Mark-18A Target Material Recovery Program: 
*Preserving Materials Critical to National Security*

Richard Meehan 
Director 
Office of Nuclear Materials Integration (ONMI) 
National Nuclear Security Administration 
U.S. Department of Energy 

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Overview

Mark-18A Target Material Recovery Program

“No other isotopic material can perform the unique function of $^{244}\text{Pu}$ in high accuracy measurements of plutonium...“

-2001 Memo signed by then Undersecretary Moniz

- Recover & preserve Pu-244 from remaining 65 Mark-18A Targets currently stored at Savannah River Site (SRS) L Basin
- Capitalizes on existing capabilities & capacity at SRS & Savannah River National Laboratory (SRNL) to execute program at lowest possible cost
- Separated material will be packaged for shipment to Oak Ridge National Laboratory (ORNL) for dry storage at the Radiochemical Engineering Development Center (REDC) pending future processing (i.e. isotopic separation)
Mark-18A Target History

• **1960’s – 1990’s**
  - 1970’s – 86 Targets irradiated in SRS K Reactor
  - 21 targets processed at ORNL to recover the Cf-252, heavy Cm, & approx. 9g of Pu-244
  - The 65 unprocessed targets remain in storage at SRS L-Basin

• **2000’s**
  - Scientists at DOE Laboratories, NIST, IAEA, & other international laboratories become concerned with limited availability of separated Pu-244
  - Need for more Pu-244 became clear
  - Strong case develops for preservation of Mk-18A targets

• **2013-14**
  - NNSA’s Office of Nuclear Materials Integration (ONMI) initiates action
  - ORNL/SRNL developed Program Management Plan

• **2015**
  - ONMI establishes project in cooperation with SRNL & ORNL
  - Targets to be processed in hot cell facility on site at SRNL
Recoverable Isotopes

- **Target Isotopic Content**
  - Major quantities identified when processing the original 21 targets
  - Pu-240, 242, & 244
  - Heavy Cm
  - Other mixed fission products

- **Demand & Use**
  - Pu-244 used in High-Precision Sample Analysis in Nuclear Forensics & International Safeguards\(^1\)
  - Current supplies of Pu-244 are limited - Stocks held closely by U.S. laboratories
  - Heavy Cm critical to the production of Cf & many other heavy isotopes\(^2\)

“If the Mark-18A Targets were to be disposed of without separation & recovery of Pu-244, the United States would risk losing measurement capabilities that are essential to maintaining an active safeguards posture in current & future world affairs“

- (Moniz, 2001)

1. Moniz, Excess Material Disposition Decision Memorandum No. 3, 2001
2. NNSA, Material Specific Management Plan For Californium 2015
Project Objective: Preserve Pu-244, & other materials of interest as identified in the Mark-18A targets, for future use.

Project Approach:

**Phase I**
- SRS/SRNL & ORNL Process reconfiguration & documentation to prepare for material recovery

**Phase II**
- Retrieve targets from SRS L-Basin & transport to SRNL Shielded Cells Facility
- Process targets in the SRNL Shielded Cells Facility, convert to oxide
- Transport recovered material to ORNL

**Phase III**
- Package & dispose of the secondary waste material
- Plutonium available to end user community

Shipments stored in existing ORNL REDC facilities

Recovery Program Utilizes Existing Capabilities
- **NNSA Baseline funding:** ~ $4.2 M/yr
- **Program Management**
  - ONMI Program Manager oversees recovery program
  - Work executed by Sites
  - ORNL Heavy Isotopes Lead Materials Management Organization (LMMO) supports ONMI by integrating all aspects of program; tracks & reports integrated schedules & deliverables
- **Schedule**

  ![Program Schedule Diagram]

- **Recent Milestones**
  - Program Execution Plan & Risk Register developed
  - Design for transportation cask nearly complete
  - Preliminary Hazards Analysis Package complete
  - Computer simulation on target material is complete - Non destructive assay validation scheduled for this year
Questions?