

Y-12 Supply of High Assay Low Enriched Uranium

AND

Overview of the Uranium Lease and Take-Back Program

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The Y-12 National Security Complex (Y-12) downblends highly enriched uranium (HEU) to produce high assay low enriched uranium (HALEU). The HALEU is cast, sampled, sized, and packed to the Y-12 Standard Specification Low Enriched Uranium Metal Supply to Research and Test Reactors.

In 2012, Congress passed the American Medical Isotopes Production Act (AMIPA), which directed the National Nuclear Security Administration (NNSA) to establish a technology-neutral program to support the establishment of domestic supplies of Mo-99 without the use of HEU. Per AMIPA, the Uranium Lease and Take-Back Program (ULTB) is managed jointly by the NNSA and the Department of Energy's Office of Environmental Management. Under this program, NNSA makes HALEU available through lease contracts for the production of Mo-99 for medical uses. Y-12 assists in developing and executing HALEU supply lease contracts, developing and coordinating HALEU production and deliveries, and coordinating and tracking HALEU requirements from potential ULTB customers.

DOE offices and SHINE sign first-ever contracts under Uranium Lease and Take-back Program to produce domestic Mo-99

January 6, 2022

Vital medical isotope is used in over 40,000 medical procedures in the United States each day

WASHINGTON – The Department of Energy's National Nuclear Security Administration (NNSA) and Office of Environmental Management (DOE-EM) have signed the first contracts as part of the Department's Uranium Lease and Take-back Program with SHINE Technologies LLC. This is a milestone in the Department's effort to increase domestic production of molybdenum-99 (Mo-99), a crucial medical isotope used in over 40,000 medical procedures in the United States each day, without the use of highly enriched uranium (HEU).

NNSA's lease contract will provide SHINE with the low-enriched uranium necessary to produce Mo-99 while DOE-EM's contract details requirements surrounding the return of any resulting radioactive waste unable to be disposed of commercially once Mo-99 production is complete.

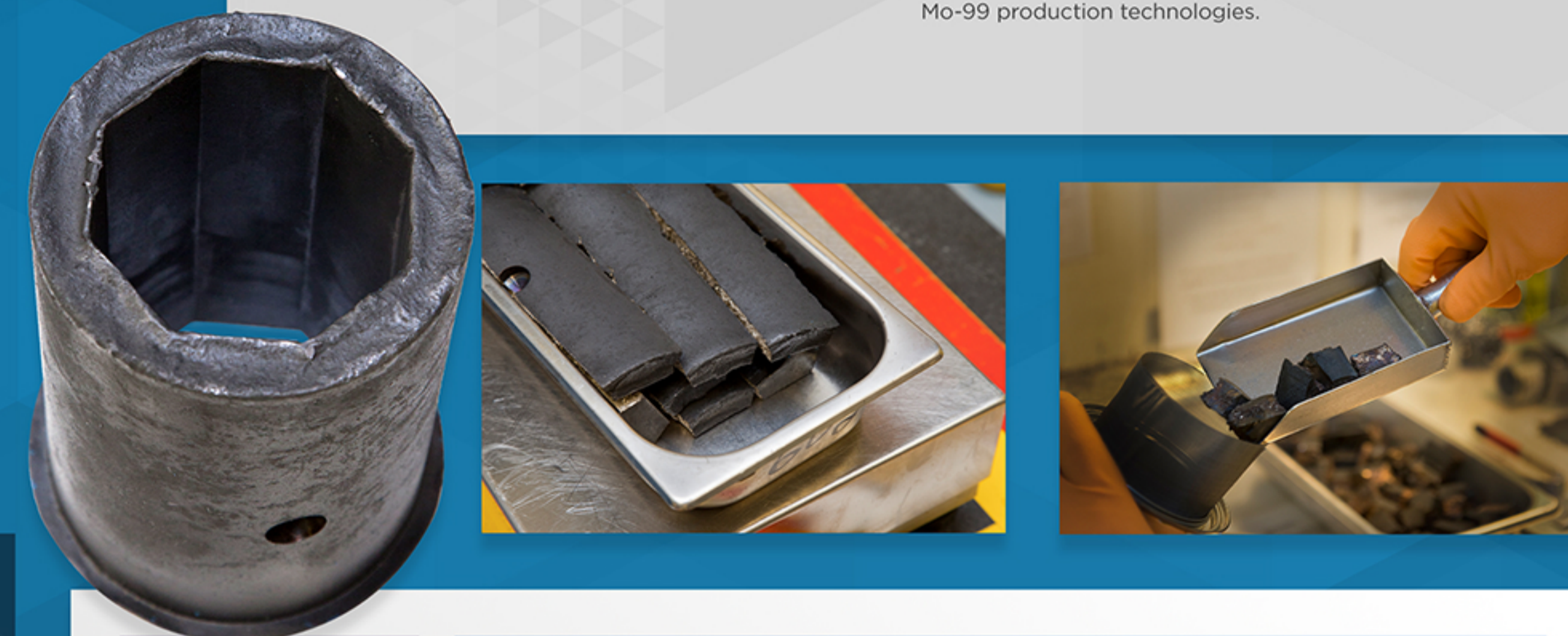
"Signing these contracts with SHINE is a crucial step toward medical isotope autonomy for the United States," said Corey Hinderstein, NNSA Deputy Administrator for Defense Nuclear Nonproliferation. "Once SHINE begins production, our country will be that much closer to creating a reliable and sufficient supply of these life-saving materials right here at home, while also increasing nuclear security by reducing the use of highly enriched uranium."

