

NNSA's Mo-99 Program

Establishing Reliable, Non-HEU Mo-99 Production Capabilities in the United States

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PERMANENT THREAT REDUCTION
MB
MATERIAL MANAGEMENT AND MINIMIZATION
CONVERT, REMOVE, DISPOSE

Material Management and Minimization
Achieving Permanent Threat Reduction by Managing and Minimizing Nuclear Materials

Convert	Remove	Dispose
<p>Convert research reactors and isotope production facilities to non-weapons-useable nuclear material both domestically and abroad</p> <ul style="list-style-type: none"> Research Reactor Conversion Mo-99 Program 	<p>Remove or confirm the disposition of excess weapons-useable nuclear material at civilian facilities across the globe and consolidate those materials that remain</p> <ul style="list-style-type: none"> International Nuclear Material Removal and Consolidation International Nuclear Material Down-blending 	<p>Dispose of and manage excess weapons-useable nuclear material, from both domestic stockpiles and material returned from abroad, and implement the MAUM (Material Management and Disposition) Agreement (PMDA) with Russia</p> <ul style="list-style-type: none"> HEU and Plutonium Disposition Uranium Supply for Peaceful Uses

What is Mo-99?

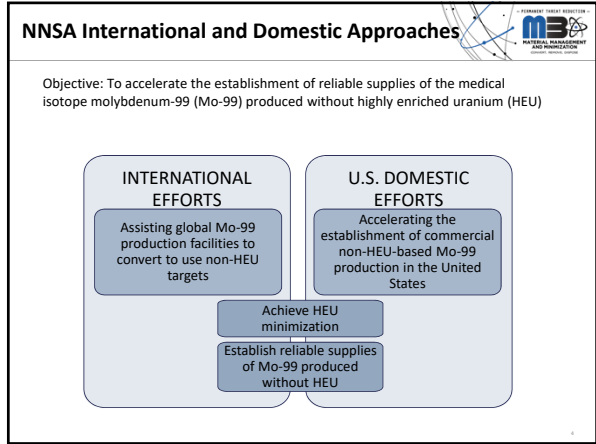
- Molybdenum-99 (Mo-99) is the parent isotope of Tc-99m, a radioisotope used in approximately 40,000 medical diagnostic tests per day in the U.S.
- Primary uses include detection of heart disease, cancer, study of organ structure and function, and other applications
- Mo-99 has a short half life (66 hours) and cannot be stockpiled
- U.S. demand is approximately 50% of the world market
 - The current global demand is ~9,000 6-day curies per week
 - Global demand has dropped since 2010
- Large-scale quantities of Mo-99 are produced at only four processing facilities worldwide, in cooperation with six research reactor facilities
- Some Mo-99 is produced today with highly enriched uranium (HEU) targets
- Shortages of Mo-99 in 2009 and 2010 due to the unexpected shut down of two major production facilities highlighted the need for new, non-HEU Mo-99 Production in the United States

SAFARI-1 Reactor (South Africa)

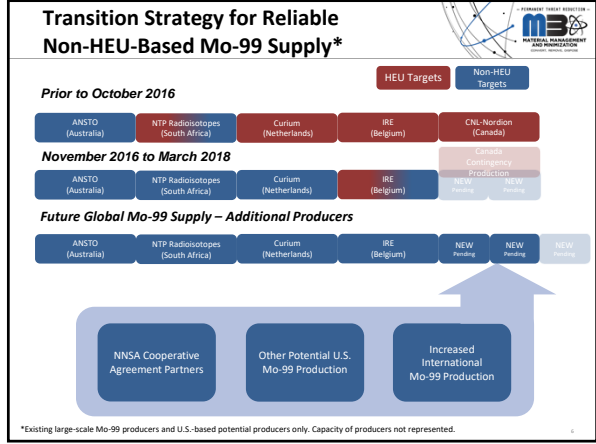
Example of a Tc-99m Generator (Image courtesy of Lutrobis Medical Imaging, Inc.)

Slide 2

MA(1) Changed font from black to white and enlarged it (easier to read)
Meehan, Alexandra (FELLOW), 10/27/2017







Recent Mo-99 Program Successes



In the past year, there has been dramatic progress in the transition to non-HEU-based global Mo-99 production:

- **February, 2018** – NorthStar’s Radiogenix™ system is approved by the U.S. Food and Drug Administration.
 - Allows NorthStar to produce Mo-99 for patient use in the United States.
- **January, 2018** – Curium converts to 100% LEU production; 3 of 4 major global Mo-99 producers are now all LEU
- **August, 2017** – South Africa’s NTP Radioisotopes converts to 100% LEU production.

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National Laboratory Support



NNSA ensures the expertise of the U.S. National Laboratories are available to:

- Support technical development of the Mo-99 cooperative agreement technical pathways as well as other potential technologies
- Ensure the expertise and equipment at the national laboratories is available to support the acceleration of commercial projects using non-HEU technologies
- All work packages funded by NNSA outside the cooperative agreement funding and results are available in the public-domain



Target Holder for mMo-100 accelerator production (MML/SARL)



Target assembly for mMo-100 accelerator production (LANL)



Electron Linear Accelerator Facility (ANL)

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Uranium Lease and Take Back Program



Congressional Mandate

- Section 3173(c) of the FY13 National Defense Authorization Act directs DOE to establish a ULTB program
- To make LEU available through lease contracts for irradiation for the production of Mo-99 for medical uses
- To retain title to and responsibility for the final disposition of spent nuclear fuel created by Mo-99 production under the contracts
- To take title to and be responsible for the final disposition of radioactive waste created by Mo-99 production under the contracts for which DOE determines the producer does not have access to a disposal path
- To recover costs to the U.S. government associated with implementation of the program

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