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Off-Site Source Recovery Program Overview

Frank Cocina

OFF-SITE SOURCE RECOVERY PROGRAM
NATIONAL SECURITY THROUGH SOURCE REMOVAL

National Nuclear Security Administration

Global Material Security

LA-UR-20-22903

Introduction

- Radioactive sealed sources have been in general use for more than 100 years.
- Not all sources owned by licensees have a commercial disposal pathway.
- For over 20 years the OSRP mission has been to remove those unwanted radioactive sealed sources that pose a potential risk to national security, public health and safety.

OSRP does not recover powders, liquids, or loose/diffuse radioactive material. The program is limited to discrete sealed sources with rad material in solid form.

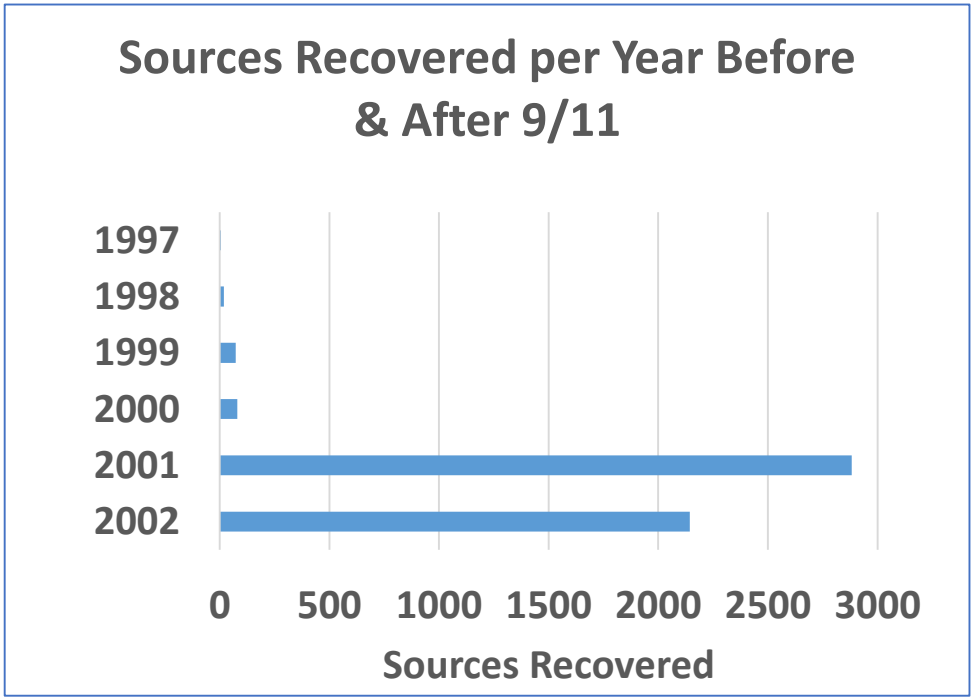
Origin of OSRP

- Pre-1994: Need for end-of-life source management was identified and the Radioactive Source Recovery Program (RSRP) was conceived in 1994
- 1997 RSRP pilot recovery operation demonstrated that such work can be done in a safe, effective, compliant, and cost-effective way.
- DOE introduced the "Off-Site Source Recovery Project" (OSRP) in a memo to the LANL Director on November 15, 1998.

OSRP has been recovering disused sealed radioactive sources for over two decades!

The Influence of 9/11

- In the four-year period from Sept. 1997 to Sept. 2001, OSRP removed a total of just 1,599 sources.
- In the one-year period from Sept. 11, 2001 to Sept. 11, 2002, OSRP successfully removed 2,667 radioactive sealed sources.
- 9/11 triggered a 500% increase in annual source recoveries.
- Since 2001, OSRP has continued to recover an average of about 2,100 disused sources each year.



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Programmatic Summary

- OSRP is sponsored by the NNSA Office of Radiological Security.
- OSRP provides assistance to many organizations.
- The OSRP team is made up of a dozen full-time experts in source recovery, source identification, packaging and transportation, health physics, radiation protection, and disposal.
- We maintain the only capability for disposal of sealed radioactive TRU sources at WIPP.

OSRP collaborates with other national laboratories and commercial vendors for high-activity removals, Type B container operations, and waste certification.

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OSRP Recovery Summary

OSRP Mission:

Over two decades of recovering excess, unwanted, abandoned, and orphaned radioactive sealed sources in the interest of national security and public health/safety.

- To date, OSRP has contributed to national and global security by removing more than 43,000 radioactive sources, totaling over 1.35 million Curies *(49,997 TBq)* of material.
- OSRP has removed sources from all 50 states and 27 countries worldwide.

