRS has never had an uncontrolled criticality accident

• Recovers Highly Enriched Uranium-235 (HEU) from on- and off-site reactor fuel rods and scrap

• Also can recover neptunium-237, plutonium-238 & plutonium-239

• Primary Objectives in SRNS Contract are to:
  – Stabilize SRS and other DOE complex wide legacy material to support footprint reduction and Category 1 & 2 Nuclear Fuels de-inventory (Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Y-12, Hanford)
  – Working to resume Blend Down of HEU with natural uranium to provide Tennessee Valley Authority with a Low Enriched Uranyl (LEU) Nitrate to produce fuel for use in commercial power reactors
  – Support U.S. non-proliferation goals
H Canyon Facility – A National Treasure

- Proven Performance - over 55 years of safe, reliable operation
- Only operational U.S. large-scale, shielded radiochemical separation facility capable of dispositioning surplus Spent Nuclear Fuel (SNF), and uranium, plutonium, and neptunium materials
- Demonstrated technology with flexible capabilities and low risks; operations comply with today’s environmental standards
- Proven and qualified work force with demonstrated world class safety performance and disciplined operations
- Robust Systems and Support Infrastructure
  - Safety Class seismically qualified structure and exhaust ventilation
  - Engineered features for risk reduction
  - Modular/flexible process cells
  - Extensive support systems (e.g., cold chemicals, cooling water, steam)
  - Modern Safety Basis Analysis Document
- Stable operational costs and limited capital costs.
Key Dates

- 1955-1961
  - Recovered Pu-239
- 1961-1964
  - Recovered Pu-240
- 1961-1984
  - Operated Frames for Pu-238 for Space Missions
- 1964-1969
  - Recovered U-233 (THOREX)
- 1972-90
  - Recovered U / Pu from stainless steel clad LEU fuels
- 1991-1992
  - Recovered Pu-242
- 1992-95
  - Cassini Pu-238 mission
- 1997-2003
  - Stabilized Spent Fuel
- 2001-2002
  - Stabilized legacy plutonium
- 2003-present
  - HEU blending operations began
- 2004-2008
  - Stabilize neptunium
- 2006
  - Completed disposition of all SRS reactor fuel
- 2008-2010
  - Processing NNSA HEU materials
- 2009
  - Process Pu from 3013 Surveillance Program
- 2010
  - Ready to process used HEU research reactor fuel
- 2017
  - Target Residue Material

H-Canyon/HB Line Pu-238 Cassini campaign 1992-1995
SRS Fuel Cycle

185 MT of HEU Processed Through Cycle (1960-1988)

Targets → Reactor Vessel → Products

- Targets:
  - Spent Fuel
  - H Canyon

- Reactor Vessel:
  - Purified HEU Solution
  - Y-12 National Security Complex

- Products:
  - Fuel Tubes
  - HEU Metal
  - 321-M
  - Tank Farm
  - OR Alloy

Products:

- Pu-238
- Pu-239
- Pu-242
- Cm-244
- Cf-252

- Am-241
- Am-243
- U-233
- Co-60
- Po-210
H Canyon
H Canyon Cross Section
Warm Canyon Interior – No Cell Covers
Canyon Cell Arrangement (Typical)
Sand Filter (Safety Class Credited Exhaust System)
Tunnel Inspection

General Equipment Layout Inside

- Robotic Crawler
- Overhead Trolley and Hoist
- Video Display Inside Hut/Control Trailers
H Canyon Process

H Canyon
Highly enriched uranium process operations

1. Charge
2. Dissolver
3. Head End
4. First Cycle
5. Second Cycle
6. Blend Down

Savannah River Site

HFR Fuel

Spent nuclear fuel processed at SRS is from domestic and foreign reactors.

Converts solids to a liquid solution

Clarifies disolver solution

Uranium solution

Process solution to separate uranium into individual streams for further processing.

Further decontaminate uranium solution

Removal of blend down operations expected in fiscal year 2020

301 metric tons of low enriched uranium have been sent to the Tennessee Valley Authority since March 2003. That’s enough to power 47 homes for 47 days.
HFIR Shipping

- 70-Ton Cask Car with HFIR Insert
High Flux Isotope Reactor (HFIR) Elements

• A HFIR assembly is composed of
  – an outer element that is approximately 17” in diameter and 31” long,
  – and an inner element that is approximately 10.5” in diameter and 31” long.

• These fuel elements both contain a large number of involute (curved) fuel plates within nested cylindrical aluminum side plates.

• The fuel plates are composed of aluminum-clad with the uranium enriched to approximately 93.1% $^{235}$U.
Material Test Reactor Fuel Types
Canadian Target Residue Materials (TRM)

• Highly Enriched U-235 Liquid
  – HEU > 60 wt% U-235

• Funding Provided by Canada

• Brought to SRS in Containers (4 per cask)

• Unloaded in the Truckwell and pumped to Tank 8.8

• Control Room will monitor Tank 8.8 for increase during pumping
TRM Delivery
Cask Removal from Trailer
Cask and Lid Removal Tool (NAC)
NAC Container

- Container holds ~14.0 gal
- 1 gal Head space at top for H2 buildup and expansion
- Filled and emptied vertically, shipped horizontally
- Volume set for Critical Mass Controls U-235 700 gram
- Each Container holds significantly less U-235 than Critical Mass
TRM Unloading Equipment
LEU Shipment Leaving SRS
Questions?