U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT

Update on H Area Operations

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September 22, 2015

Purpose

Nuclear Materials Committee requested a 2015 Work Plan topic on H Area:

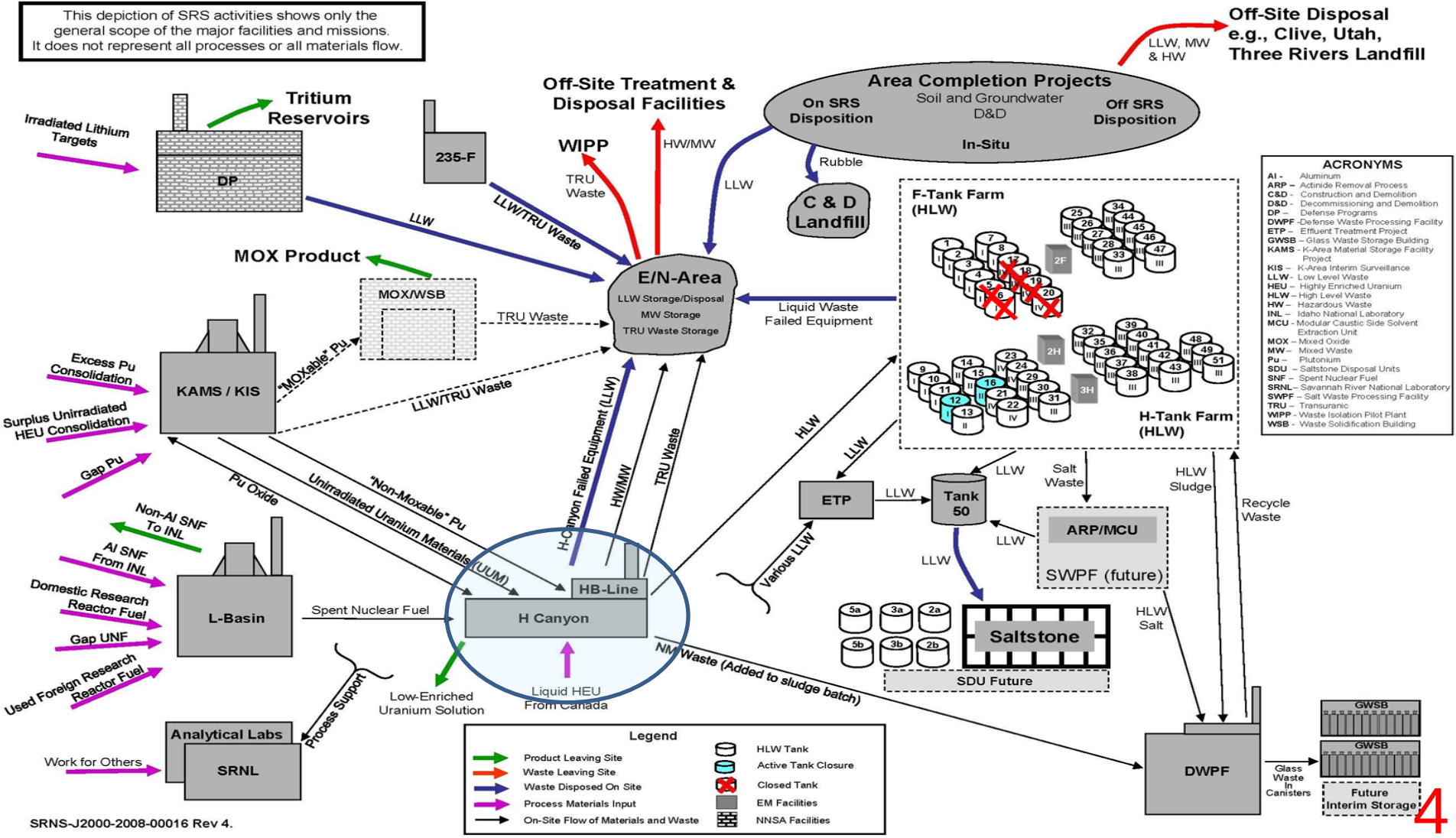
- Provide an update on H Area Operations
  - Plutonium (Pu) processing for NNSA's Pu Disposition Program
  - Highly Enriched Uranium (HEU) Spent Nuclear Fuel (SNF) Disposition via H-Canyon

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
STD - Standard
TRU – Transuranic Waste
TSR – Technical Safety Requirements
U – Uranium
WIPP – Waste Isolation Pilot Plant

Savannah River Site
Waste and Material Flow Path

This depiction of SRS activities shows only the general scope of the major facilities and missions. It does not represent all processes or all materials flow.