Isotope	Sources Recovered	Curies Recovered*
^{60}Co	6,741	340,931
^{90}Sr	303	640,567
^{137}Cs	5,404	333,862
^{238}Pu	2,537	16,118
^{239}Pu	1,186	1,337
^{241}Am	24,557	17,519
All Others	2,986	399
TOTALS	**43,735**	**1,350,734**

**Activity upon recovery*

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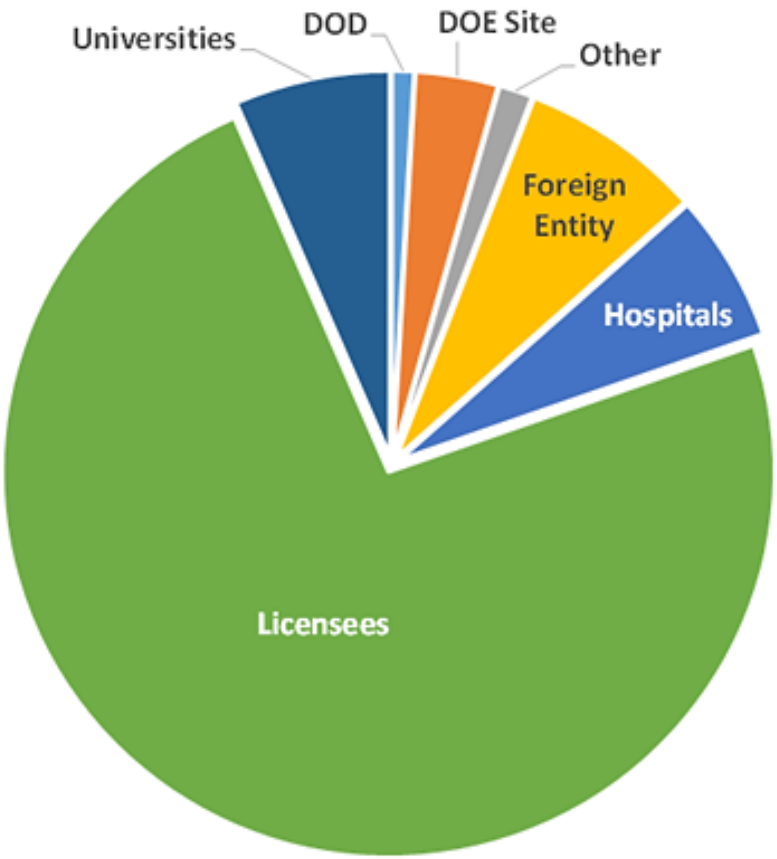
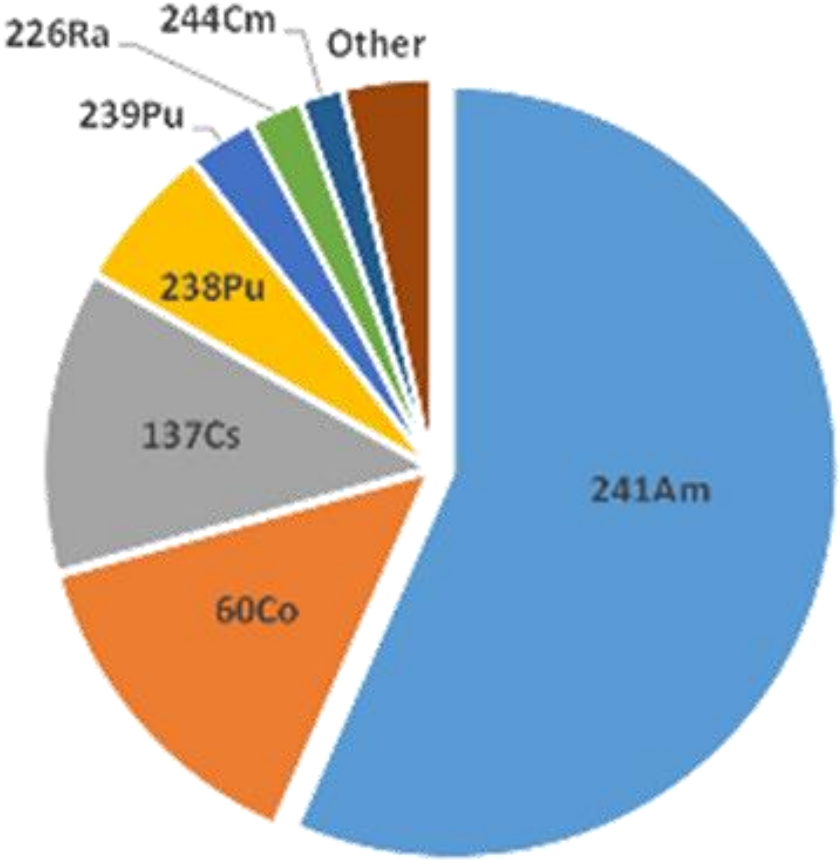
Facility & Isotope Types





