U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT

# Canadian Liquid Highly Enriched Uranium Return

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**Governor's Nuclear Advisory Council**
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# Canadian HEU Liquid Return

**Agenda:**

- History
- Background
- Scope
- Conclusion

# Canadian HEU Liquid Return

## History:

- Beginning in the early 1950s, as part of the "Atoms for Peace" program, the United States began providing highly enriched uranium (HEU) fuel and target materials to various countries to support research and development with the intention of bringing the HEU back to the US when the country was finished with the material.
- In 1996 the Department issued a Final Environmental Impact Statement (EIS) and Record of Decision (ROD) formalizing the US policy concerning the return of foreign research reactor spent nuclear fuel and target material.
- In 2000 Savannah River issued a site EIS which evaluated alternatives for the storage of spent nuclear fuel (SNF) and target material that Savannah River Site (SRS) manages.
- The 2000 SRS EIS included this Canadian target material.
- March 2012 Nuclear Security Summit, the US and Canadian governments reached an agreement on the return of U.S.-origin HEU that was stored in Canada.
- September 2012 the Department signed a contract, dependent on the completion of National Environmental Policy Act (NEPA), to receive the Canadian liquids.
- March 2013 the Department approved a Supplement Analysis and Amended Record of Decision to receive, purify, and down blend the HEU material.

# Canadian HEU Liquid Return

## Background:

- Highly enriched uranium is slightly irradiated to produce Molybdenum-99 (Moly-99) which quickly decays to Technetium-99 (Tech-99 )
- Tech-99 is an isotope used in the medical industry to support cardiology, oncology, and other medical screening techniques.
- Atomic Energy Canada Limited (AECL) irradiates highly enriched uranium targets and processes the targets to recover the Moly-99/Tech-99. The resulting solution containing HEU and fission products have been store at an AECL facility.
- Approximately 90+% of the Moly-99/Tech-99 recovered by AECL is imported into the US to support the US medical industry.

# Canadian HEU Liquid Return

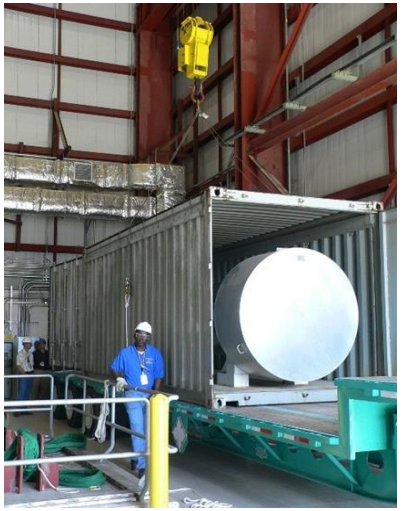
## Background (cont):

- The material the Department is planning on bringing to SRS from AECL is the resulting solutions from the processing of the targets that contain HEU and fission products.
- Quantity of material is approximately 6,000 gallons of solution plus flush material.
- SRS will receive the solution, process the solution in H Canyon, purifying the HEU solution in H Canyon, and discard the fission products to the SRS liquid waste system.
- The purified HEU solution will be down blended and shipped to Tennessee Valley Authority for fabrication into reactor fuel.

# Canadian HEU Liquid Return

**Scope:**

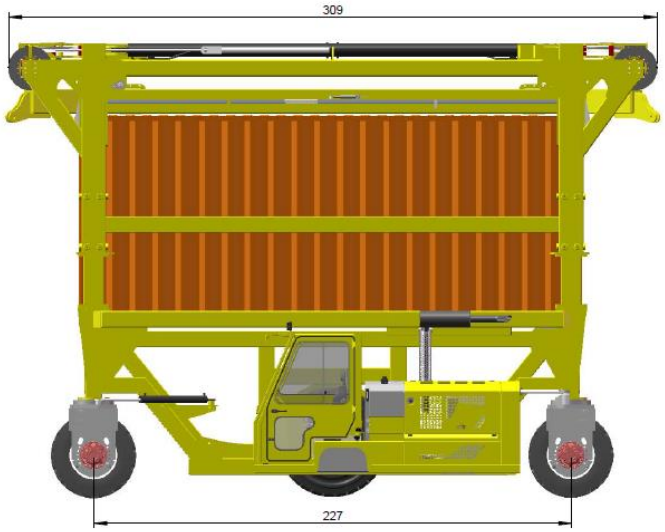
- Shipment
  - The solution will be shipped in a spent fuel cask, NAC International Legal Weight Transport (LWT) cask
  - NAC has submitted a license application to the Nuclear Regulatory Commission (NRC) for the 4 small canister configuration and the HEU liquid content in the LWT cask.
  - An NRC license/Certification of Compliance amendment and US DOT validation is required for these shipments
  - It is planned that the International Atomic Energy Agency will apply seals to the container in Canada and DOE will return the seals to AECL or IAEA

