K Area Overview/Update

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DOE-Savannah River

Citizens Advisory Board
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Purpose

• To provide information on K-Area and Plutonium storage which fulfills a Nuclear Materials Program work plan item.
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<th>Acronyms</th>
<th>Description</th>
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<td>CCO</td>
<td>Criticality Container Over-pack</td>
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<tr>
<td>DOE</td>
<td>Department of Energy</td>
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<tr>
<td>DE</td>
<td>Destructive examination</td>
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<tr>
<td>FGE</td>
<td>Fissile Gram Equivalent</td>
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<td>KIS</td>
<td>K Interim Surveillance</td>
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<tr>
<td>LANL</td>
<td>Los Alamos National Laboratory</td>
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<td>Lawrence Livermore National Laboratory</td>
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<td>MIS</td>
<td>Materials Identification and Surveillance</td>
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<td>NDA</td>
<td>Non-destructive assay</td>
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<tr>
<td>NDE</td>
<td>Non-destructive examination</td>
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<tr>
<td>PSI</td>
<td>Pounds per square inch (gas pressure above atmospheric)</td>
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<td>Pu</td>
<td>Plutonium</td>
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<td>RFETS</td>
<td>Rocky Flats Environmental Technology Site</td>
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<td>SRS</td>
<td>Savannah River Site</td>
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<td>SRNL</td>
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<td>SWMF</td>
<td>Solid Waste Management Facility</td>
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<td>WIPP</td>
<td>Waste Isolation Pilot Plant</td>
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SRS EM Plutonium Flow Path

Key:

- AFS-2 – Alternate Feed Stock #2
- EM – Environmental Management
- KAMS – K-Area Material Storage
- MOX – Mixed Oxide
- NNSA – National Nuclear Security Administration
- Pu – Plutonium
- SRS – Savannah River Site
- WIPP – Waste Isolation Pilot Plant
- EM Activity
- NNSA Activity
• 1994 Department decided to stabilize, package and store excess plutonium until final disposition

  • Robust oxide stabilization – at least 950 °C for two hours
  • Robust packaging – two welded, nested stainless steel containers
  • Requires surveillance program to assure there is no long term degradation of containers

• Plutonium stabilization and packaging began in late 2001
  • Rocky Flats Environmental Technology Site (RFETS)
  • Hanford Site
  • Los Alamos National Laboratory (LANL)
  • Lawrence Livermore National Laboratory (LLNL)
  • Savannah River Site (SRS)
K Area Storage in 2000
K Area Storage in 2018
K Area Storage Configuration

3013 Container
(~30 lbs.)

9975 Shipping Container
(~400 lbs.)

9975 Cross-Section View
Example 3013 Container Set (SRS)
Convenience Container with Pu Oxide
Pu Oxide Transferred into Pan for Sampling
• **Surveillance and Monitoring Program approved in 2003**

• **Materials Identification and Surveillance (MIS) Working Group provides guidance and performs the technical oversite for the program**
  - Consists of technical experts from the plutonium processing sites and laboratories (SRS, Hanford, LANL, and LLNL)
  - Selects 3013 containers for Destructive Examination at SRS and evaluates the results
    - Containers selected are a combination of randomly selected containers and ones selected by the MIS based on Shelf-Life and surveillance results

• **Shelf-Life and corrosion tests**
  - Containers of plutonium-bearing materials were selected that are representative of all of the different types of materials packaged
  - Tests bound the gas generation and corrosion that might occur in actual containers
• Non-destructive examination (NDE) and destructive examination (DE) of stored 3013 containers are performed at SRS

• NDE started in 2005
  • Radiographic examination for possible pressurization
  • External examination of containers for any evidence of corrosion
  • NDE of the randomly selected containers was completed in FY2010

• DE started in 2007
  • Analyzes gas composition and measures gas pressure
  • Metallurgical examination of containers for evidence of corrosion
  • Chemical and physical analyses of the material
  • Currently examining 6 containers per year
  • Scheduled to complete randomly selected containers in FY2025
  • DE will continue as long as containers are stored at SRS

• Surveillance program has not identified any condition that would challenge the 50 year storage life

• Continue to perform Destructive Examinations in K Area and Shelf-Life program at LANL to validate storage life
Blend down Program Status

• BACKGROUND
  • Prior to 2012, SR was dissolving Pu and discarding to high level liquid waste for incorporation into high level waste glass.
  • In FY2012, Savannah River Site changed and began dry down blending with an inert agent in H Area for disposal at the DOE’s Waste Isolation Pilot Plant.
  • Due to conflicting missions and budgets, SRS terminated down blending in H Area in FY2013.
  • SRS was in the middle of shipping the down blended material to WIPP when it was interrupted in early 2014 due to fire/release at WIPP
  • SRS resumed shipments of down blended Pu to WIPP in April 2017 and SRS completed the current campaign in August 2017
Blend down Program Status

• **Status**
  
  • The Department issued a Record of Decision for the Supplemental Environmental Impact Statement for the down blend and disposal of up to 6 metric tons of surplus Pu
  
  • Due to reduction in DE surveillance, SRS resumed down blending operations in K Area in FY2016; down blending continues in K-Area utilizing a one-shift operation funded by EM
K-Area Plutonium Downblending Flowsheet

Pu Oxide Sample Returns DE Daughter Cans → KIS Glovebox

KIS Glovebox

- Puncture & Cut Open 3013 Cans/Contents
- Sieve & Size Reduce Oxide
- Add Predetermined Pu Oxide Weight into blend Cans

Load Blend Cans with Adulterant → Load Blend Cans into Blend Cans

Load Blend Cans into Blend Cans → Perform NDA on Blend Cans

Load Blend Cans into CCOs → Stage CCOs in K-Area

Perform NDA on Blend Cans

Load Blend Cans into CCOs

Perform WIPP Characterization

Load into TRUPAC-II

Ship to WIPP

Bag Out Blend Cans

Mix Blend Can Contents

Weigh Loaded Blend Cans
Plutonium Oxide in Weighing/Inspection Pan in K-Area Glovebox
K-Area Inner Blend Can
Sieving and Oxide Size Reduction

- Size Reduction Tools
K-Area Plutonium Inner Blend Can Mixer
Inner Blend Can Inserted into Outer Blend Can
Criticality Control Over-pack (CCO)
Summary

- Pu is safely stored in K-Area
- SRS continues to evaluate storage conditions to ensure safe storage
- SRS has the experienced staff and facility to handle Pu
- SRS is currently and plans to continue down blending the 6MT of EM Pu for disposal at WIPP (funding dependent)