

Reactor-Based Mo-99 Supply System (RB-MSS) Using Selective Gaseous Extraction: Update

by
Kathy Murray
General Atomics

Presented at the
**2017 Topical Meeting on
Molybdenum-99
Technology Development**



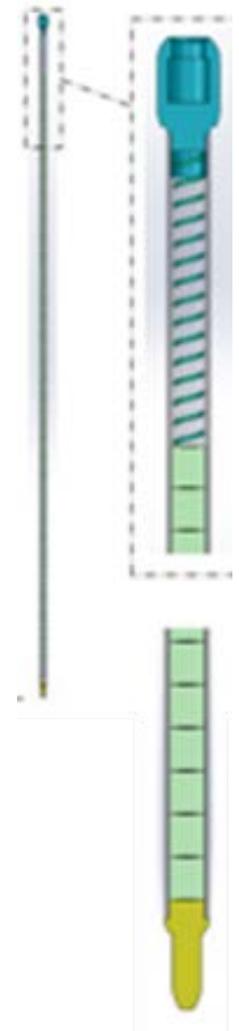
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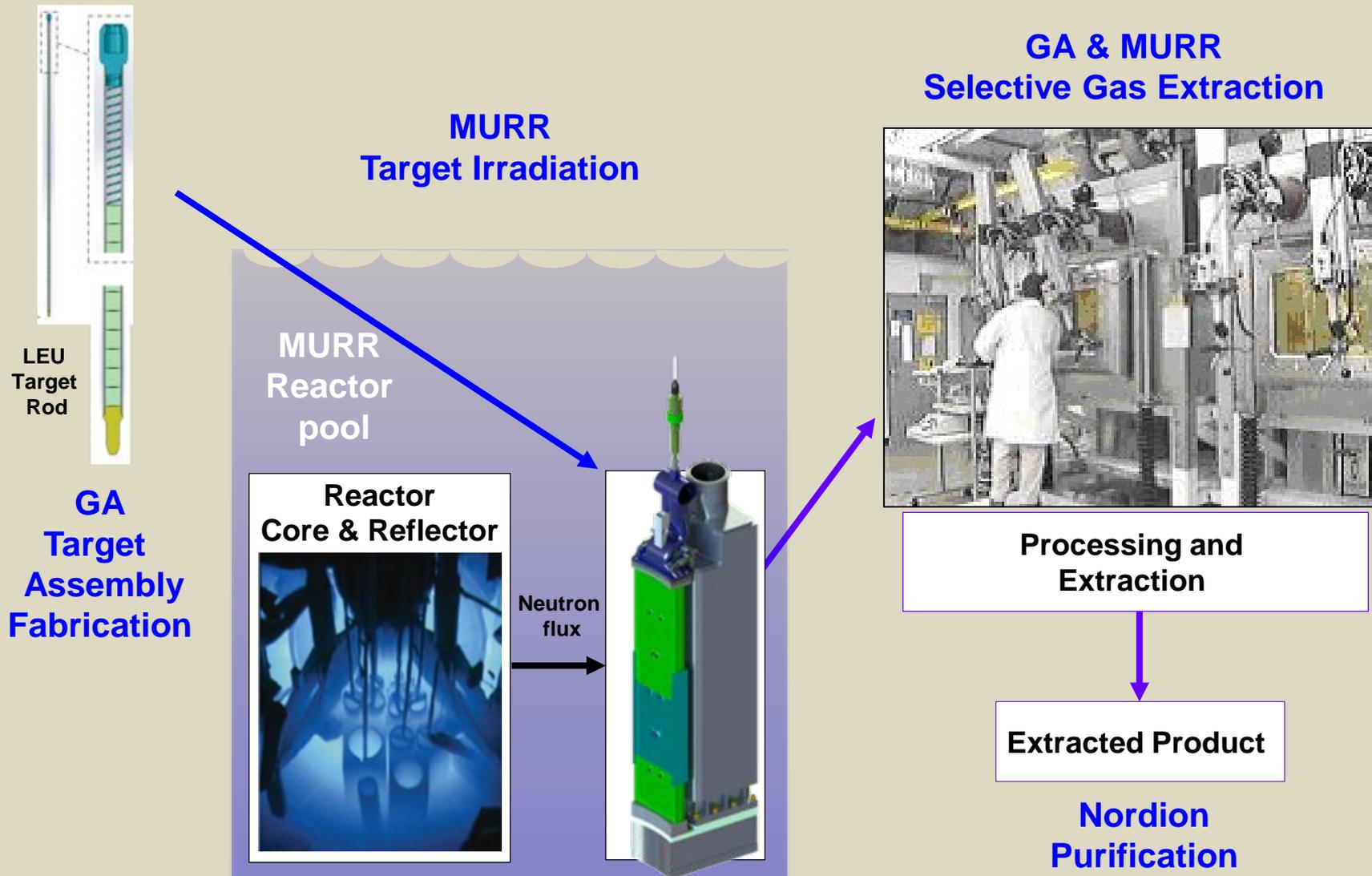