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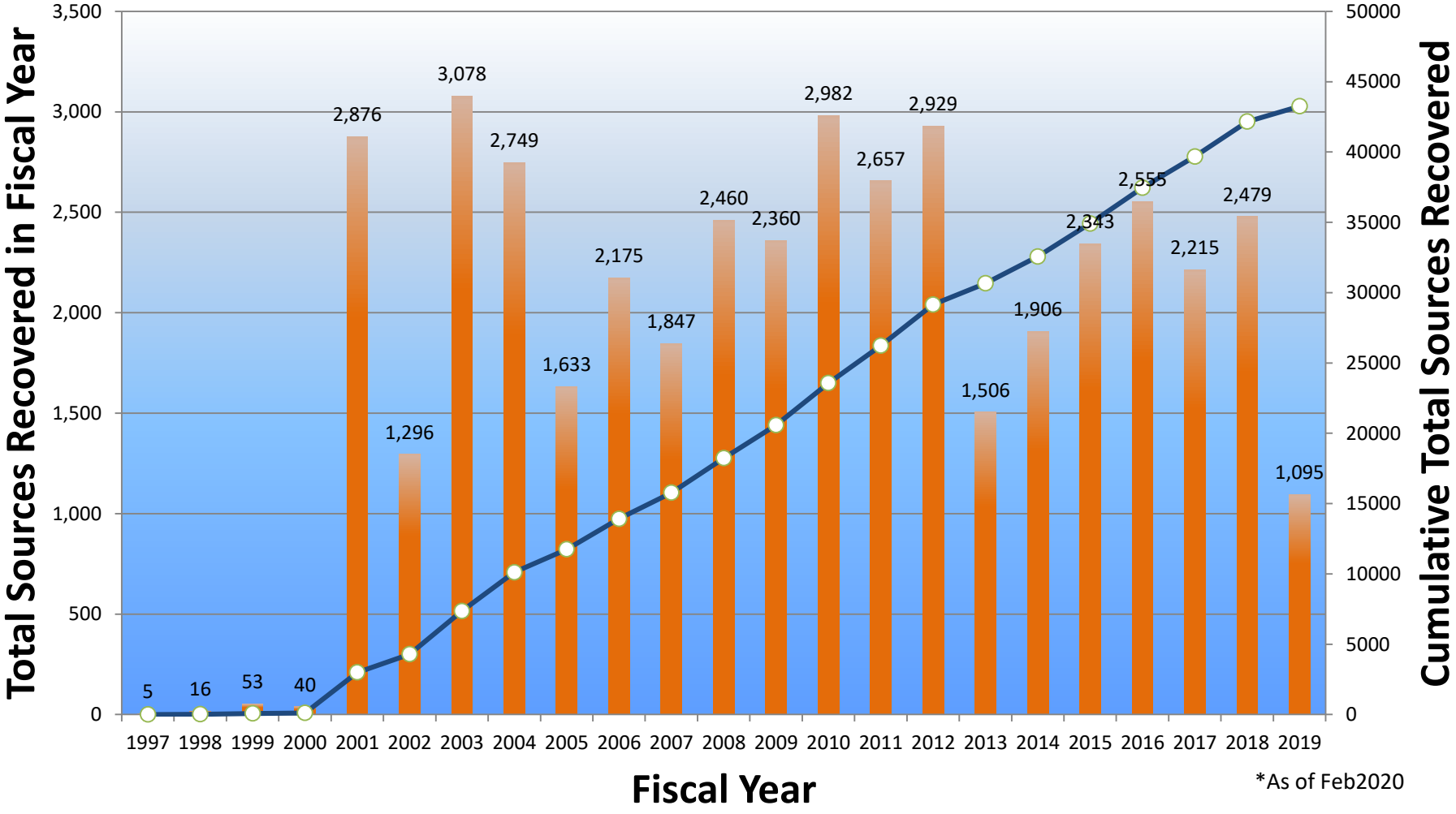
Recoveries Over the Years



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Source Recovery Operations

- Beyond LANL and the DOE/NNSA complex, sealed radioactive sources are used in several applications:
  - industrial devices (moisture-density, thickness gauges etc.),
  - medical devices (blood irradiators, radiotherapy, nuclear medicine),
  - research facilities,
  - universities,
  - nuclear power plants, etc.
- The team works with NRC and Agreement State licensed facilities such as private companies, universities, hospitals, and other governmental sites.
- For international recovery missions, the team works with foreign source owners and directly with their in-country regulators. We also coordinate with the IAEA.

