



West Valley Demonstration Project

West Valley
Environmental
Services

Vitrification of High-Level Radioactive Waste at the WVDP

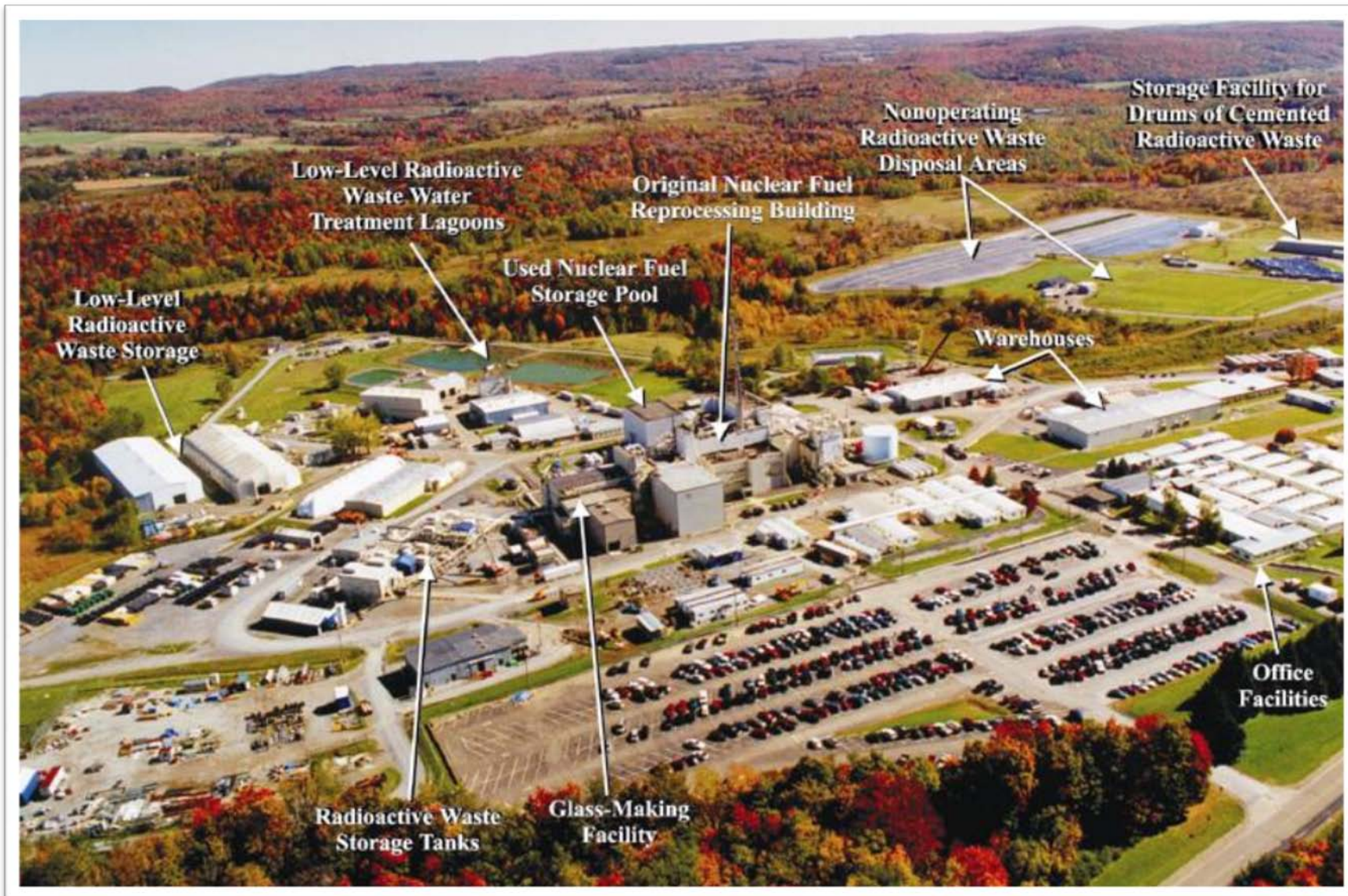
Dan Meess, Chief Engineer
West Valley Environmental Services

NWTRB Meeting in Buffalo, NY
April 27, 2011



Site Aerial Photo 2002

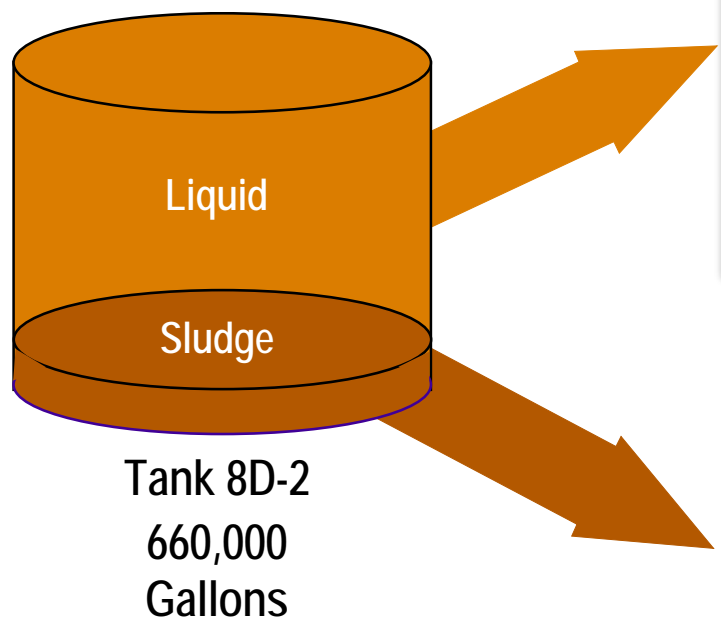
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Nuclear Waste Management Challenge



