Savannah River National Laboratory™

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SRNL Mo-99 Technical Support for SHINE™

Discussion on Tritiated Waste Disposition Pathways for Commercial Entities

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Presentation for Tritium Focus Group Meeting
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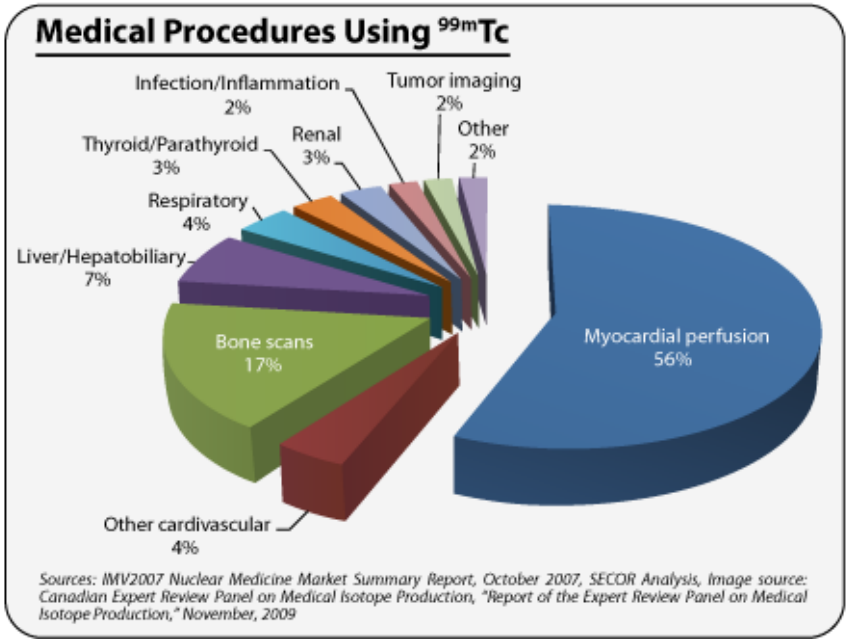
Background – Molybdenum-99 (^{99}Mo or "moly")

- "Molybdenum-99 is the parent isotope of technetium-99m (^{99m}Tc)
  - ^{99}Mo is loaded into ^{99m}Tc generator and is produced by ^{99}Mo decay
  - ^{99m}Tc is extracted (by radiopharmacy staff) for use in patients
- ^{99m}Tc is a light-emitting element used to diagnose and stage a multitude of diseases, including cancer and heart disease
- ^{99m}Tc is administered to some 55,000 Americans every day
- ^{99m}Tc is used in over 80% of nuclear diagnostic procedures worldwide – "The heart of modern nuclear medicine."
- North America uses about 50% of the world's Mo-99 supply



- Myocardial perfusion studies are typically done to diagnose and stage heart disease.
- Bone scans are typically performed for cancer staging.

Need for New Mo-99 Sources

- NRU Reactor at Chalk River, Ontario, Canada is scheduled for shutdown in 2016; produces about 40% of the world's supply of Mo-99.

- 85-95% of the world's Mo-99 is produced via the use of highly enriched uranium (HEU) targets.
- Mo-99 Program mission is to convert Mo-99 production to use Low Enriched Uranium (LEU) – a non-proliferation initiative.
- NNSA Mo-99 Programs have formed cooperative agreements with several companies to support the continued development and commercialization of the medical radioisotope molybdenum-99 (Mo-99) production without the use of highly enriched uranium (HEU).

SHINE Medical Technologies™ Approach for Mo-99

- SHINE Medical Technologies will produce ^{99}Mo using a deuterium-tritium accelerator to produce neutrons which irradiate the Low Enriched Uranium (LEU) solution