Work is Conducted Off-Site

- OSRP staff travel the US and the world to successfully complete their mission.
- Off-site activities have been successfully completed at nuclear power plants, DOE and NNSA facilities, military bases, naval yards, commercial and industrial locations, and several foreign entities.
- Each location is different, so recoveries are individually structured to implement controls commensurate with the nature of the radiological packaging activities performed–in collaboration with the sources owner/licensee.

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High-Activity (Category 1 and 2) Beta-Gamma Recoveries

Domestic Recoveries

- Prioritized based on current activity and level of security.
- Primarily blood and research irradiators, some teletherapy
- From medical institutions, universities, and various industries.
- Typically 10 to 20 device removals per year

Cesium Irradiator Replacement Project (CIRP)

- Prioritized based on x-ray replacement agreement with NNSA
- Primarily blood and research irradiators, some teletherapy
- From medical institutions, universities, and various industries.
- Demand has increased from 2 to 70 device removals per year.

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High-Activity (Category 1 and 2) Devices Commonly Recovered by OSRP

- Blood and Research Self-Shielded Irradiators
  - Primarily Cs-137 and Co-60
  - Typically 4.81TBq (130Ci) to 148TBq (4,000Ci) decayed

High-Activity Beta/Gamma Devices

Gammacell 1000

Isotope: Cs137
Max. Activity: 3,246Ci
Weight: 3,000 lbs

Gammacell 3000

Isotope: Cs137