Cement
filled drums

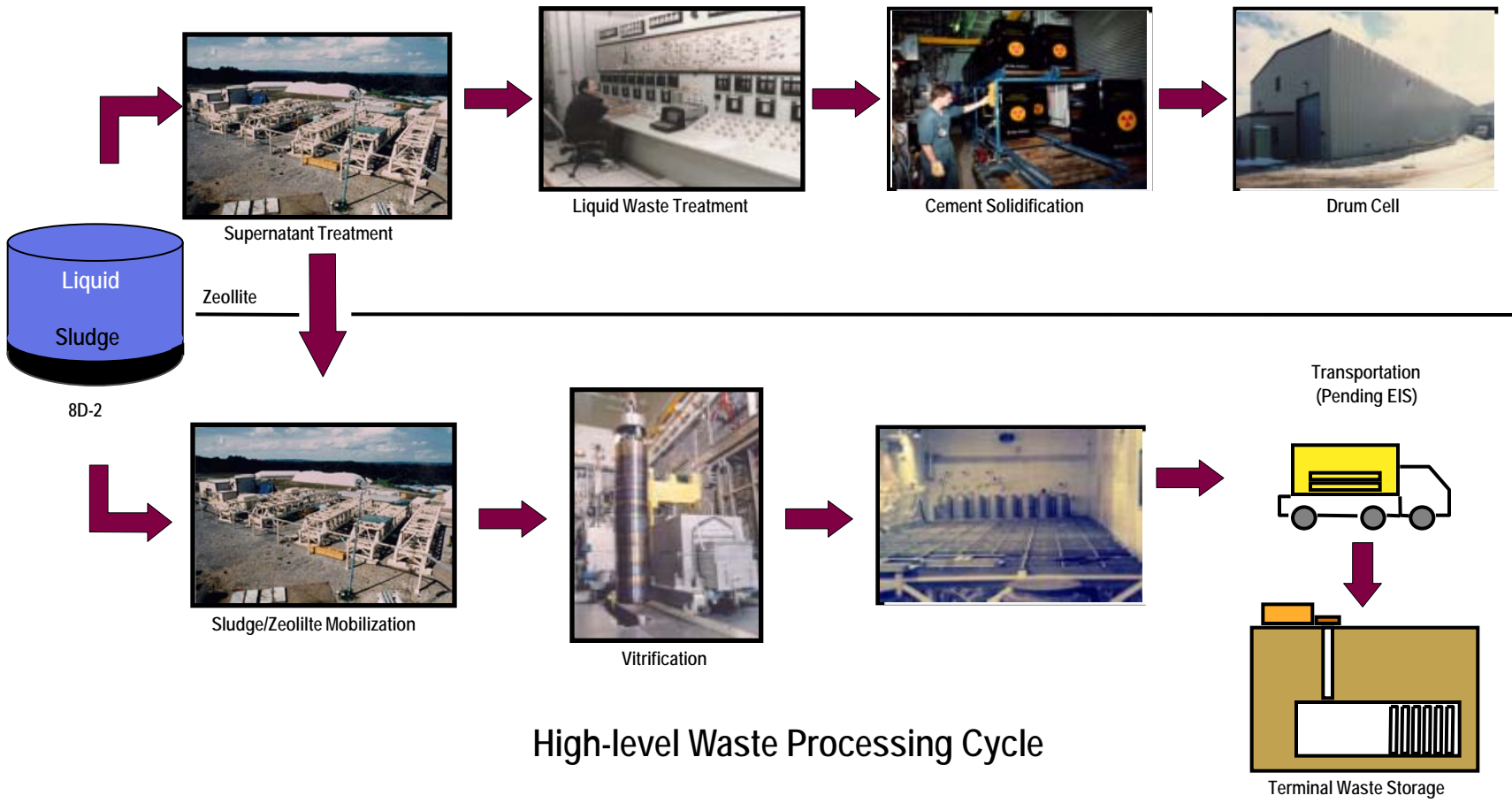


Glass
filled
canisters

24 million total curies



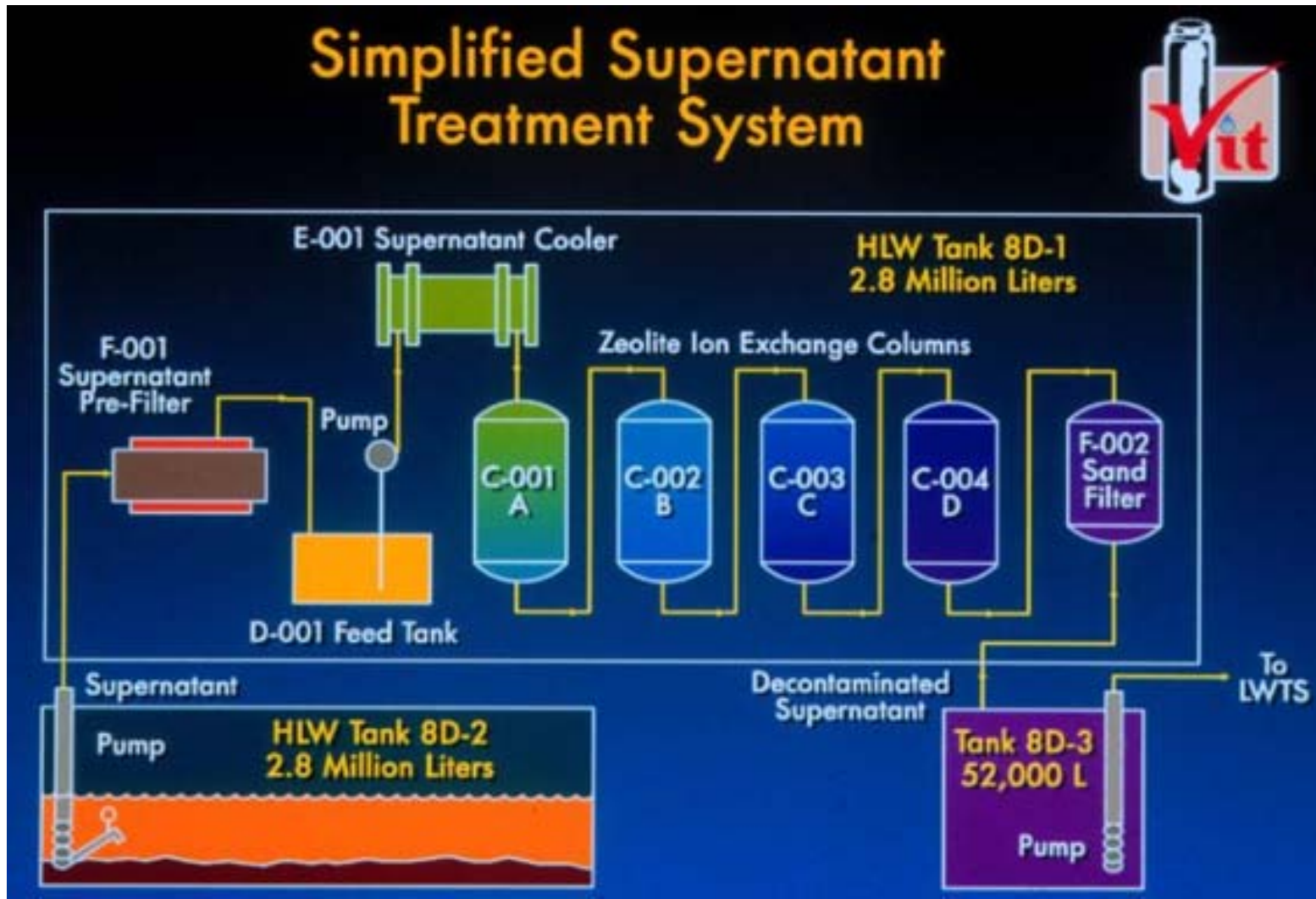
Process Overview



High-level Waste Processing Cycle

