Citizens Advisory Board
Nuclear Materials Committee

Plutonium Surveillance Program at the Savannah River Site

H. Allen Gunter

Senior Technical Advisor

Assistant Manager

Nuclear Material Stabilization Project

Savannah River Operations Office

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PURPOSE

- DOE-STD-3013 provides for safe, stable storage of Pu metal and oxide for up to fifty years.
- Surveillance program is required by DOE-STD-3013.
- Surveillances are conducted to ensure continued integrity of 3013 containers during storage and funded under PBS-11C.

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Acronyms

- Pu Plutonium
- DOE Department of Energy
- MT Metric Tons
- STD Standard
- DNFSB Defense Nuclear Facilities Safety Board
- NDE Non-destructive Examination
- DE Destructive Examination
- DWPF Defense Waste Processing Facility
- MFFF Mixed Oxide Fuel Fabrication Facility

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Background

- In early 1990's, DOE suspended weapons production operations
  - no long-term plans for storage or disposition of surplus Pu (>50 MT) and other nuclear materials
  - Pu materials in various forms (pits, metal, oxide, residues, scrap, solutions)
  - safety issues associated with storage
- DNFSB Recommendations (1994-1 and 2000-1) identified need for stabilization and safe storage of nuclear materials.
- DOE developed DOE-STD-3013 for long-term storage.

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DOE-STD-3013

- Scope
  - Pu plus Uranium (>30 wt%)
  - Storage for up to 50 years (3013 container)
  - Assurance of safety via a surveillance program (non-destructive exam (NDE) and destructive examination (DE))

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DOE-3013 Standard (cont)

- Stabilization
  - Metal
    - » Brush off oxide
    - » No small pieces less than 50 grams
  - Oxide
    - » Crush material
    - » Heat to 950°C for minimum of two hours in oxidizing atmosphere
      - Removes moisture
      - Removes organics
      - Reduces particle surface area
    - » Package in dry atmosphere with helium

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DOE-3013 Standard (cont)

- Packaging
  - Two nested, welded, leak-tight containers
  - Compatible with material to be stored
  - Outer container must pass 30 ft drop test
  - Outer can must be capable of being designated Safety Class

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DOE-3013 Standard (cont)

- Surveillance
  - Surveillance and Monitoring program approved 2003 by DOE-EM1
  - NDE looks for pressurization
    - » Began 3 years after packaging (2005)
    - » ~ 40 per year
  - DE looks for corrosion, gas analysis, and material characteristics
    - » Began 5 years after packaging (2007)
    - » ~ 15 per year