Max. Activity: 3,246Ci
Weight: 3,500 lbs

IBL 437c

Isotope: Cs137
Max. Activity: 5,610Ci
Weight: 4,450 lbs

Gammacell 40

Isotope: Cs137
Max. Activity: 4,200Ci
Weight: 7,000 lbs

Gammacell 200/220

Isotope: Co60
Max. Activity: 26,400Ci
Weight: 8,250 lbs

J.L. Shepherd 143

Isotope: Cs137
Max. Activity: 3,300Ci
Weight: 2,000 lbs

J.L. Shepherd Mark 1

Isotope: Cs137
Max. Activity: 22,500Ci
Weight: 3,000 lbs

Theratron 780

Isotope: Co60
Max. Activity: 13,400Ci
Weight: 5,500 lbs

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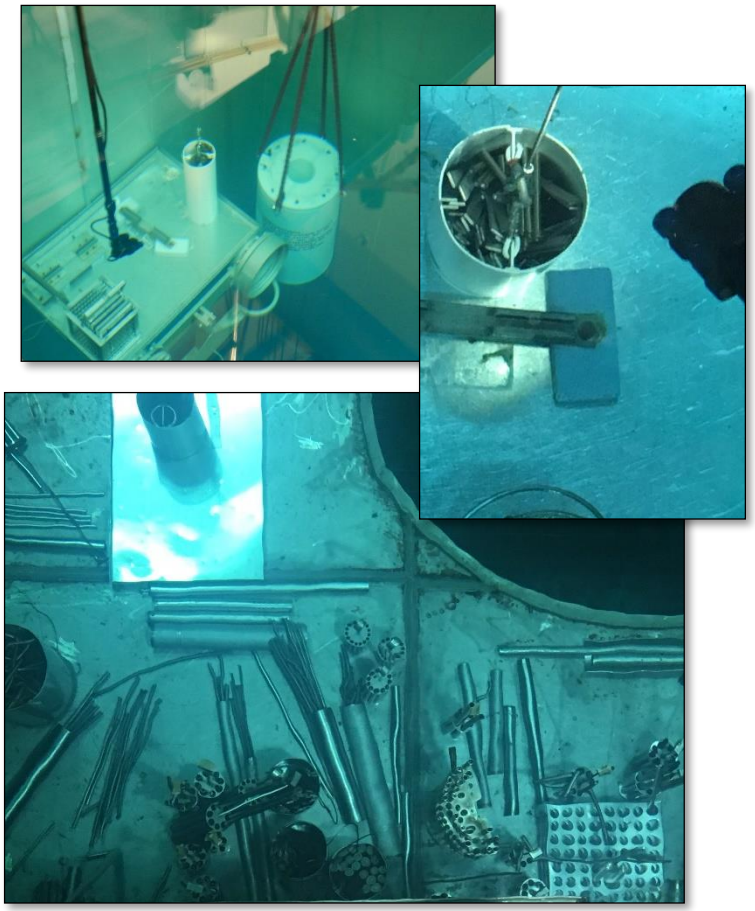
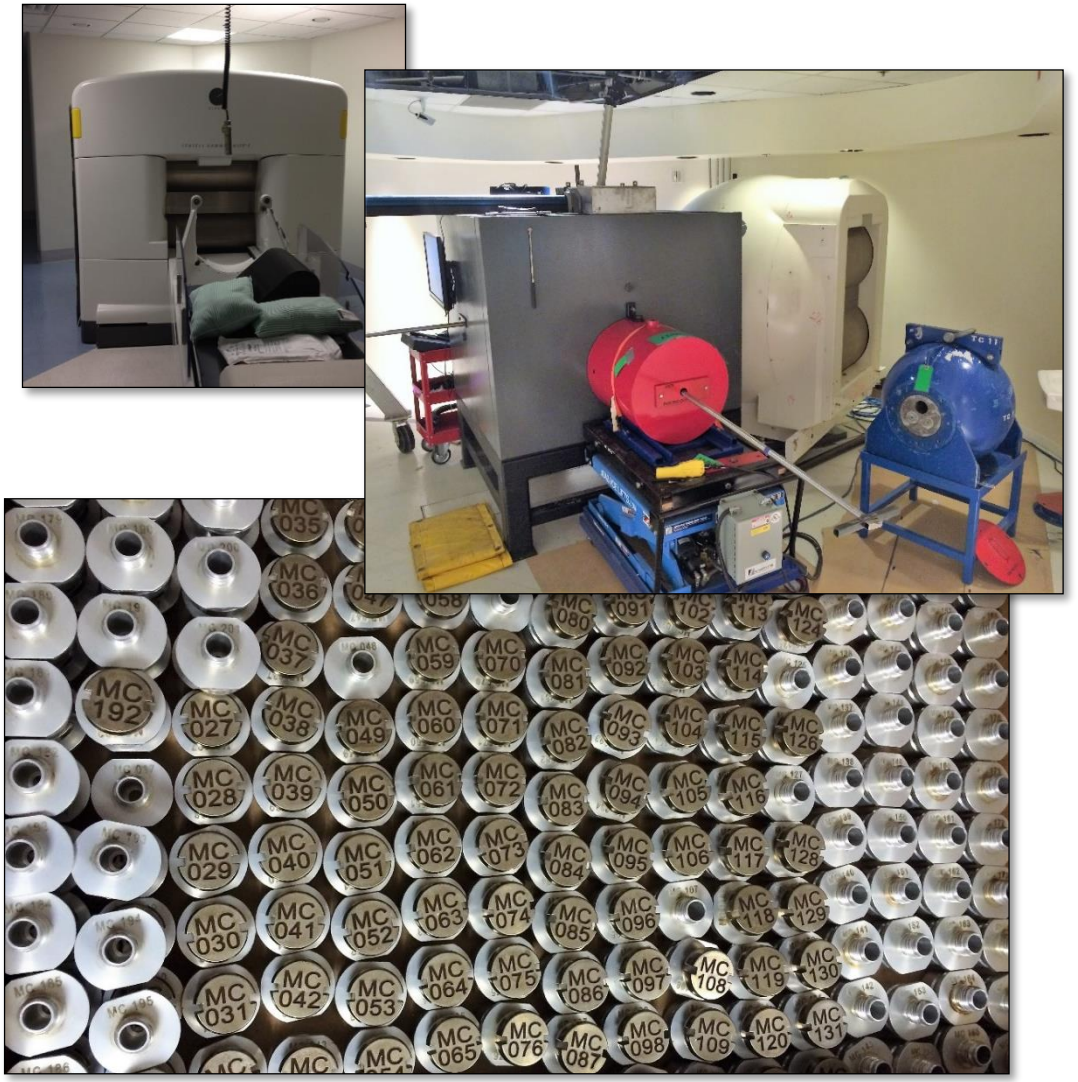
Other, Less Common, Removals



Pool Irradiators/Source Storage



Gamma Knife

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High Activity Removal Options

Commercial Vendor Responsible for Transportation

- Commercial vendor removes device from licensee facility and prepares it for shipment.
- Commercial vendor is a registered user of a commercially available U.S. NRC-certified Type B container.
- Commercial vendor acts as shipper of record and is responsible for transportation security.
- Ownership transferred upon receipt at consolidation facility.

Nordion F-431
USA/9310/B(U)-96

NPI-20WC-6 MkII
USA/9215/B(U)-96

DOE National Laboratory Responsible for Transportation

- Commercial vendor removes device from licensee facility and prepares it for shipment.
- DOE-owned and operated Type B container used for shipment.
- DOE/Lab acts as shipper of record and is responsible for transportation security.
- DOE-ownership is taken prior to the shipment.

