Update on H Area Operations

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Savannah River Site Citizens Advisory Board
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Purpose

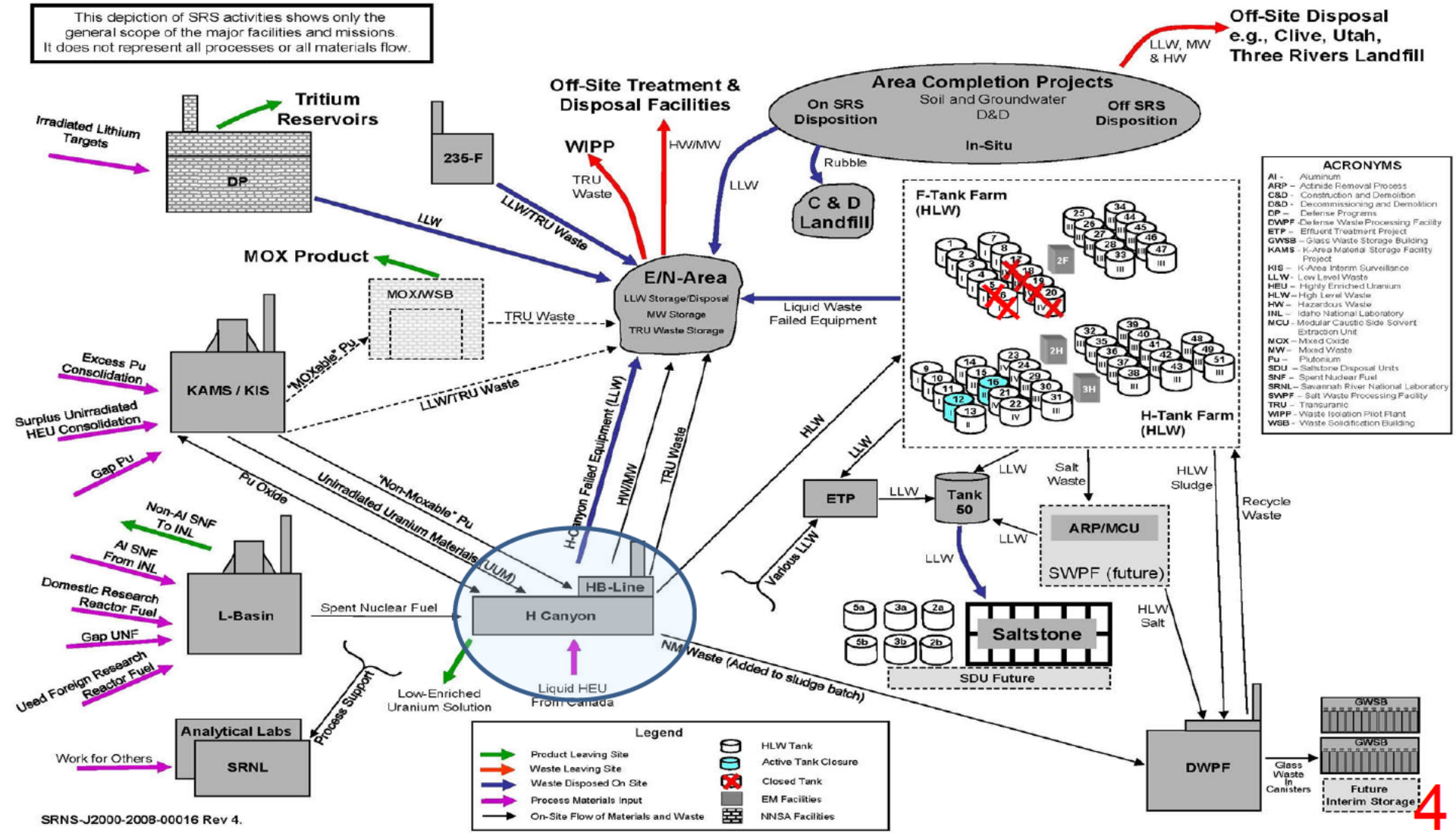
To satisfy Nuclear Materials Committee 2014 Work Plan topic by:

- Provide an update on H Area Operations
  - Plutonium (Pu) processing for NNSA's Pu Disposition Program
  - Sodium Reactor Experiment (SRE) Disposition
  - Highly Enriched Uranium (HEU) Spent Nuclear Fuel (SNF) Disposition via H Canyon

Acronyms

Al –clad – Aluminum clad
AROD – Amended Record of Decision
ARRA – American Recovery and Reinvestment Act
CNLL – Canada Nuclear Laboratories Limited
DSA – Documented Safety Analysis
HEU – Highly Enriched Uranium
HEPA – High Efficiency Particulate Air
HFIR – High Flux Isotope Reactor
IAEA – International Atomic Energy Agency
MFFF – Mixed Oxide Fuel Fabrication Facility
MOX – Mixed Oxide
MTR – Material Test Reactor
NNSA – National Nuclear Security Administration
PISA – Potential Inadequacy in the Safety Analysis
Pu – Plutonium
SA – Supplement Analysis
SNF – Spent Nuclear Fuel
SRE – Sodium Reactor Experiment
SRNS – Savannah River Nuclear Solutions
TRU – Transuranic Waste
TSR – Technical Safety Requirements
U – Uranium
WIPP – Waste Isolation Pilot Plant

Savannah River Site
Waste and Material Flow Path



SRNS-J2000-2008-00016 Rev 4.

H Canyon

- **This year has been a very busy year for H Area**
  - Resolution of ground level release Potential Inadequacy in the Safety Analysis (PISA)
  - Startup of Pu Oxide Production
  - Completion of Sodium Reactor Experiment (SRE) dissolution
  - Initiation of other Spent Nuclear Fuel (SNF) Processing

H Canyon Ground Level Release

- The H Canyon safety analysis credits the exhaust tunnel and stack to provide an elevated air release after a seismic event.
- The potential for a post-seismic ground level release was identified, reported and compensatory measures were put in place.
- Compensatory measures included no Pu processing in HBL or SNF processing.
- The following actions were completed before beginning Pu processing in HBL

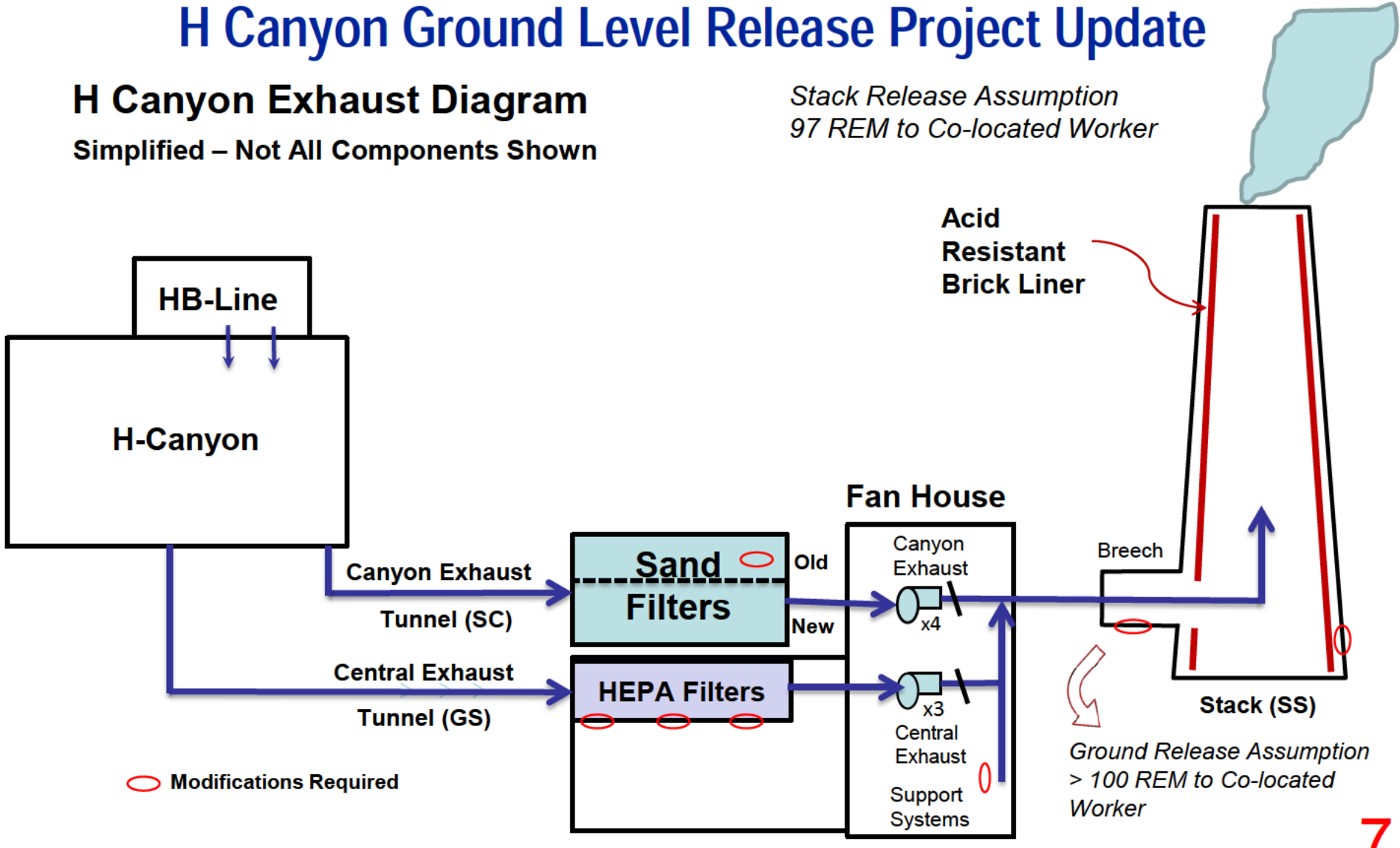
  - ❑ Modifications to H Canyon to prevent a ground level release included:
    - Sealing of stack annulus blower
    - Sealing of exhaust tunnel between Canyon exhaust fans and stack
    - Closing of the support systems tunnel
    - Modifications to the central exhaust system HEPA room.
    - Isolation of the old sand filter
  - ❑ Revision to the H Canyon documented safety analysis and technical safety requirements.