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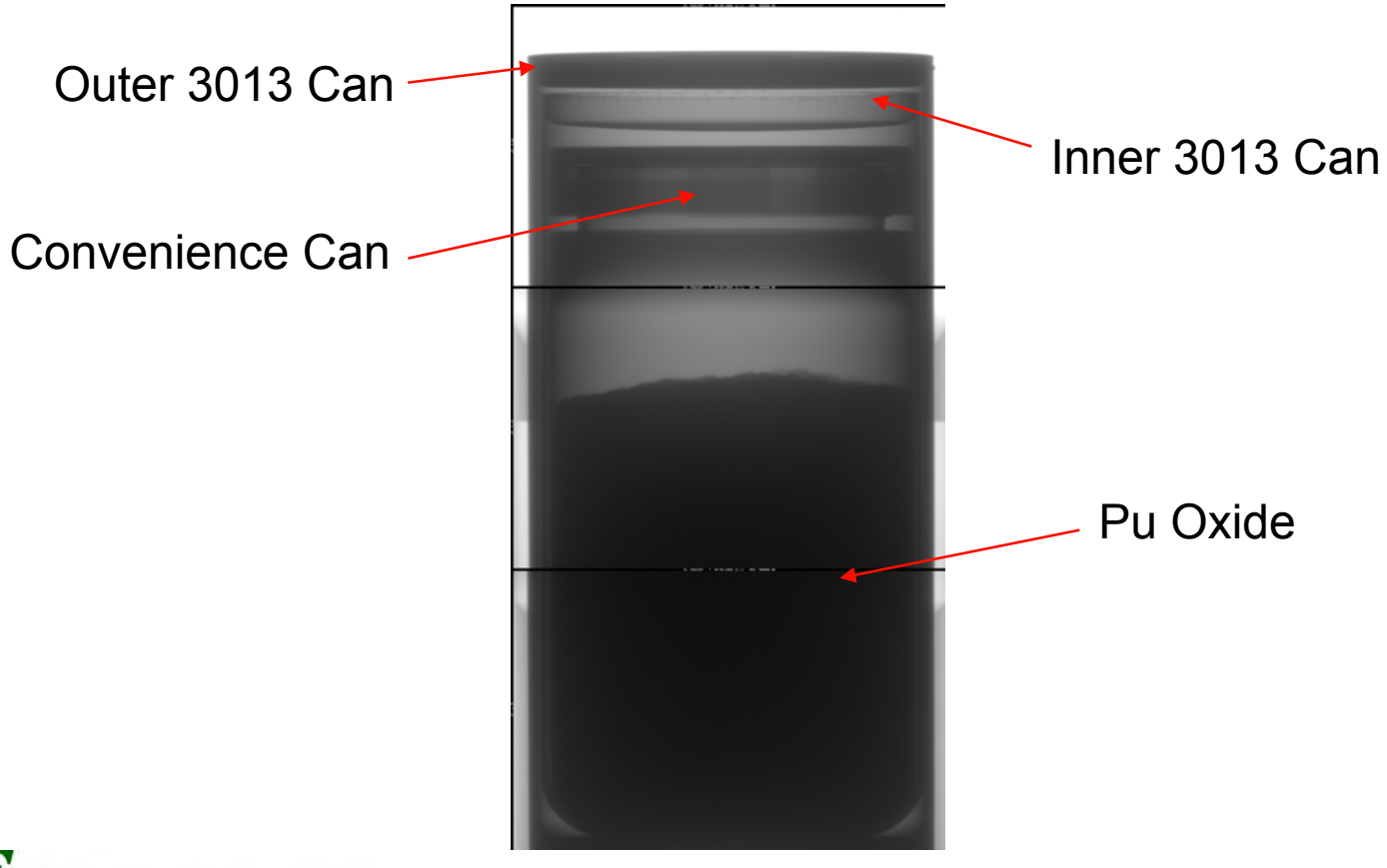
DIGITAL RADIOGRAPHY



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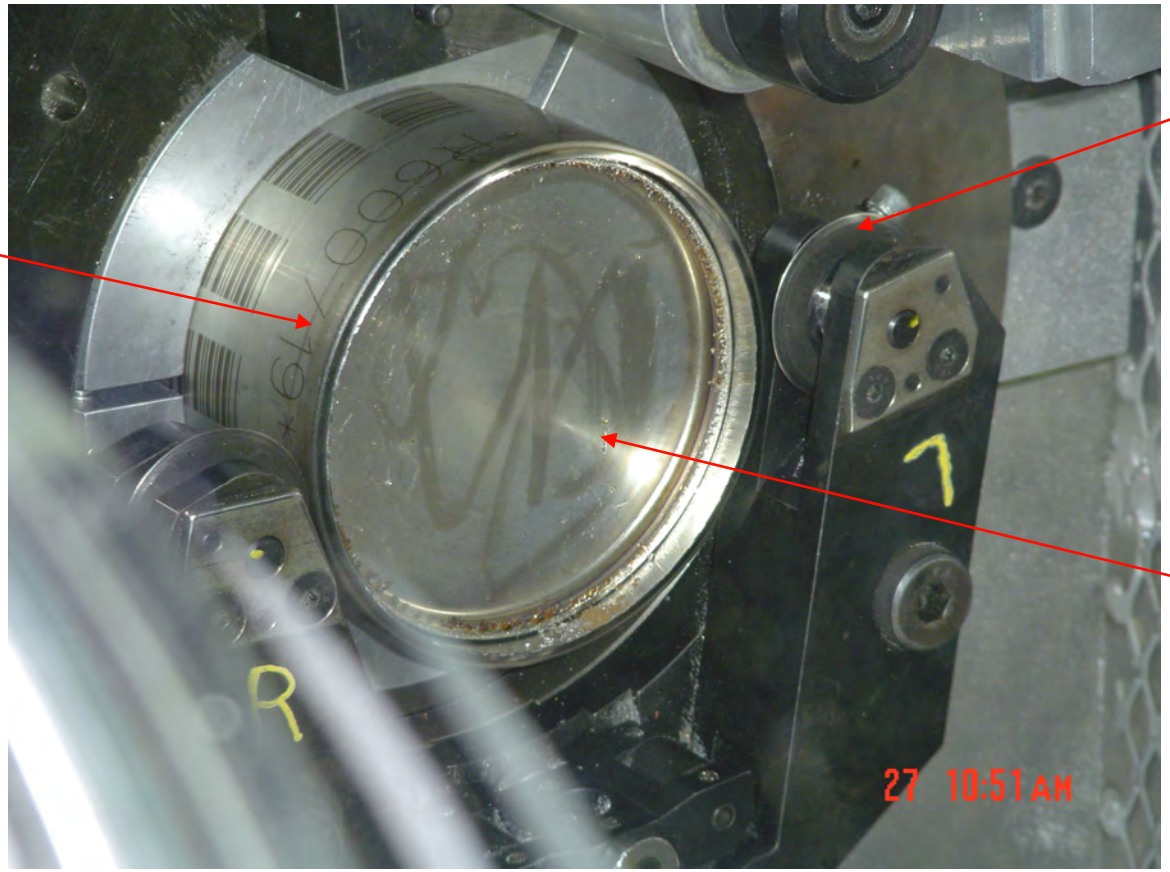
CAN PUNCTURE DEVICE