435B
USA/9355/B(U)-96

CNS 10-160B
USA/9204/B(U)F-96

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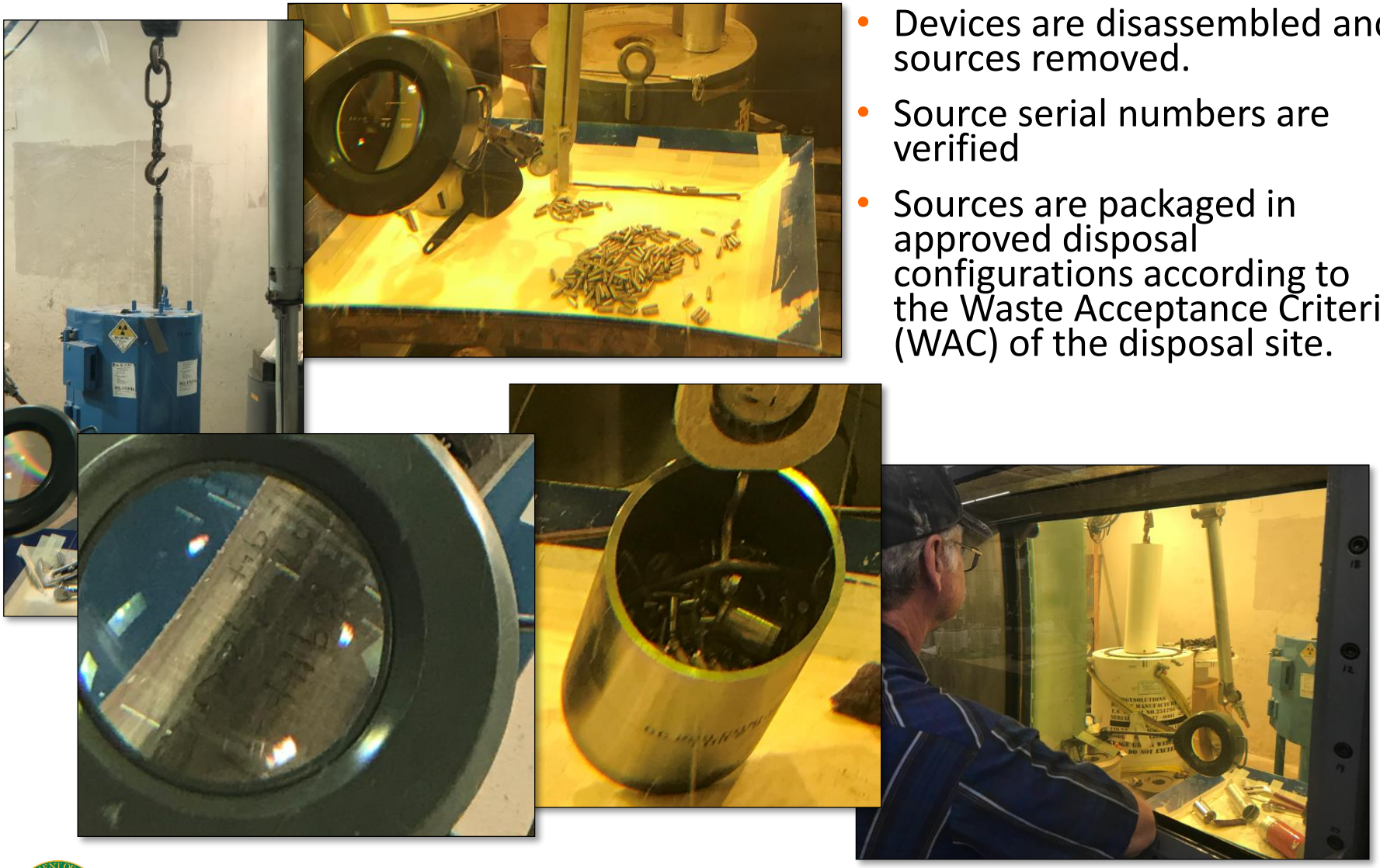
Consolidation for Disposal



- Devices are disassembled and sources removed.
- Source serial numbers are verified
- Sources are packaged in approved disposal configurations according to the Waste Acceptance Criteria (WAC) of the disposal site.

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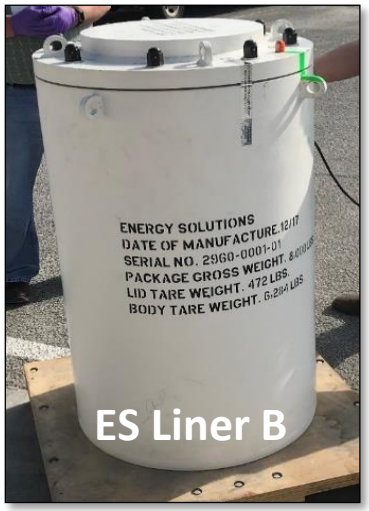
Disposal Packaging