The American Medical Isotopes Production Act of 2012 directed DOE/NNSA to establish a program to make uranium available to medical isotope producers in the United States. Although the Act also requires DOE to establish take-back contracts for spent nuclear fuel and radioactive waste resulting from medical isotope production without a disposal path, there is no spent fuel involved in these contracts.

NNSA's Mo-99 program works to ensure a stable, domestic supply of this critical isotope while also reducing the use of HEU in Mo-99 production. Reducing the use of HEU increases nuclear security because HEU could be used in creating a nuclear or radiological weapon.

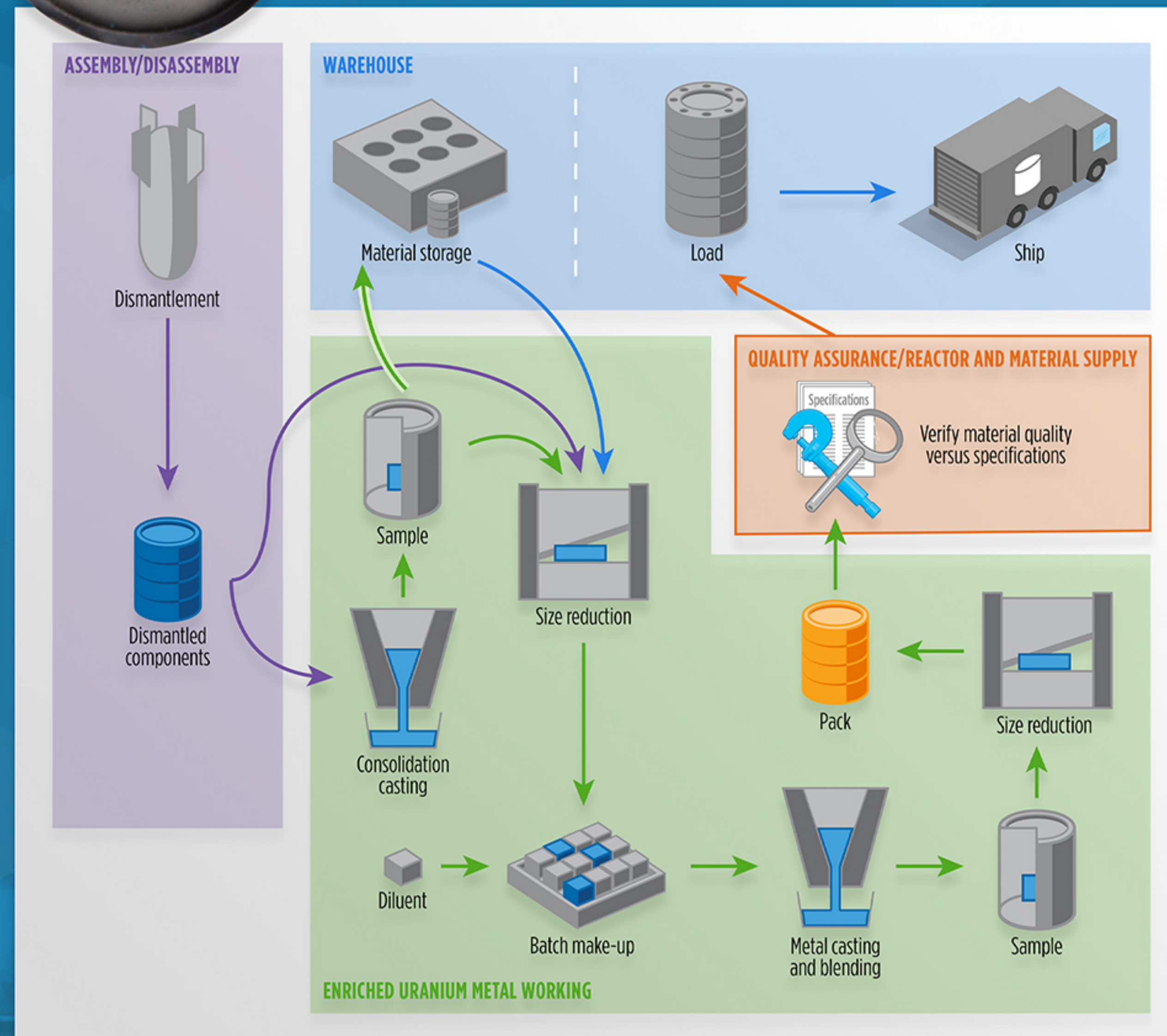
SHINE Technologies, LLC, of Janesville, Wisconsin, is one of NNSA's cooperative agreement partners. In October 2021, NNSA awarded SHINE \$35 million to support their efforts to produce Mo-99 commercially by the end of 2023.