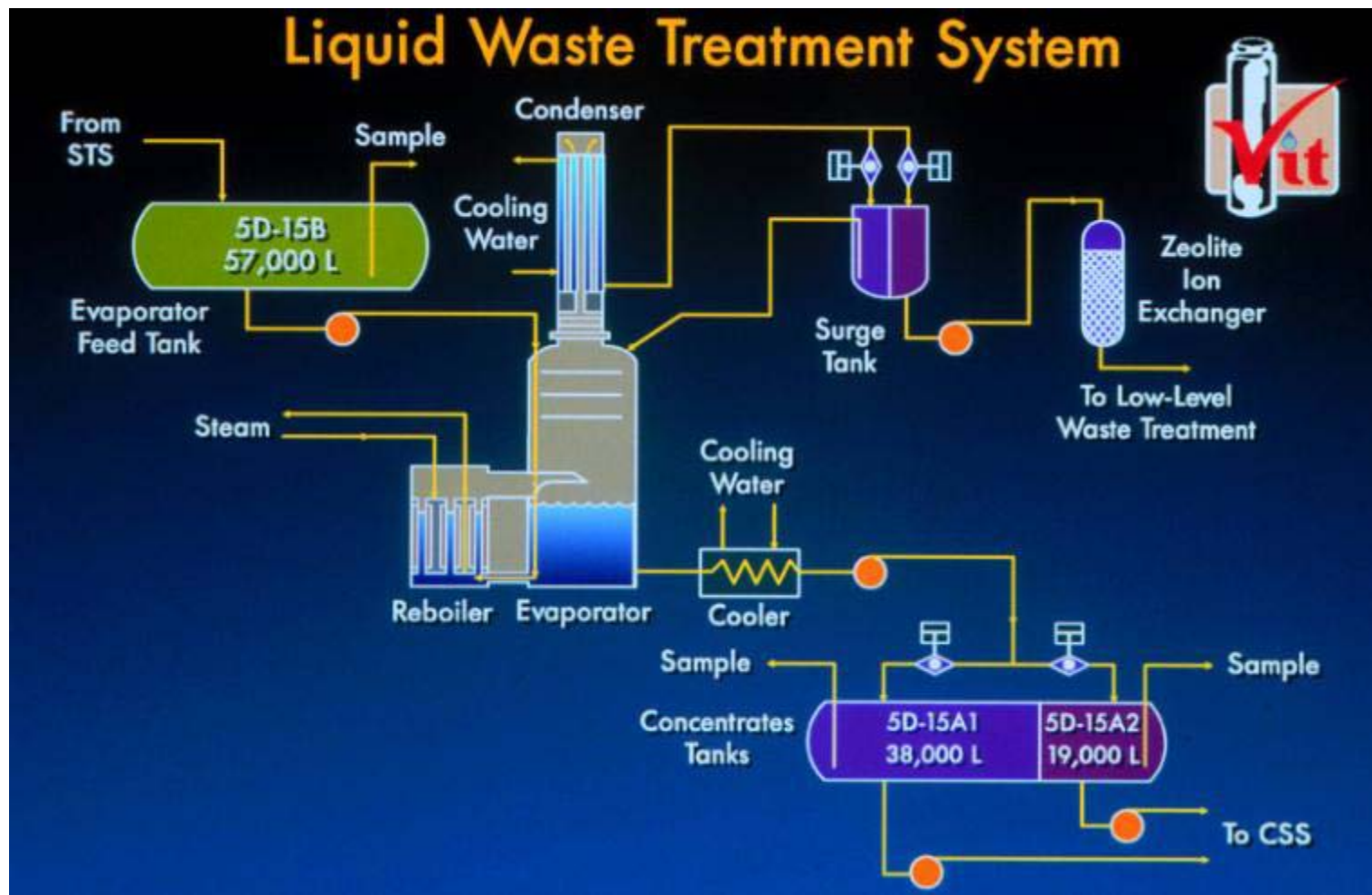


Supernatant Treatment System



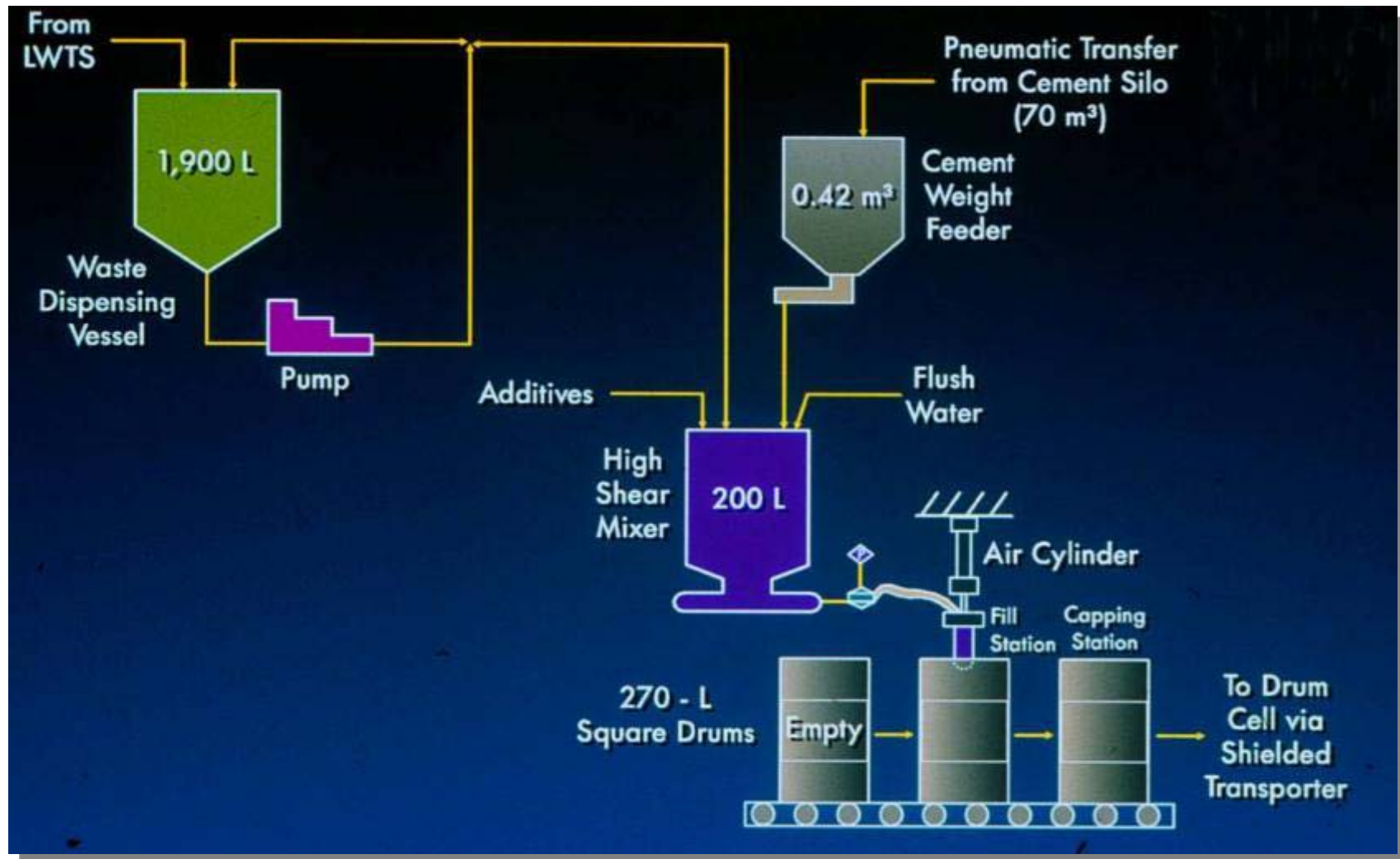


Liquid Waste Treatment System





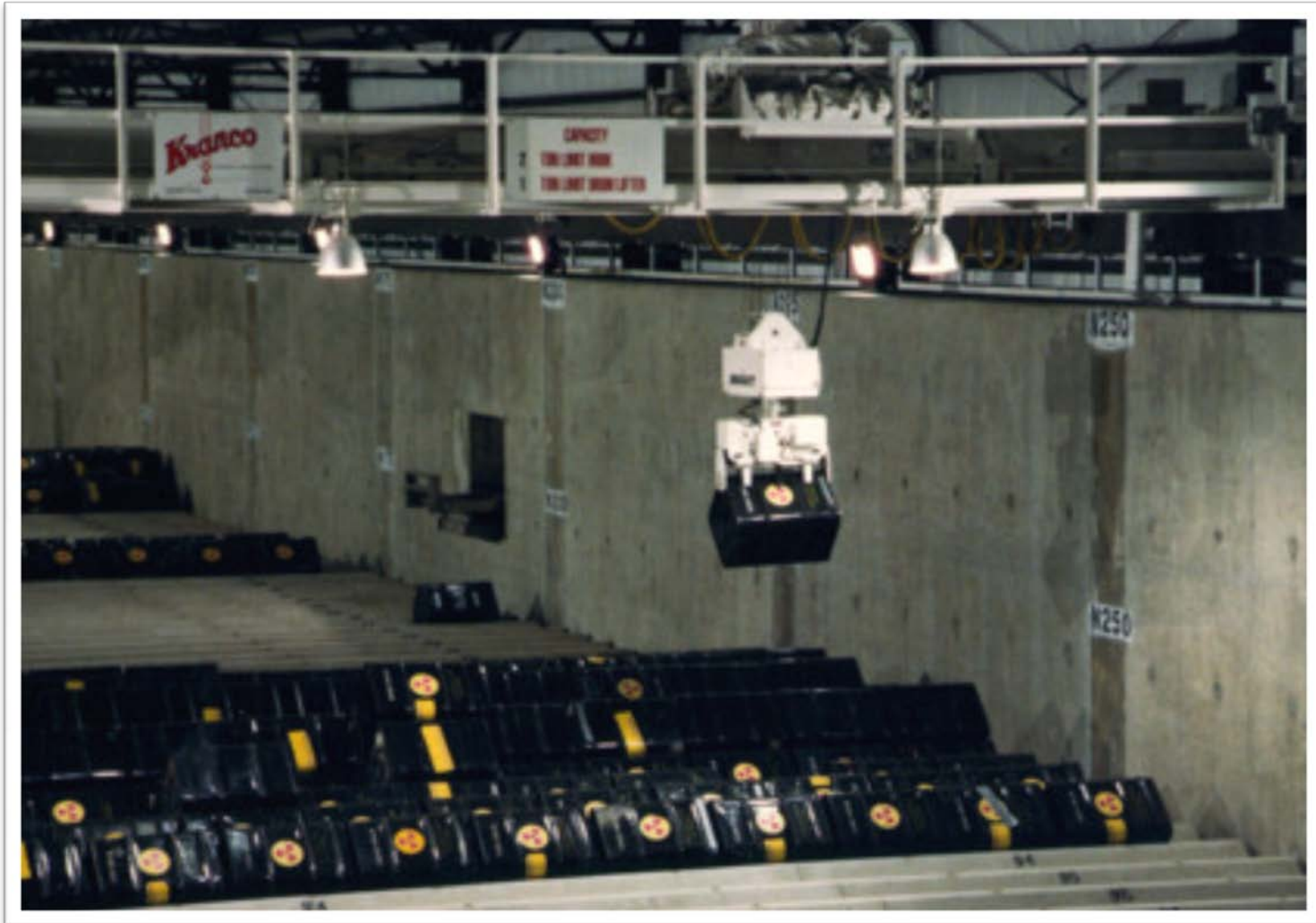
Cement Solidification System