Current Disposal Containers

- Energy*Solutions* Disposal Liner A and B
  - 7” Lead Shielding
  - Authorized Content in the 10-160B
  - 999TBq (27kCi) Cs137 / 352TBq (9.5kCi) Co60
  - Wet- or dry-load capability
  - Large physical payload space
- GammaCell 200 and 220 Shields
  - Repurposed shields from blood/research irradiators originally loaded up to 851TBq (23kCi) Co60.
  - Authorized Content in the 10-160B
  - 999TBq (27kCi) Cs137 / 333TBq (9kCi) Co60
  - Dry-load capability
  - Smaller physical payload space



Disposal Shipments

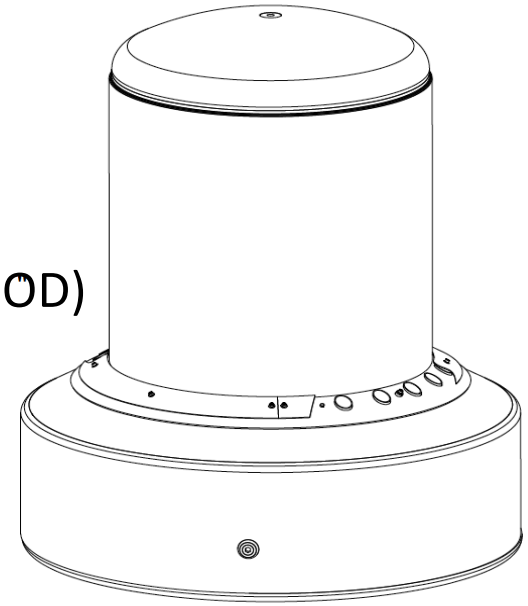
- Liners are surveyed for DOT and WAC requirements and loaded into the DOE-owned 10-160B Cask.
- DOE personnel act as Shipper of Record on disposal shipment to a secure DOE facility.

Type B Container Development

- In 2009, NNSA recognized that, due to new regulations, many commercial Type B container were no long certified for shipments.
- This limited the number available Type B containers and increased the costs of Type B shipments while demand was increasing.
- In response, NNSA and OSRP began work on two type B containers in 2009.
  - The 435-B, a smaller, non-shielded over-pack type container
  - The 380-B, a large, shielded over-pack.

435-B Design

- Based on previously certified containers.
- Design criteria/parameters
  - Leak-tight – Normal Condition of Transport (NCT) and Hypothetical Accident Conditions (HAC)
  - Transport by truck, rail, ship, air
  - External dimensions 82” H x 70” Outside Diameter (OD)
  - Internal Cavity 60” H x 43” Inside Diameter (ID)
  - Gross weight 10,100 lb (4,581 kg)
  - ~13,000 Ci Co-60, 200 Watts



- For transportation of
  - Shielded devices with Cs-137 or Co-60 – max weight 3,505 lb
  - IAEA Long Term Storage Shield (LTSS) – custom lodgment
  - LTSS Cs, Sr, Ir, Se, Ra, Am, Pu and small neutron sources
  - Disposal liners, pending certification and fabrication

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435-B Testing

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435-B First Recovery: March 2018

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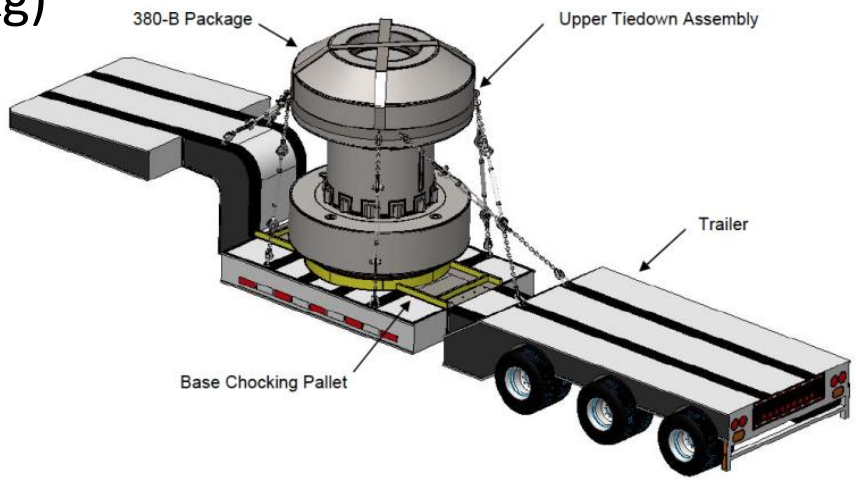
380-B Design

- Shielded transport container for devices that may not be certified for shipment in other containers and/or documentation is not available
- Design criteria/parameters:
  - Leak tight – Normal Condition of Transport (NCT) and Hypothetical Accident Conditions (HAC)
  - Transport on dedicated trailer
  - External dimensions 118” height by 100” OD (including impact limiters)
  - Internal Cavity 48.6” height by 38” ID
  - Gross weight 67,000 lb (30,390 kg)
  - Approximately 7,700Ci Co-60
- Currently in fabrication, scheduled to be completed summer 2019