To establish a reliable domestic Mo-99 production base in the United States, NNSA has also provided financial assistance to potential medical isotope producers. NNSA has implemented this by competitively awarding cost-shared cooperative agreements to commercial entities as well as providing funds to DOE's National Laboratories to support development of non-HEU Mo-99 production technologies.



HALEU METAL SUPPLY ROM COST ESTIMATE

COST BREAKDOWN	
BASE COSTS (EACH ORDER)	Project Management
	Material casting, analysis, and characterization
	Order sizing, canning, packing, and staging for shipment
SPECIAL COSTS (AS NEEDED)	Container refurbishment (until companies are able to obtain commercially)
	Off-site support for operation of ES-3100 shipping container and return of empty containers
	Off-site radiological support or other services as requested



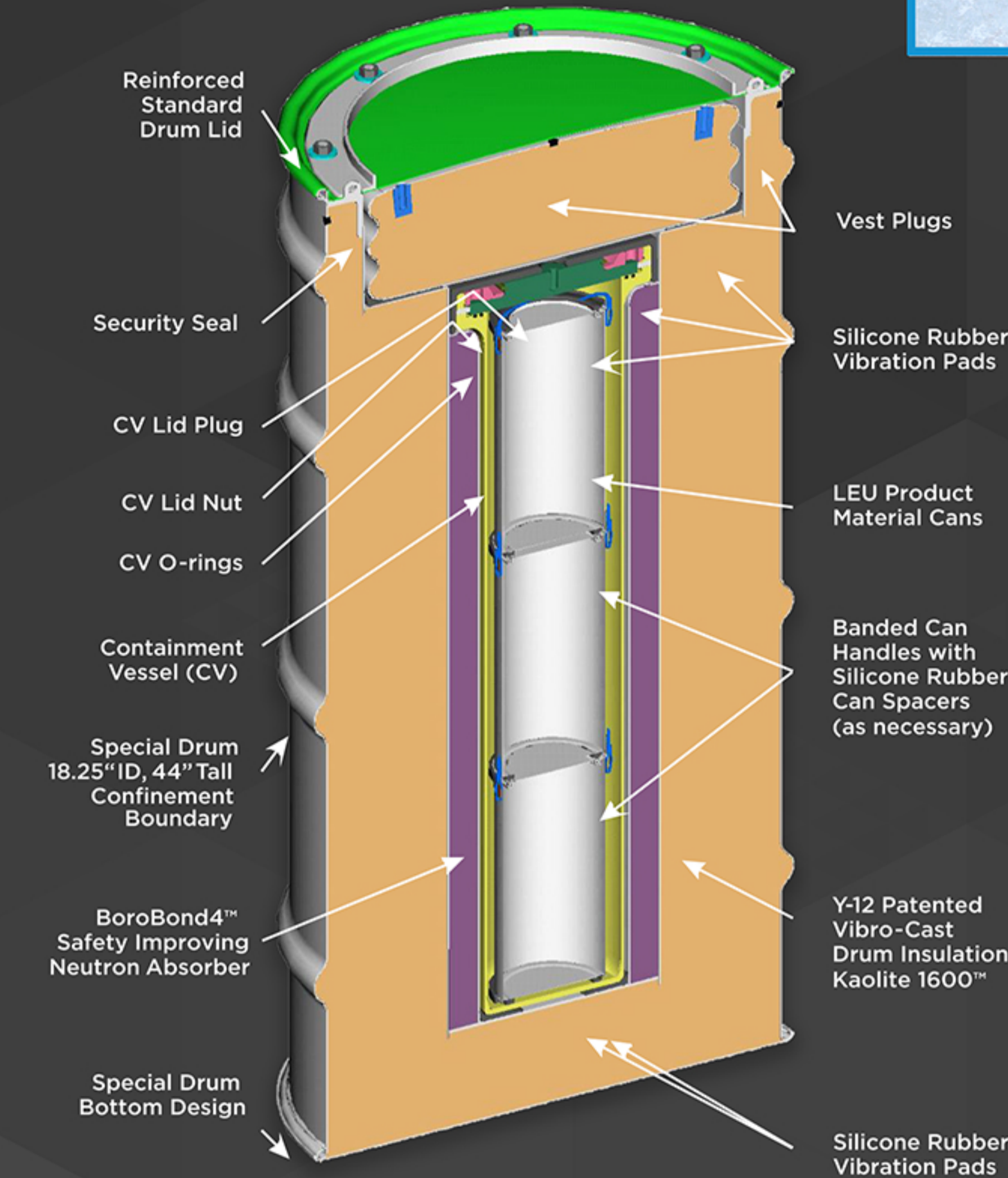
URANIUM LEASE AND TAKE-BACK PROGRAM

HQ MANAGEMENT	Office of Conversion is the Programmatic lead for ULTB
MAKE LEU AVAILABLE	NNSA Production Office (NPO) at Y-12 leases LEU required for domestic Mo-99 production.
SPENT FUEL & WASTE MANAGEMENT	DOE Office of Environmental Management (EM) manages the Take-Back program for the disposition of spent nuclear fuel and radioactive waste without a commercial disposal path.
COSTS	Contracts are negotiated to ensure U.S. government recovers costs of chosen waste disposal path

ES-3100 TYPE B(U) SHIPPING CONTAINER

SPECIFICATIONS

Dimensions: Dia 19" x 43.5" Tall
Empty Wt.: 146 kg (320 lbs)
Max Wt.: 191 kg (420 lbs)
Max Loading: 7 kgU235(Air)



DESIGN