Gas Sample Vessel

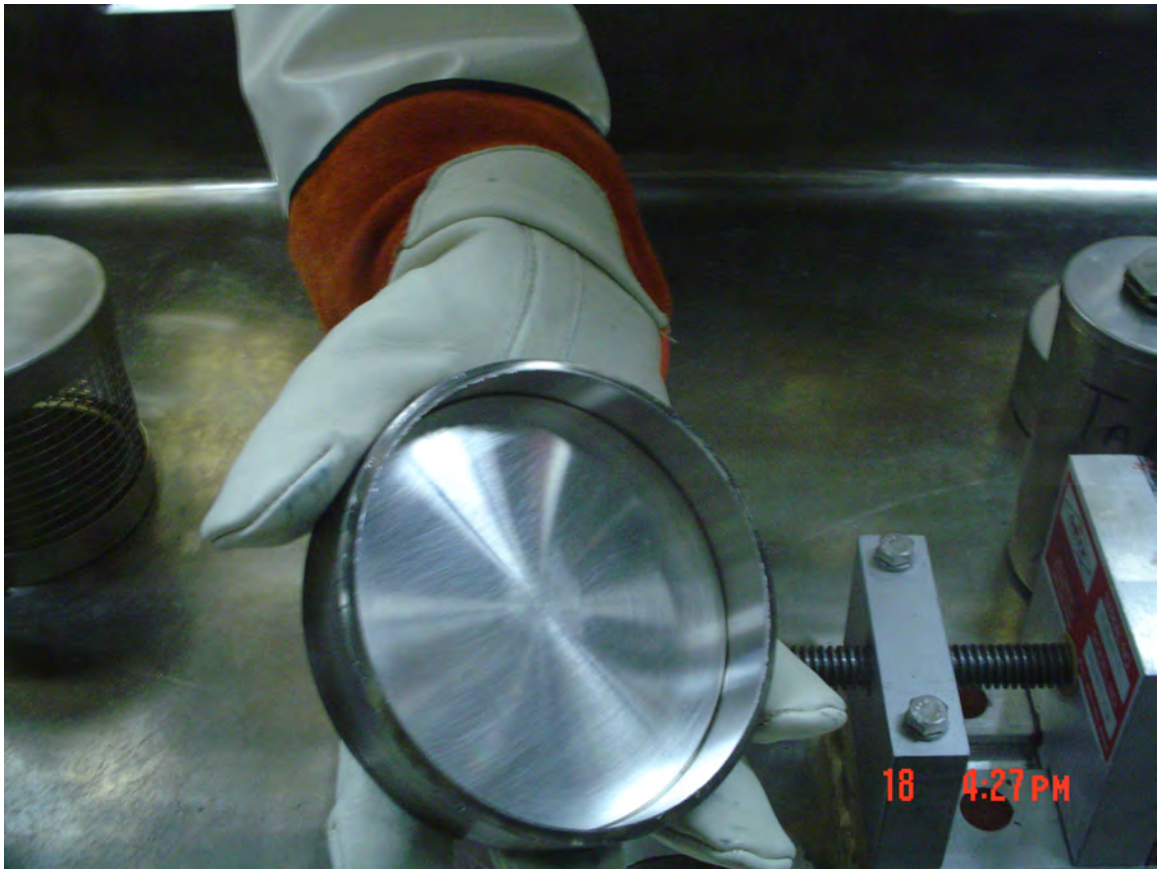
Drill

Pressure Chamber

CAN CUTTER



CUT OUTER LID



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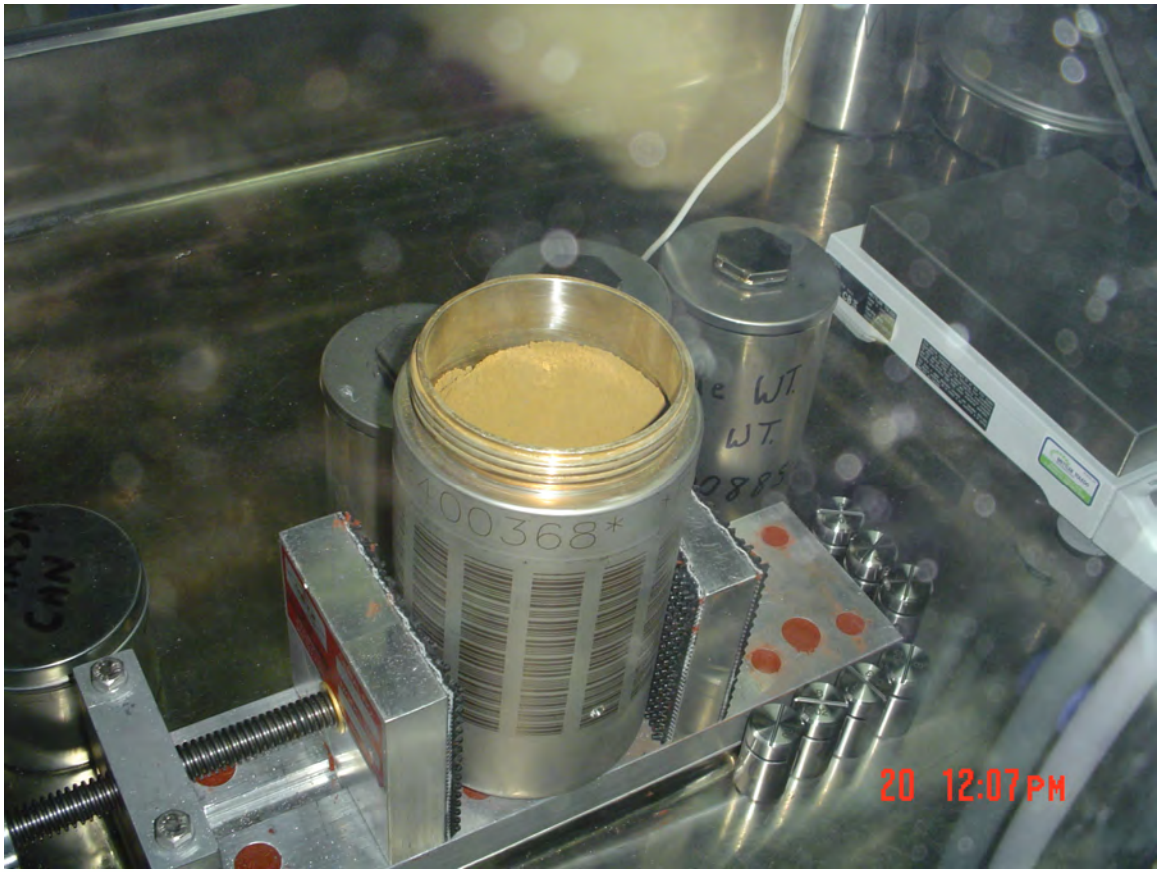
Pu OXIDE IN CONVENIENCE CAN



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Pu OXIDE IN WEIGH PAN

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Surveillance Program Results

- Non-Destructive Examinations
  - Containers are intact
  - No visible signs of corrosion on outer can
  - No contamination on outer surface
  - No measurable pressure identified via Radiography
  - No degradation impacting performance of the 9975 shipping container
    - O-rings
    - Fiberboard

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Surveillance Program Results

- Destructive Examinations
  - Maximum measured pressure has been less than 15 psig compared to theoretical maximum pressure of 699 psig
  - No flammable gas mixtures (hydrogen with no oxygen)
  - Minimum surface corrosion of convenience can
  - No degradation of inner or outer can

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Summary

- Material and packaging performing as predicted in the standard.
- Surveillance program has identified no safety issues that challenge 50 year storage.
- Site will continue to validate safe storage with on-going surveillance program.

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