General Atomics, MURR, and Nordion Are Working Together To Produce Mo-99 from LEU

- **NNSA is funding a cooperative agreement to GA with Nordion providing the cost share**
 - **MURR** and **Nordion** are key partners
 - Over 100 scientists, engineers and professionals engaged
 - Project meets NNSA required yield of > 3000 6-day Ci/wk
 - Commercialization scheduled for 2019
- **The technical approach relies on an innovative selective gas extraction (SGE) step**
 - The SGE process requires no wet chemistry for Mo-99 recovery from target material
 - Mo-99 is extracted in the gas phase from irradiated targets
 - Fast processing results in high yields
- **The project maximizes use of existing facilities and infrastructure**
- **Mo-99 produced by SGE will work seamlessly in all existing Tc-99m generators**

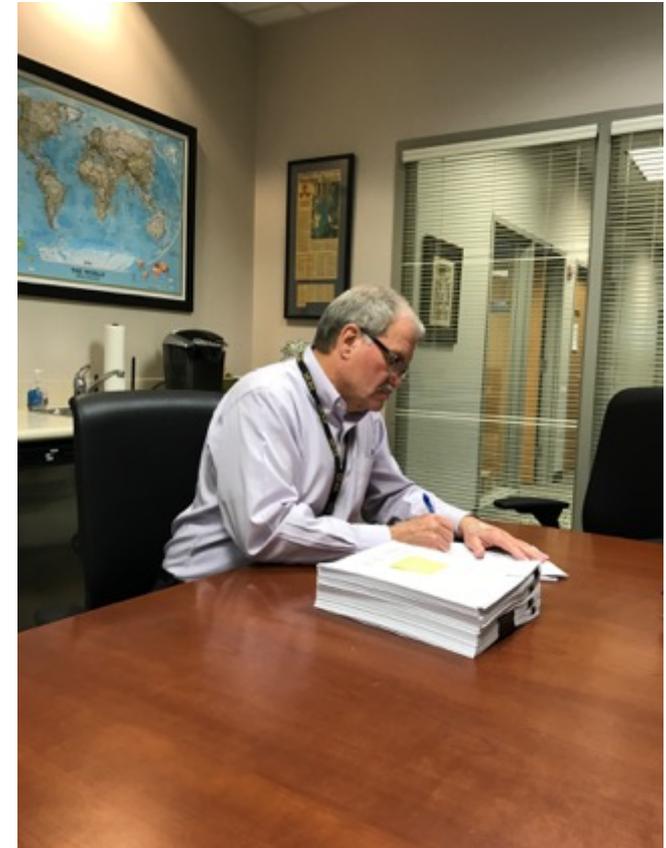


Mo-99 Technology Development Involves Steps At All Three Team Member Facilities



Reactor License Amendment Application Part 1 submitted to NRC - May 2017

- **Single Part 50 Class 104(c) Reactor License – Two Part License Amendment Application**
- **Part One: In-Pool Activities**
 - Amendment to existing Part 50 Utilization Facility License
- **Part Two: Ex-Pool Activities**
 - Amendment to authorize production activities under existing Part 50 Utilization Facility License
- **Part 2 License Amendment application is in preparation**



**Ralph Butler of MURR
signs Part 1 License
Amendment Application**

High Yield, Full-Scale Extractions with ^{99}Mo -Doped Pellets Demonstrated – August 2017

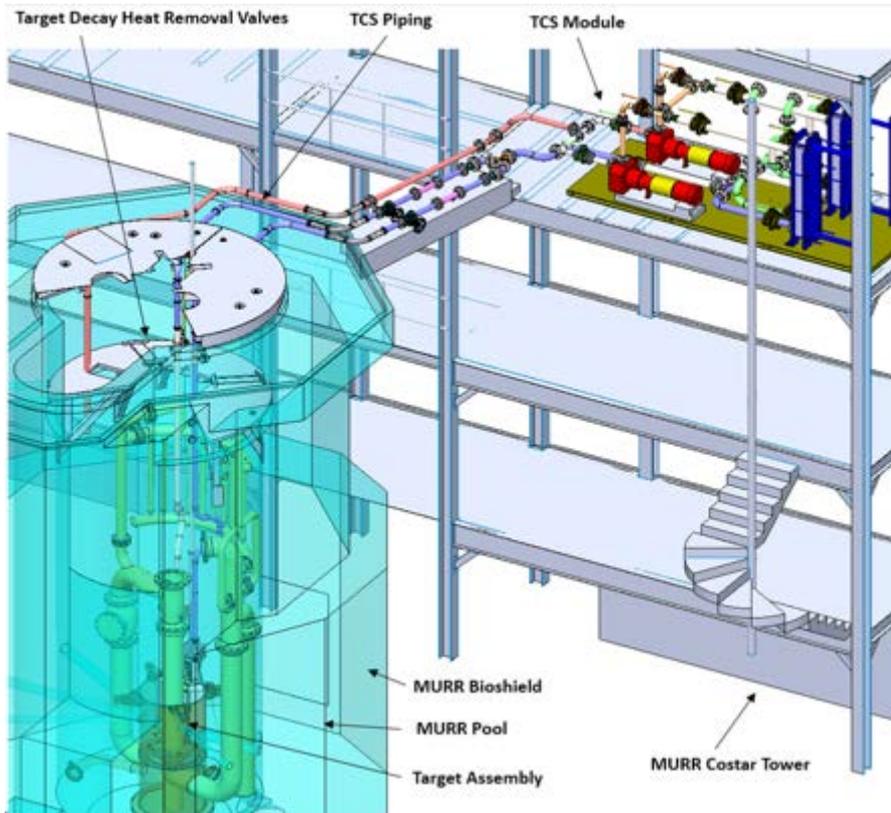
Mo-99 extraction testing is operating at full scale