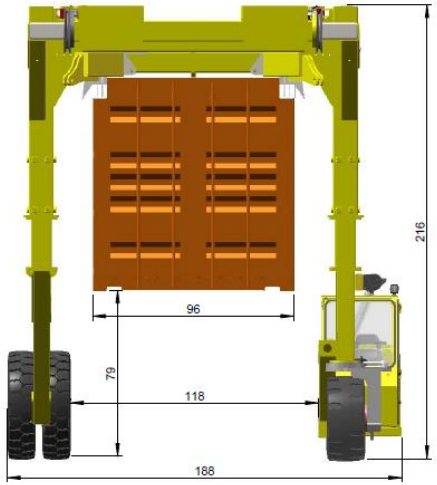


# Canadian HEU Liquid Return

## Scope (cont):

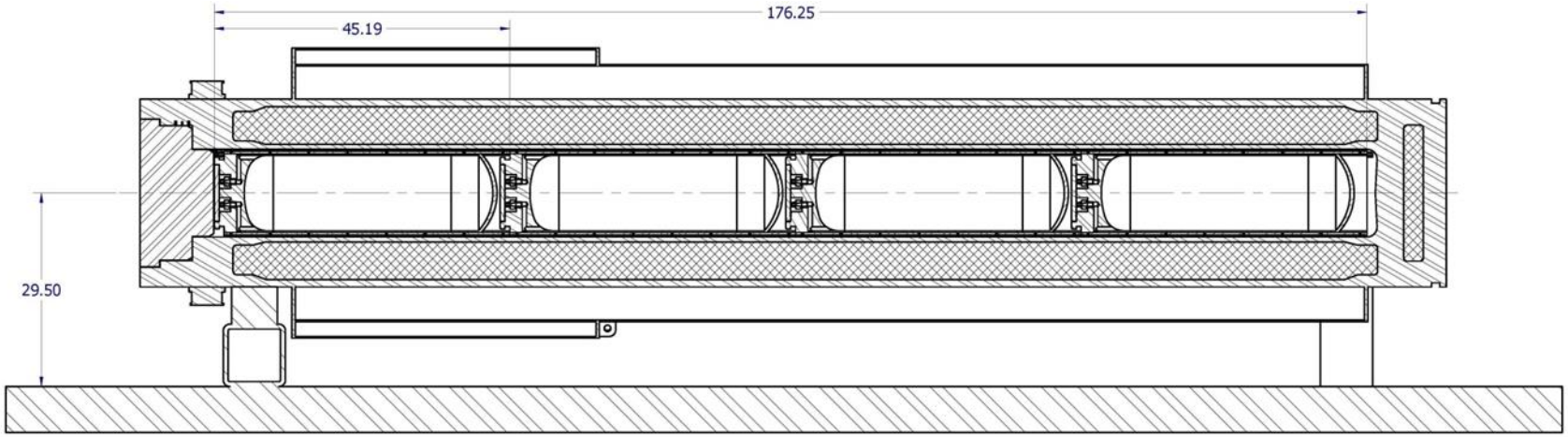
- Receipt
  - Savannah River Site will receive these shipments directly into H Area
  - Minor modifications are being made in H Canyon to allow the off loading of the material in H Canyon.
  - The HEU solution will be off loaded in H Canyon