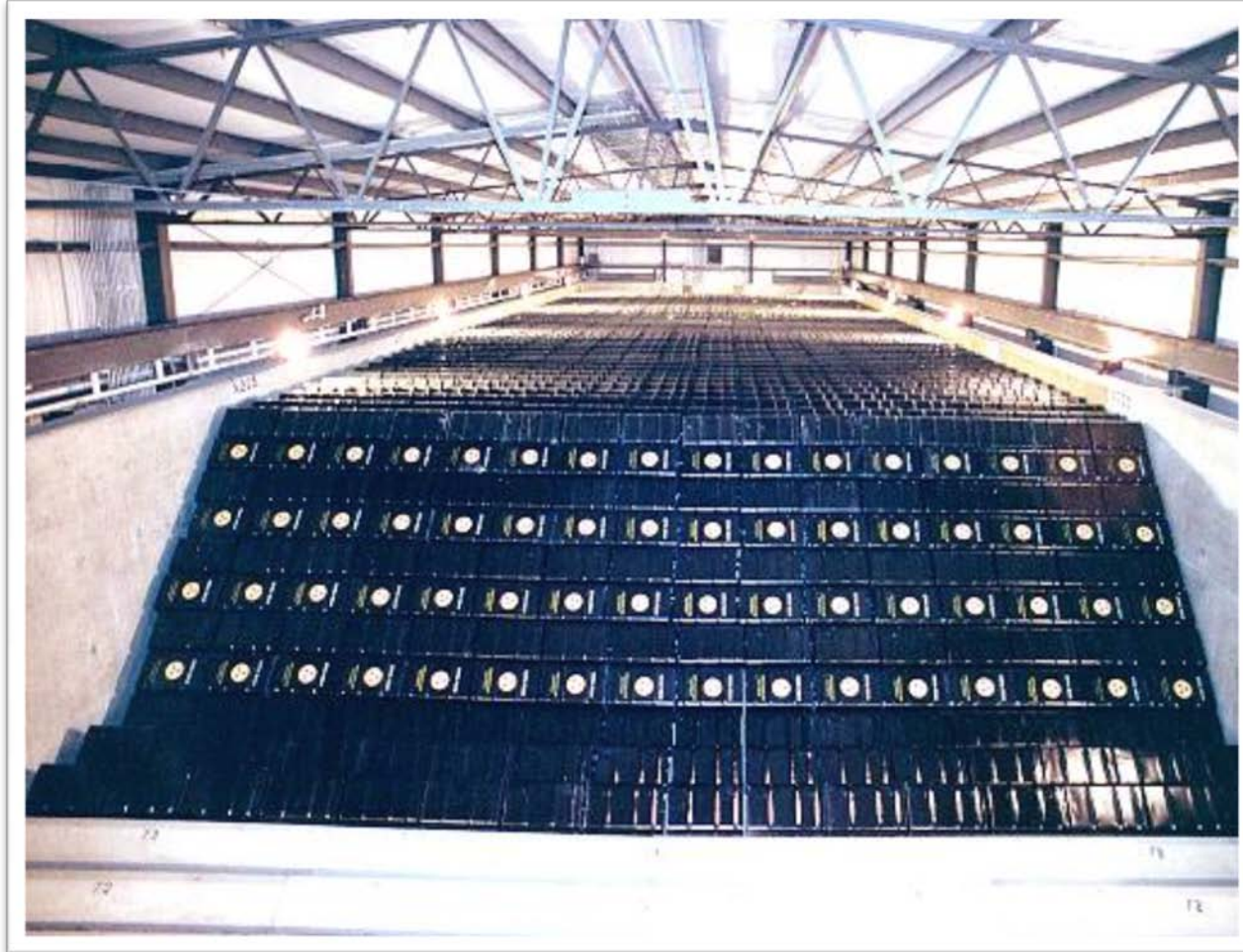


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Remote Drum Placement



Drum Cell



Cement Drums Stored in Unique Above-Ground Shielded Facility with Easy Bar Code Retrieval System

