Overview and Status Update of the Savannah River Site Building 235-F Risk Reduction Project

Randall J. Clendenning
Building 235-F Program Manager

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Purpose

- Provide an overview of Building 235-F and the ongoing Risk Reduction Activities
Building 235-F

- Building 235-F was part of the original construction at the Savannah River Site (SRS) in the early 1950s.
- The facility is a blast-resistant, windowless, two-story, reinforced concrete structure about 222 feet long, 109 feet wide, and 28 feet high with walls 14 inches thick. It is located in SRS’s F Area, near F Canyon.
Missions

It has had several production missions throughout its operational life:

• Original mission was “C-Line”. C-Line was to take Pu 239 metal and make triggers. However, the mission was cancelled before any equipment was installed. Following cancellation, the building was reconfigured for other missions.

• The first mission was the Actinide Billet Line (ABL). This line produced special billets containing Np-237 for irradiation in SRS reactors.

• The next mission was the Plutonium Experimental Facility (PEF) and the Plutonium Fuel Form (PuFF) Facility including the Metallography Laboratory (ML).

• In the mid 1970’s the building was again reconfigured. ABL was truncated and what is present day PuFF was built to include Cells 1 – 5 (east line), Cells 6 – 9 (west line), as well as, east and west maintenance rooms.

• All metallurgical processes within the building were shut down by 1990.

• The final mission was receipt, storage and disbursement of plutonium-bearing materials in support of SRS and the DOE complex. In 2006, the storage vaults for nuclear materials were emptied and the building was placed in a surveillance and maintenance mode.
PuFF

- The Np-237 billets from ABL were irradiated in SRS reactors to produce Pu-238. The reactor products were processed in H-Canyon/HB-Line and the Pu-238 separated, packaged and sent to PuFF.
- The Pu-238 was introduced into PuFF through the Cell 1 Wing Cabinet.
- Processed though PuFF from Cell 1 to Cell 9. Emerged as an encapsulated pellet of Pu-238 for use in construction of Radioisotope Thermoelectric Generators (RTG).
Products

- Hot Press Die Assemblies
- Iridium Hemisphere
- Assembled Pu-238 Pellet
- Hot Press “Punches”
- Pu-238 Sphere
Products - continued

Assembly of SRS $^{238}\text{PuO}_2$ pellets into General Purpose Heat Source module

Space Mission

Pu-238 Pellet
Risk Reduction

- At the conclusion of the PuFF Mission, work just stopped.
  - Facility deactivation did not occur
- Residual material in the nine PuFF Cells was last measured in 2006.
- About 1.5 kilograms of Pu-238 material remains in the cells.
- In a seismically induced full facility fire accident scenario the calculated unmitigated dose is about 11,900 rem onsite and 14.3 rem offsite.
- The 235-F Building is currently maintained safely in surveillance and maintenance mode.
- The project objective is to reduce the unmitigated onsite dose to less than 100 rem by reducing Pu-238 levels within PuFF.
Cells 1 and 2

- **Cells Function**
  - Introduced Pu 238 into PuFF Cell Line
  - Used Oxygen Exchange Furnace to enrich O-16 content
  - Material ball milled to extremely fine particles
  - Cold pressed to resize oxide particles
  - Cells 1 through 5 maintained in Argon atmosphere
Cell 3

- Cell Function
  - No processing occurred in this cell
Cell 4

- Cell Function
  - Oxide particles high fired \(1600^0\text{C}\) or low fired \(1200^0\text{C}\)
  - Mixed 60/40 (low fire/high fire) and pressed into spheres/pellets
  - 1978 to 1980, 250g spheres; 1980 forward, 150g pellet
Cell 5

- **Cell Function**
  - Spheres/pellets transported to Cell 6 using an under-floor belt transfer device
Cell 6

- **Cell Function**
  - Operated with a Helium atmosphere during Tungsten Inert Gas welding
  - Sphere/pellet was placed into an iridium metal shell and welded
Cell 7

- **Cell Function**
  - Primarily used to decontaminate encapsulated sphere/pellet
Cell 8

- Cell Function
  - Primarily used to decontaminate encapsulated sphere/pellet
Cell 9

- Cell Function
  - Leak testing of encapsulated sphere/pellet
  - Material exited PuFF process cell line via an air lock
  - Subsequently placed into shipping containers
Work Completed to Date

- Transient combustibles removed from the building and control program established.
- Fixed combustibles encapsulated or isolated
- De-energized electrical circuits not needed for deactivation
- Fire Detection and Alarm System installed
- Selected deactivation team based on past experience working in high hazard environments
- Developed procedures and training to support material removal from PuFF cells and wing cabinets
Work Completed to Date - continued

- Revised and implemented Safety Basis Documents to allow work in cells 1-9
- Removed outer windows on cells 1-9 to provide visibility into the PuFF cells and allow characterization to be performed from outside of the cells.
- Performed Enhanced Characterization of PuFF cells and wing cabinets.
- Developed and tested tools to be used for MAR removal including a vacuum that will be used in the cells
- Replaced 235-F process HEPA filters
- Electrically and mechanically isolated cells 1-9 and wing cabinets
Work Planned for FY 2019

- Apply an incombustible fixative inside a PuFF cell for testing and evaluation by SRNL
- Remove material and components from cells 1-5 including the wing cabinets.
- Package and characterize waste for shipment to Solid Waste
- Initiate vacuuming PuFF cells to remove remaining MAR
QUESTIONS???