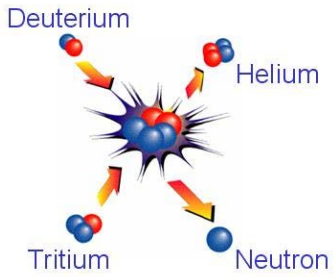
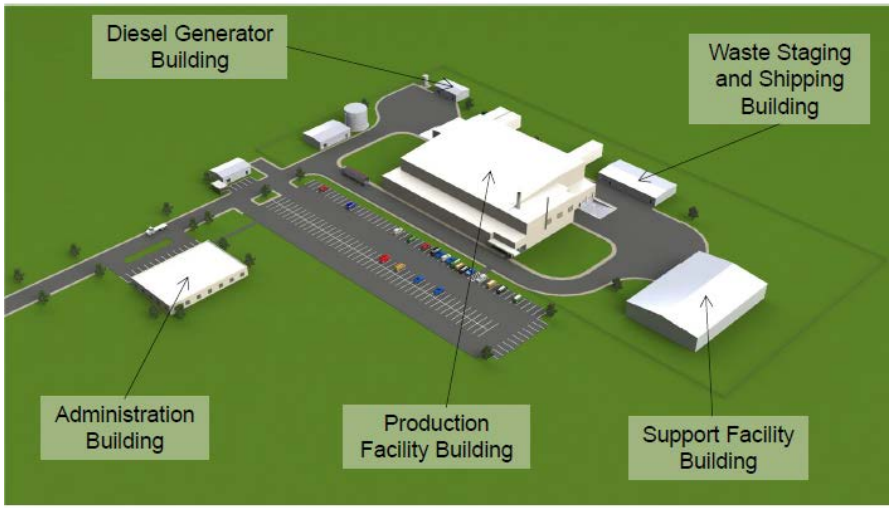


Image: itep.kit.edu

- GOAL: Start Production in 2018!!!!! (Slip from target 2016 production date is based on funding profile; contingent on NRC authorization)