ACRONYMS

- **Al** - Aluminum
- **ARP** – Actinide Removal Process
- **C&D** - Construction and Demolition
- **D&D** - Decommissioning and Demolition
- **DP** – Defense Programs
- **DWPF** -Defense Waste Processing Facility
- **ETP** – Effluent Treatment Project
- **GWSB** – Glass Waste Storage Building
- **KAMS** - K-Area Material Storage Facility Project
- **KIS** – K-Area Interim Surveillance
- **LLW** - Low Level Waste
- **HEU** – Highly Enriched Uranium
- **HLW** – High Level Waste
- **HW** – Hazardous Waste
- **INL** – Idaho National Laboratory
- **MCU** - Modular Caustic Side Solvent Extraction Unit
- **MOX** – Mixed Oxide
- **MW** – Mixed Waste
- **Pu** – Plutonium
- **SDU** – Saltstone Disposal Units
- **SNF** – Spent Nuclear Fuel
- **SRNL** – Savannah River National Laboratory
- **SWPF** – Salt Waste Processing Facility
- **TRU** – Transuranic
- **WIPP** - Waste Isolation Pilot Plant
- **WSB** - Waste Solidification Building

SRNS-J2000-2008-00016 Rev 4.

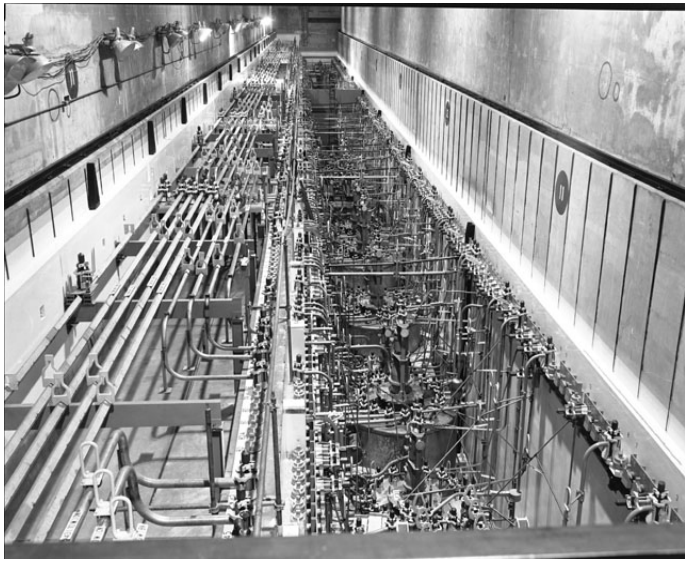
H Area: H-Canyon and HB-Line

- This year is again a very busy year for H Area
  - Continued Processing of Al-clad Spent Nuclear Fuel (SNF)
  - Readiness Assessments for the purification of the uranium from dissolved SNF
  - Pu Oxide Production
  - Recovery from the Agitator event

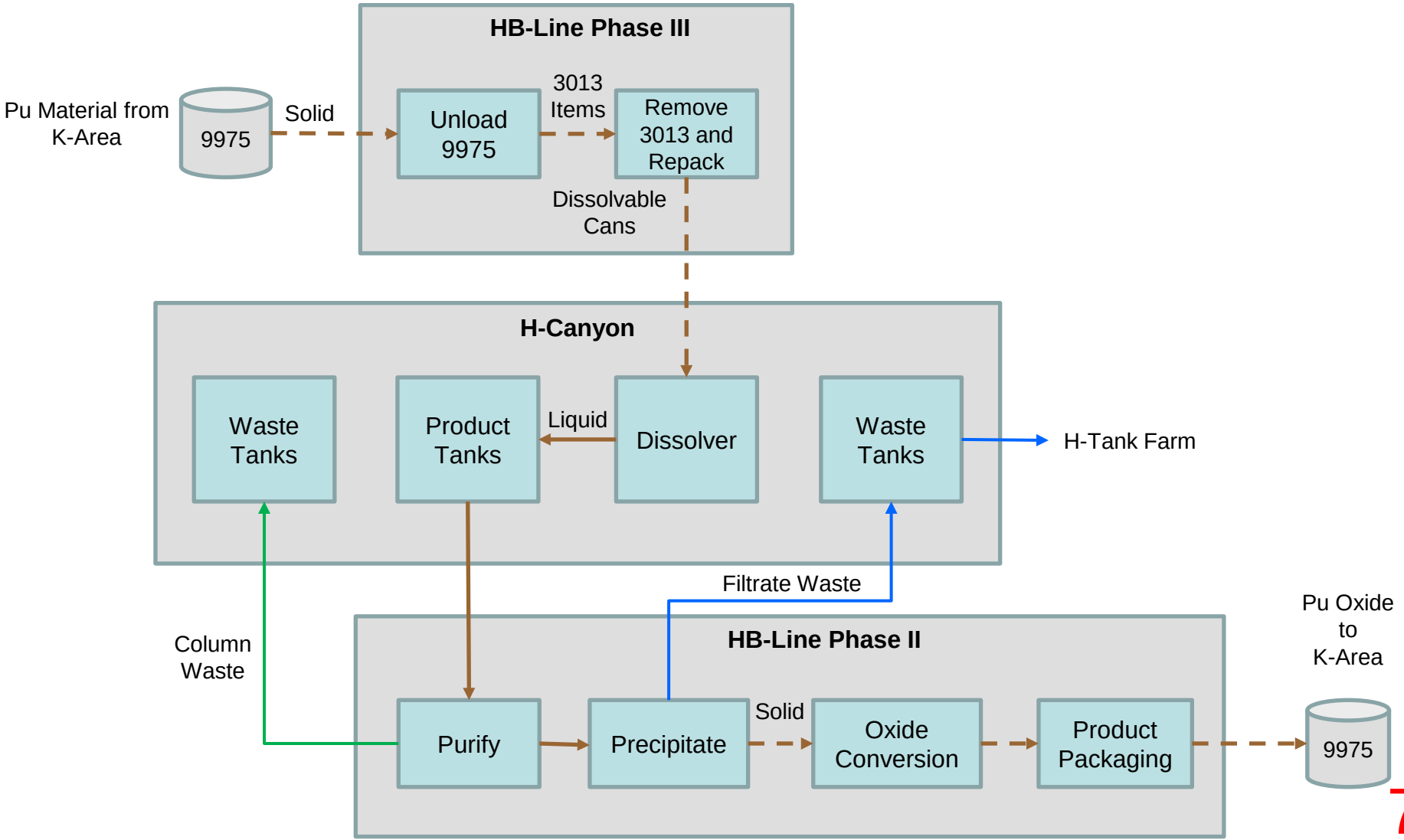
Plutonium processing for Mixed Oxide Fabrication Facility