- Certificate of Compliance issued by Department of Energy (DOE) and Nuclear Regulatory Commission (NRC)
- Efficient shipping of bulk fissile material
- 31" Containment Vessel (CV) can hold up to three 10" cans or six 4 7/8" cans

ULTB HALEU SUPPLY SHIPPING CONSIDERATIONS

- HALEU will be cast, sampled, sized, and packed to the Y-12 Standard Specification Low Enriched Uranium Metal Supply for ⁹⁹Mo Isotope Production
- Y-12 will provide support to customers for initial shipment(s) made with ES-3100. Including travel to customer site, operation of the container during unloading process, paperwork, labeling, and application of tamper indicating devices (TID's) as necessary to ship empty containers back to Y-12.
- Host site will provide radiological support (Y-12 may provide such support for special circumstances). Shipments of uranium metal and empty container returns will be made via commercial carriers, arranged by customer.
- Type A and A(F) packaging available for small quantity shipments.

CURRENT COOPERATIVE AGREEMENTS

NNSA currently manages cooperative agreements with three U.S. companies, all developing diverse Mo-99 production technologies:

- NorthStar Medical Radioisotopes, LLC (Beloit, Wisconsin)**
 - Neutron capture technology using molybdenum-98 targets
 - Accelerator-based technology using molybdenum-100 targets
- SHINE Technologies, LLC (Janesville, Wisconsin)**
 - Accelerator with fission technology to produce Mo-99 with an LEU solution target
- Niowave, Inc. (Lansing, Michigan)**
 - Superconducting electron linear accelerator with fission technology to produce Mo-99 with LEU targets

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