H Canyon Ground Level Release Project Update

H Canyon Exhaust Diagram

Simplified – Not All Components Shown

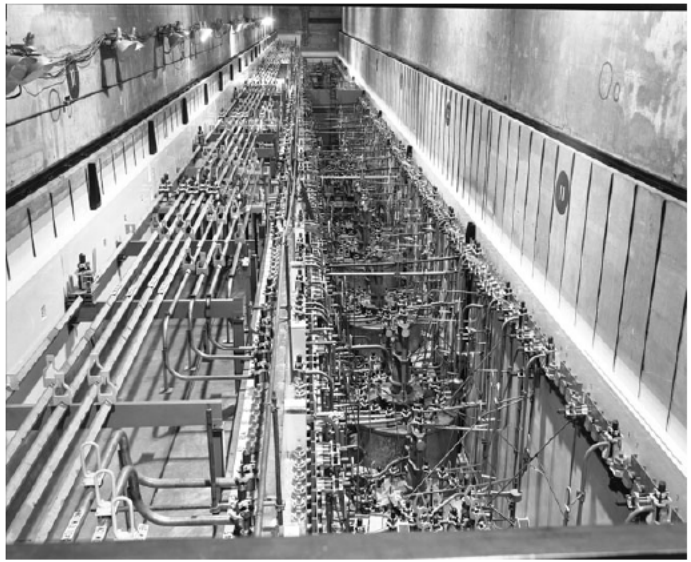
Stack Release Assumption
97 REM to Co-located Worker