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 and staffing to allow for ramp up in 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



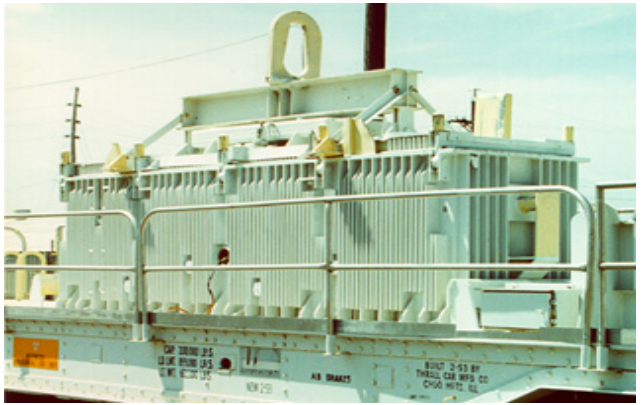
Plutonium Processing for Mixed Oxide Fabrication Facility

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 Nuclear Solutions is hiring staff to support multiple shift operations in HB-Line
- 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 – 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 up to:
  - 1000 Material Test Reactor (MTR) Bundles
  - 200 High Flux Isotope Reactor (HFIR) Cores
- SRS initiated processing al-clad 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 high level waste glass canisters
- Processed 60 bundles of Al-clad MTR SNF this fiscal year (through end of June 2015)



Canadian Target Residue Materials (Liquid)

- The Department is planning on bringing material to the Savannah River Site from Canadian Nuclear Laboratories Limited (CNLL) (formerly Atomic Energy of Canada Limited) which is the resulting solutions from the processing of targets that contain US origin HEU and fission products
- This is being conducted as part of the Material Management and Minimization Program to eliminate weapons-usable nuclear material.
- 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
- The processing of the Canadian Target Residue Materials (Liquid) will generate less than a vitrified glass canister of waste

HEU Liquid Shipment

- Solution will be shipped in a spent fuel cask, International Legal Weight Transport cask
- License application has been approved by the Nuclear Regulatory Commission for the 4 small canister configuration and the HEU liquid content in the Legal Weight Transport cask.
- 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

HB-Line Agitator Event

- Fissile limits defined in the criticality analyses were never violated
- The facility safety basis credits the thorough mixing of the solutions in HB-Line to ensure representative sample prior to transfer to H-Canyon as one of its criticality controls.
- The facility experienced a loss of power in the facility which resulted in the variable speed drives on the agitators tripping off-line without operations personnel recognition.
- After sampling, but without agitation, three transfers were made between HB-Line and H-Canyon.
- Upon discovery, operations were suspended and vessels were evaluated to ensure within established safety limits, a thorough extent of conditions was performed to ensure all credited actions could be performed, and modifications were made to assist operators in the verification of tank agitation.
- SRNS then completed a readiness assessment, SR shadowed the RA and validated closure of corrective actions, and operations were resumed on July 20, 2015.

Summary

- H-Canyon Complex remains a unique national asset for large scale nuclear materials processing
- Continues dissolution of HEU Al-clad SNF
- Performing readiness assessments to resume full facility operations
- Continue with preparations to receive HEU liquid from Canada
- Recovered from the agitator event and resume plutonium operations

H Area Complex