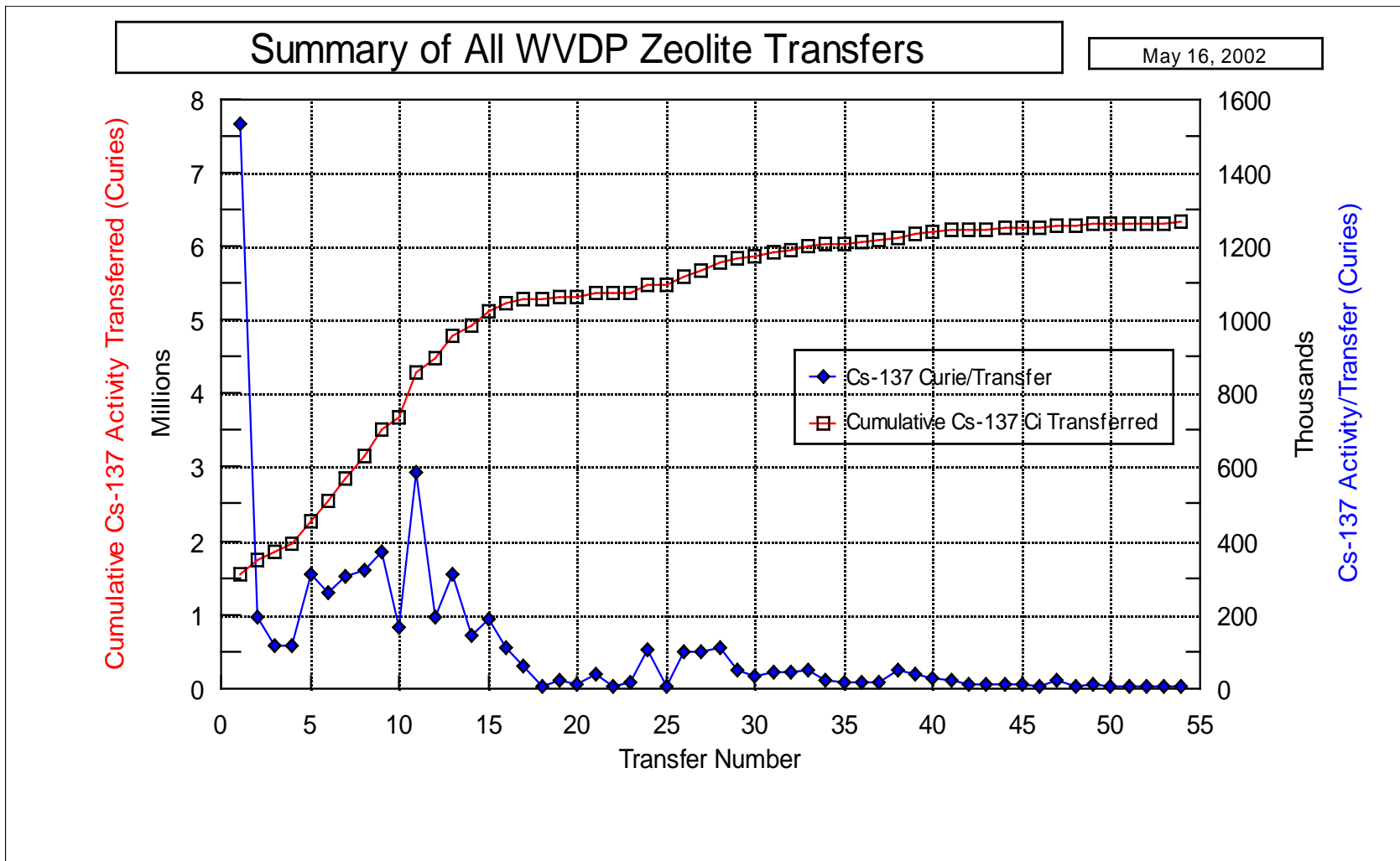


HLW Pretreatment Summary

- Adsorbed soluble Cs-137 onto 2,500 cubic feet of zeolite
 - IE-96 zeolite
 - TIE-96 zeolite: also removes Sr-90 and Pu
- 99.99% removal of Cesium-137
- Cs-137 decontaminated solutions solidified into 19,877 drums of LLW (10CFR61)
- Three portland cement-based recipes successfully developed to NRC stability criteria and RCRA stability requirements