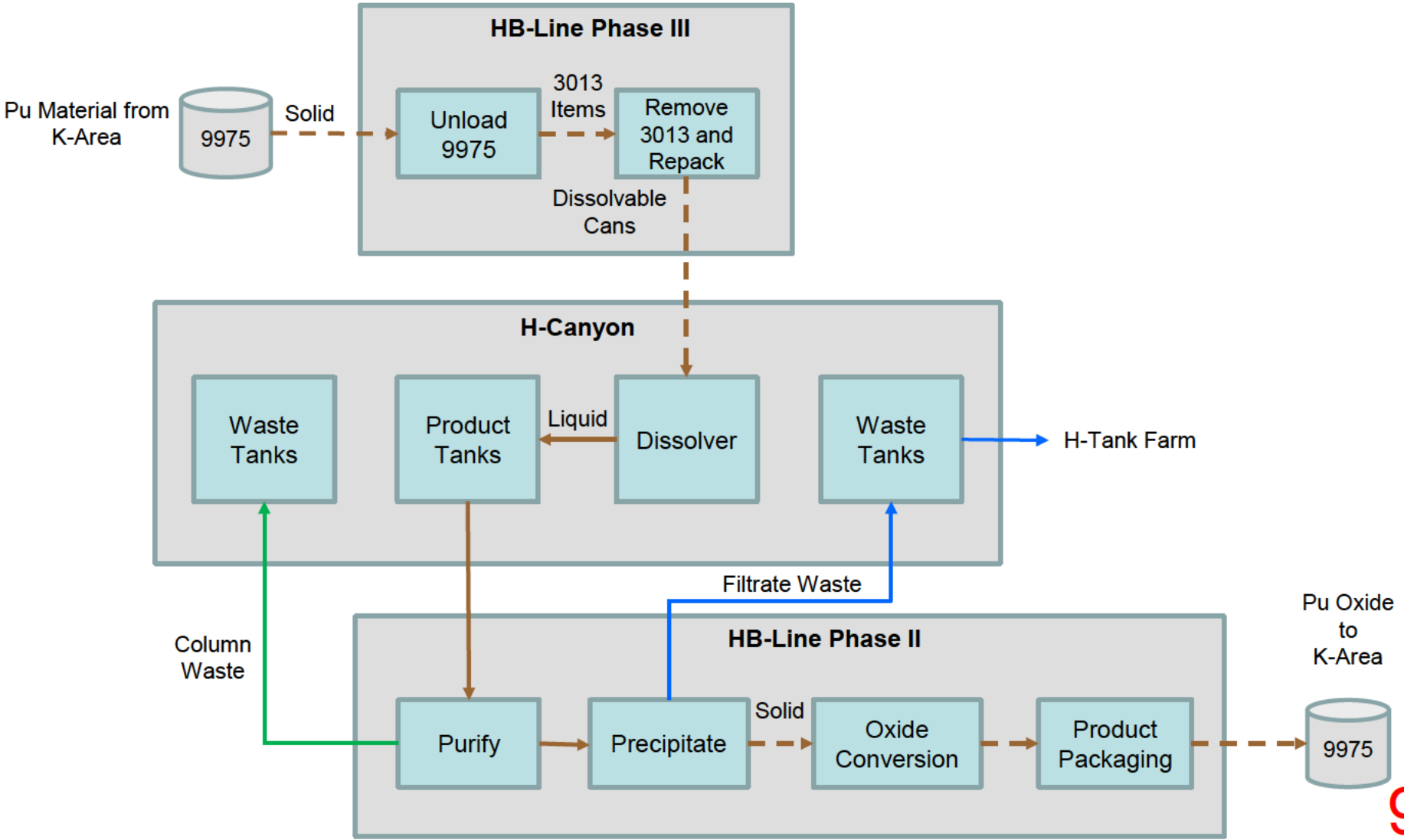
Plutonium processing for Mixed Oxide Fabrication Facility

In November 2011, the National Nuclear Security Administration (NNSA) decided to use H Area for a mission to produce plutonium oxide for its surplus plutonium disposition program using non-pit material stored in K Area:

- Prepare H-Canyon/HB-Line and support facilities for startup to produce plutonium oxide
- Reconfigure process operations to allow for full ramp up to 1 MT oxide production rate.
- Develop/implement all required safety basis documentation and required modifications, including implementation of DOE Std 3009 compliant Documented Safety Analysis/Technical Safety Requirements (DSA/TSR) for HB-Line