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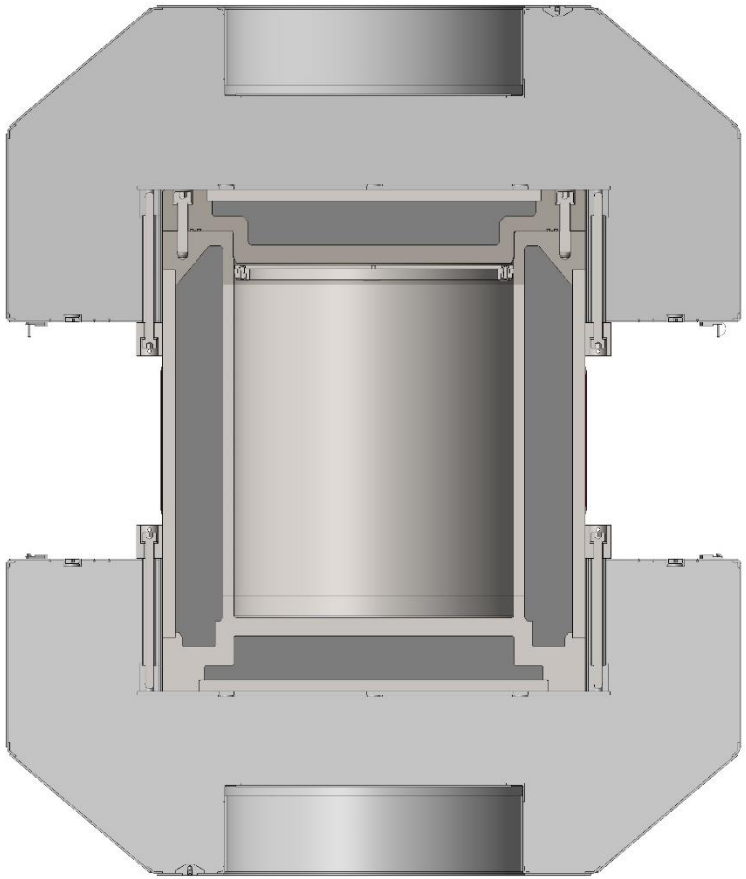
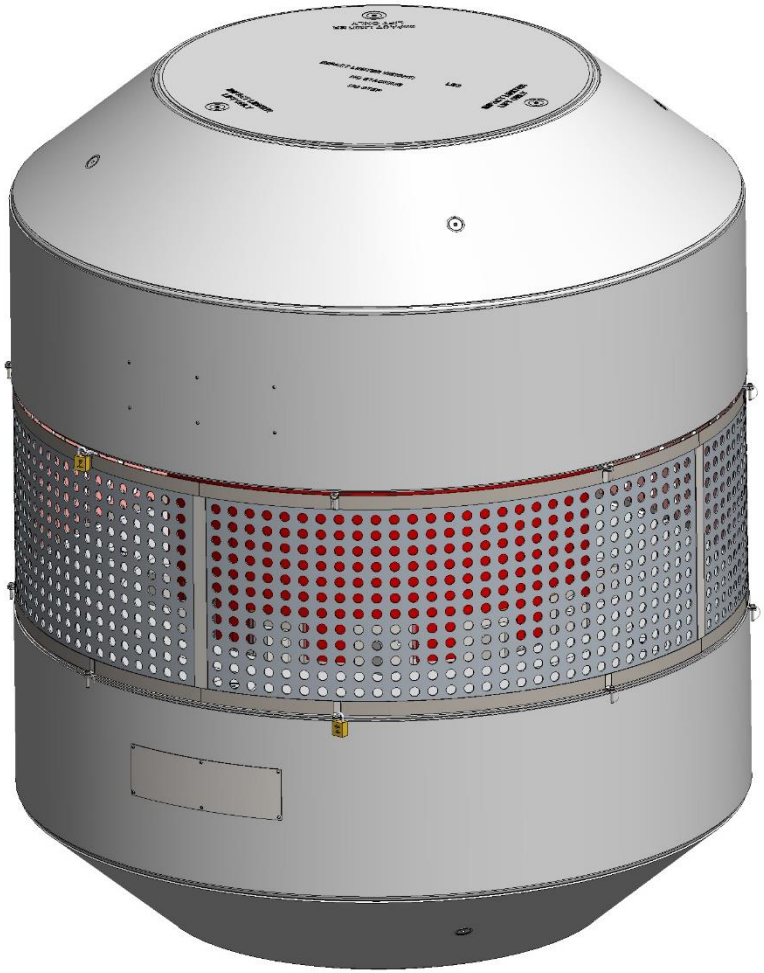
380-B Design





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Questions?

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