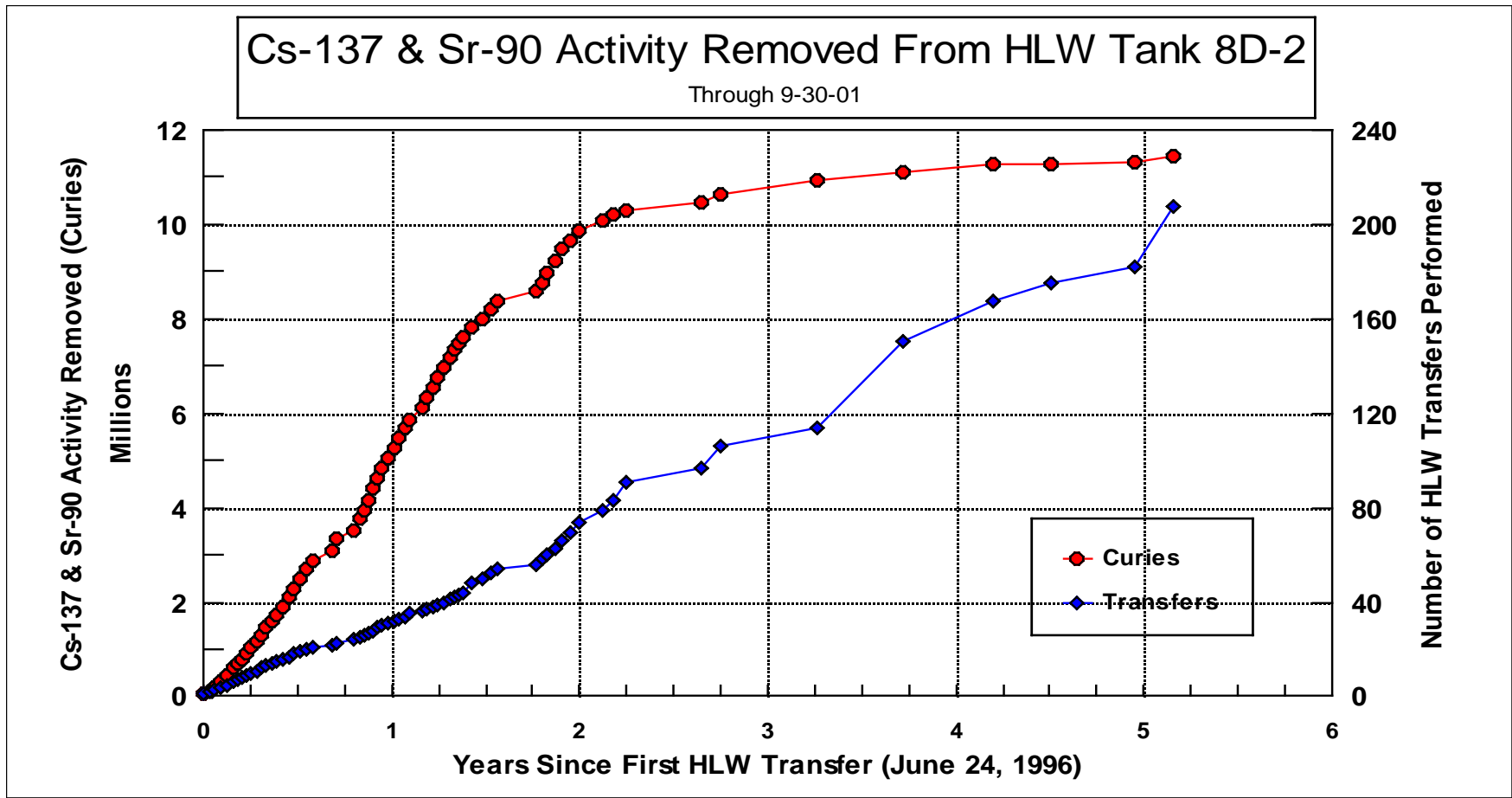


Zeolite Transfer to Tank 8D-2



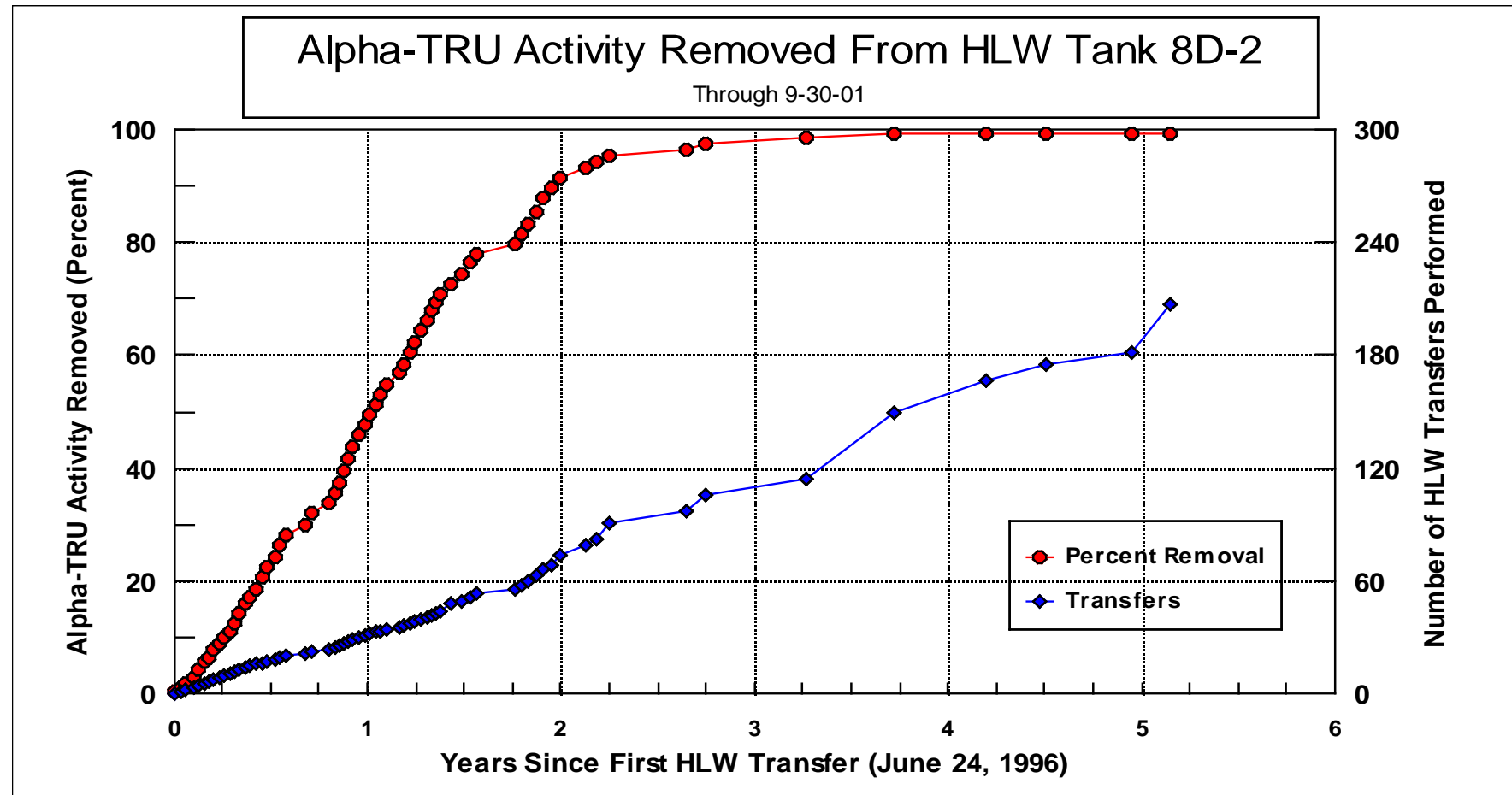