- Batches processed contain the number of pellets from a full target assembly
- All SGE process steps have been successfully demonstrated
- ^{99}Mo is largely separated from other fission products during collection – simplifying purification of final product

Full-Scale Target Assembly Flow Testing Completed- July 2017

- Verified the flow and pressure drop analysis
- Demonstrated tooling for installation/removal of rods



Target assembly was flow tested in simulated MURR reactor pool

Target Rod Fabrication and Handling Equipment Now in Testing at Full Scale

Target rod and cartridge in-pool handling equipment is demonstrated



Target rod decladder is designed, built, and in testing with surrogate target rods



Target pellet/rod fabrication equipment is producing NU target pellets

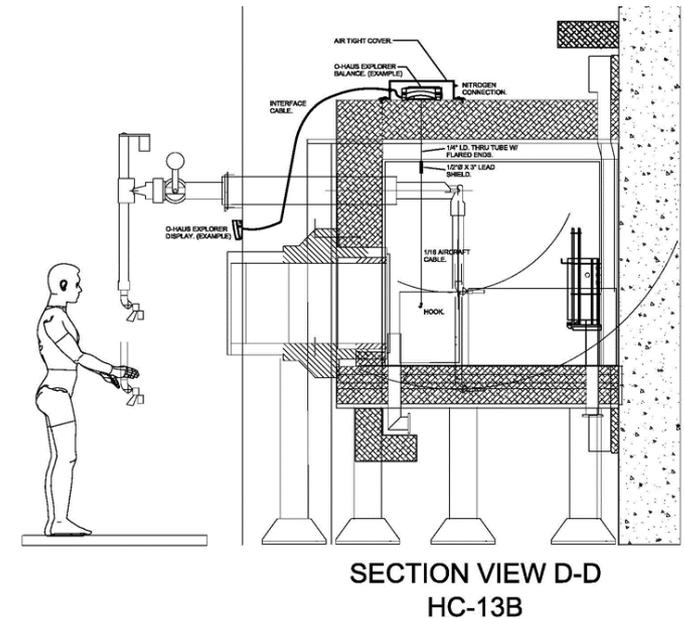
- Ready for commercial LEU target manufacturing

Upcoming Activities Include Installation and Commissioning

- Delivery, installation and checkout of target housings and cooling system in MURR reactor pool
- Installation of hot cells at MURR
- Testing of SGE equipment in mockup hot cells at Nordion



**Hot Cell
Mockups at
Nordion**



- Installation and cold commissioning of SGE equipment at MURR
- Post-irradiation examination of irradiated target capsules at CNL
- Licensing of spent target material shipping cask

Our Project Will Have US National Lab Support in 2018

- Savannah River National Lab will support target material production



- Pacific Northwest National Lab will work on innovations in fission gas capture

The labs have core expertise in their respective areas and we are very pleased to work with them!

NRC License Amendments and Other Agreements/Approvals Are In Progress

- **NRC License Amendment Application**
 - NRC is reviewing Part 1 (in-pool activities) license amendment application; currently addressing first round of RAIs
 - Part 2 (ex-pool activities) license amendment application is being prepared for SGE
- **Uranium Lease and Take Back**
 - A waste profile for target residue was submitted for NNSS review
 - Take-back agreement is being worked with NNSA
- **FDA Approvals**
 - Process and product validation will follow NRC approval and irradiation of targets in the MURR reactor
- **Shipping Cask Approvals**
 - CNSC approval received for shipping raw Mo-99
 - Awaiting DOT approval



Licensed Shipping Container

Our Team is Working Hard Toward Making Domestic Mo-99 From SGE a Reality!



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