Plutonium Oxide Production Flowsheet



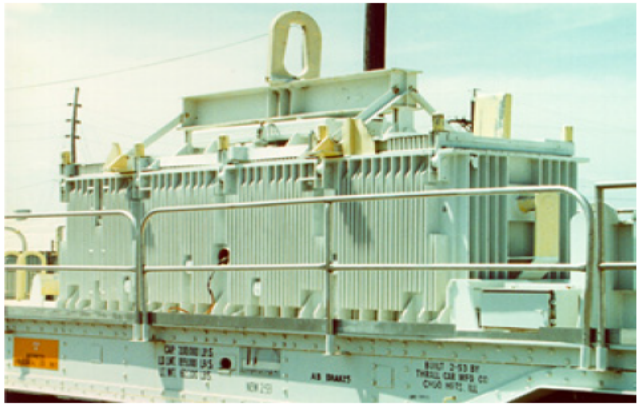
Plutonium processing for Mixed Oxide Fabrication Facility

Progress/Current Status:

- Completed multiple safety basis changes, procedure changes, training, etc.
- H Canyon continues dissolution of non-pit plutonium
- Savannah River approved the Documented Safety Analysis/Technical Safety Requirements (DSA/TSR) to support oxide production and the facility has implemented the DSA/TSR requirements including personnel training
- Savannah River completed its HB-Line Readiness Assessment and concurred the facility ready to start oxide production
- Introduced plutonium solution to the facility on August 8, 2014 and produced the first can of oxide on August 27, 2014

H Canyon – "Vulnerable" Spent Nuclear Fuel Disposition

- Completed the dissolution of Sodium Reactor Experiment (SRE) Spent Nuclear Fuel (SNF) Fuel on August 14, 2014
- SRE and other Hi Al/Low U SNF campaigned as a blend to mitigate viscosity issues of thorium-based fuel (SRE) in caustic solution
- Disposition of resulting solution directly to sludge batch tank
- Initiated transfers of the dissolved SRE and high aluminum fuel to the liquid waste sludge batch tank.



H Canyon – Spent Fuel Disposition

- DOE approved a Supplement Analysis (SA) and Amended Record of Decision (AROD) to allow the processing of a limited amount of enriched uranium Al-clad SNF
  - 1000 Material Test Reactor (MTR) Bundles
  - 200 High Flux Isotope Reactor (HFIR) Cores
- SRS initiated processing al-clad enriched uranium SNF on September 16, 2014
- SNF will be dissolved, uranium recovered, purified, down blended, and shipped for use at Tennessee Valley Authority (TVA)
- Processing the SNF identified in the AROD will generate approximately 40 metric tons low enriched uranium (LEU) and will only generate approximately 35 glass canisters

Canadian Liquid

- The material the Department is planning on bringing to the Savannah River Site from Canadian Nuclear Laboratories Limited (CNLL) (formerly Atomic Energy of Canada Limited) is the resulting solutions from the processing of the targets that contain HEU and fission products.
- Quantity of material is approximately 6,000 gallons of solution plus flush material.
- Savannah River Site will receive the HEU solution, process through H Canyon, purifying the HEU solution, and discard the fission products to the liquid waste system.
- The purified HEU solution will be down blended and shipped to Tennessee Valley Authority for fabrication into reactor fuel.

HEU Liquid Shipment

- The solution will be shipped in a spent fuel cask, International Legal Weight Transport cask
- The license application has been submitted to the Nuclear Regulatory Commission for the 4 small canister configuration and the HEU liquid content in the Legal Weight Transport cask.
- An Nuclear Regulatory Commission license/Certification of Compliance amendment and US Department of Transportation validation is required for these shipments
- It is planned that the International Atomic Energy Agency (IAEA) will apply seals to the container in Canada and the site will return the seals to CNLL or the IAEA

HEU Liquid Transportation

Short Video Clips of Cask Tests

TRUCK2.AVI

TRAIN1.AVI

Summary

- H Canyon Complex remains a unique national asset for large scale nuclear materials processing
- Completed SRE dissolution campaign in August 2014
- Initiated processing HEU Al-clad SNF on September 16, 2014
- Completed facility preparations for the startup of plutonium oxide production and produced the first can of oxide in August 2014
- Completed improvements in ventilation system
- Continue to maintain operator proficiency/equipment operability
- Continue with preparations to receive HEU liquid from Canada

H Area Complex