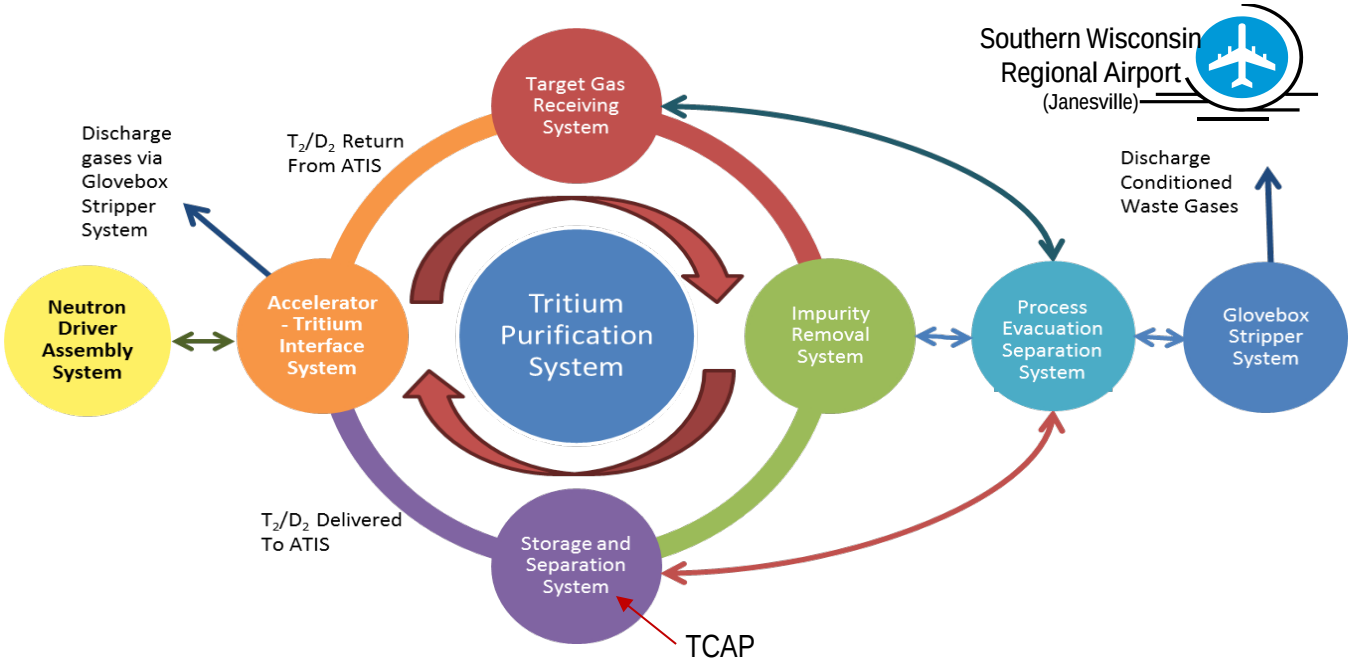


UPDATE October 2015 – The Nuclear Regulatory Commission (NRC). The NRC staff have completed their environmental and safety reviews of the SHINE facility and have recommended that SHINE be issued a Construction Permit. SHINE now enters the final stage of the permitting process, which includes a hearing with the NRC Commissioners in Dec 2015.

SHINE Production Facility
(2014 Mo-99 Topical Meeting)

Tritium Fuel Cycle Overview

- Accelerator uses tritium-deuterium gases to produce neutrons
- Tritium (deuterium) supplied and received must be processed to achieve remove impurities and condition waste gases for discharge
  - TCAP is the technology that connected SHINE to SRNL
  - TCAP is very robust and versatile, but is only one component of the tritium fuel cycle that is needed to operate an accelerator (or any other tritium/energy producing process)

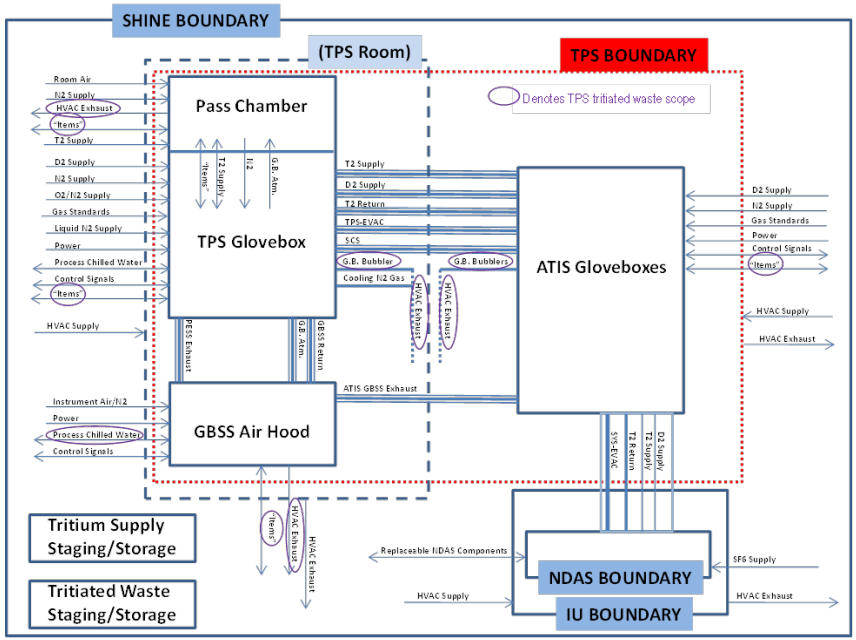


The SHINE facility will be located in Janesville, WI next to the regional airport and pasture land. Minimizing emissions of tritium and other radioisotopes is essential!

Tritiated Waste Assessment

- Three types of tritiated waste (solid, liquid, and gas) will be generated from operations of the TPS process, TPS glovebox, the Accelerator Tritium Interface System (ATIS), and the ATIS gloveboxes.
- Functions and requirements were developed for the tritiated waste and associated tritiated waste storage areas. (Ref: TPS Tritiated Waste Interface Control Document)
- The Tritiated Waste Assessment will identify commercial pathways to dispose of tritiated waste for SHINE and document in a releasable report.

Tritium Purification System (TPS) Interfaces for Tritiated Wastes



Summary

- Goal
  - Evaluate disposition pathways for tritiated waste for commercial entities such as SHINE
- Tritiated Waste Disposition Pathways (government and private)
  - National Laboratory
  - Commercial Entities
- NWC Site Contact Information for Tritiated Wastes?
  - LANL
  - PPPL
  - PNNL
  - Others?
- Nancy Halverson, SRNL

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