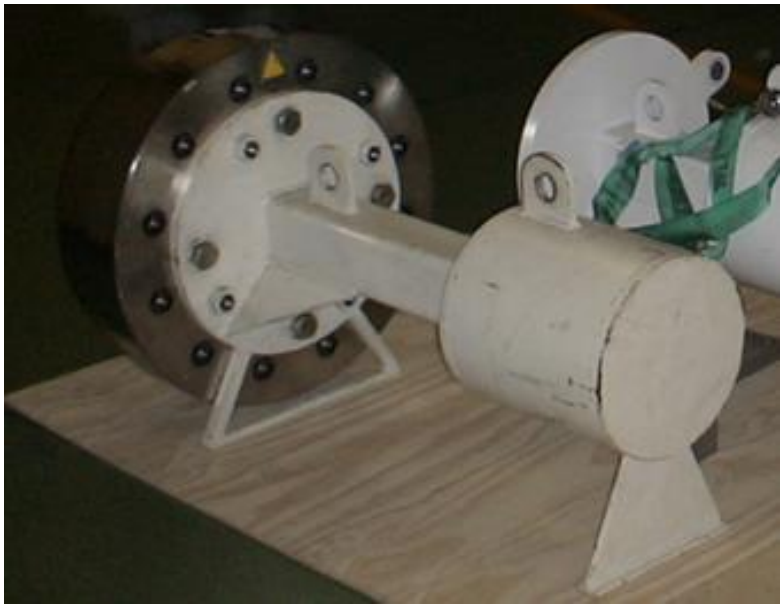


# Canadian HEU Liquid Return

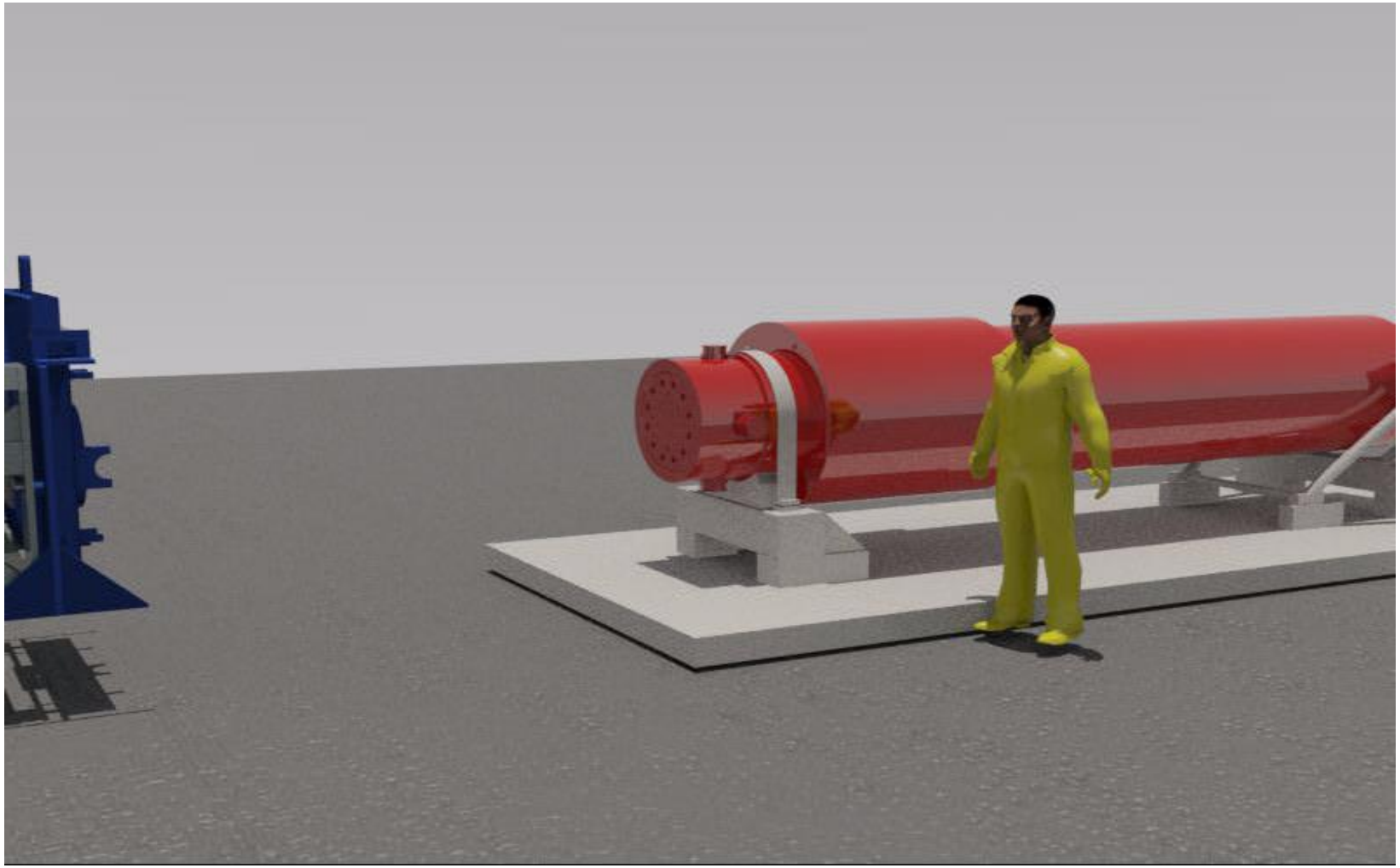
## Cask and Components



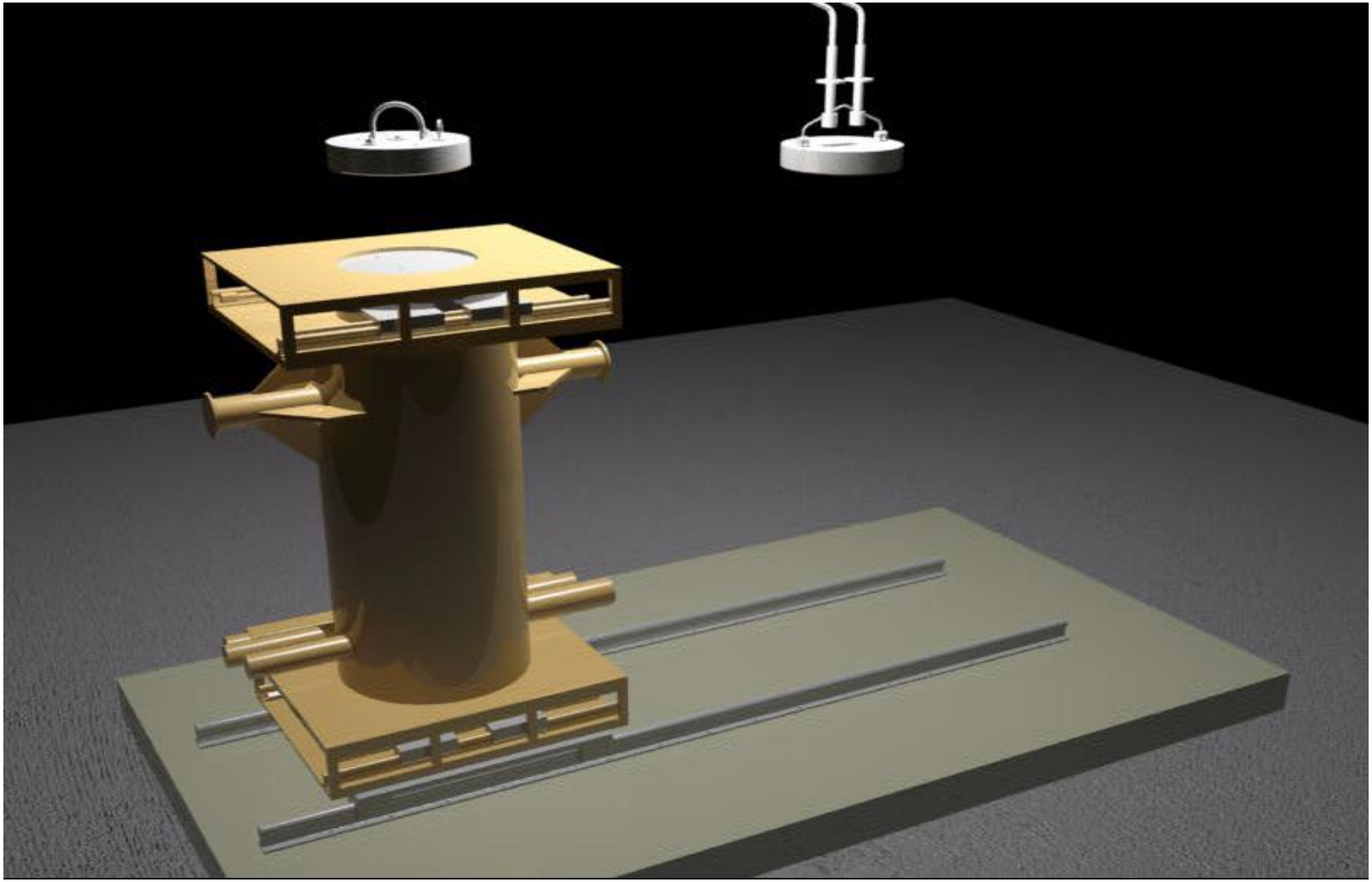
# Canadian HEU Liquid Return

## Animation of Cask/CRS Operations



# Canadian HEU Liquid Return

## Container Unloading Station



# Canadian HEU Liquid Return

## Scope (cont):

- Processing
  - Once the HEU solution is off loaded, an accountability measurement will be made of the shipment and the information will be made available to the IAEA.
  - The HEU solution will then be combined with HEU solution in H Canyon resulting from the processing of enriched uranium used nuclear fuel.
  - The HEU solution will be purified utilizing the standard H Canyon solvent extraction process
  - The purified HEU solution will be down blended to less than 5% enrichment
  - The down blended solution will then be shipped to the TVA vendor for fabrication into reactor fuel.

# Canadian HEU Liquid Return

## Schedule

- SR's expectation is to begin shipments in 2015
- There will be approximately 50-60 shipments, 2 casks per shipment
- Shipments are planned to take place over the next few years

# Canadian HEU Liquid Return

## Conclusion

- The material planned to be received is of US origin
- The US will down blend the HEU significantly reducing any proliferation threat
- The material will be safely shipped in spent fuel cask certified by the NRC
- The material is compatible and will be safely processed in H Canyon
- The shipments are planned to take place over the next few years
- This provides a disposition option for the material which allows reuse of the uranium