Tank 8D-2 Waste Retrieval



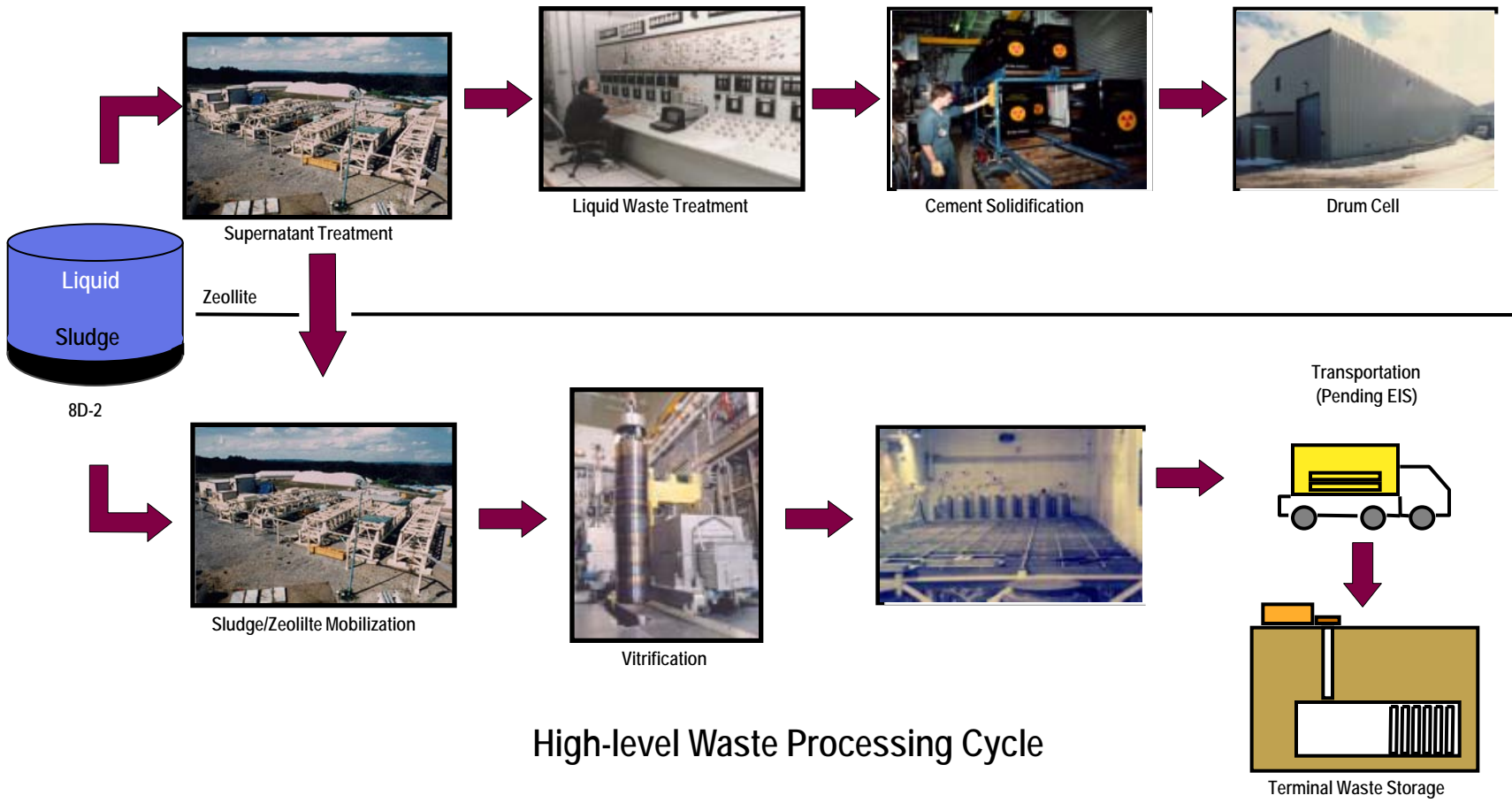


Tank 8D-2 HLW Waste Retrieval





Process Overview

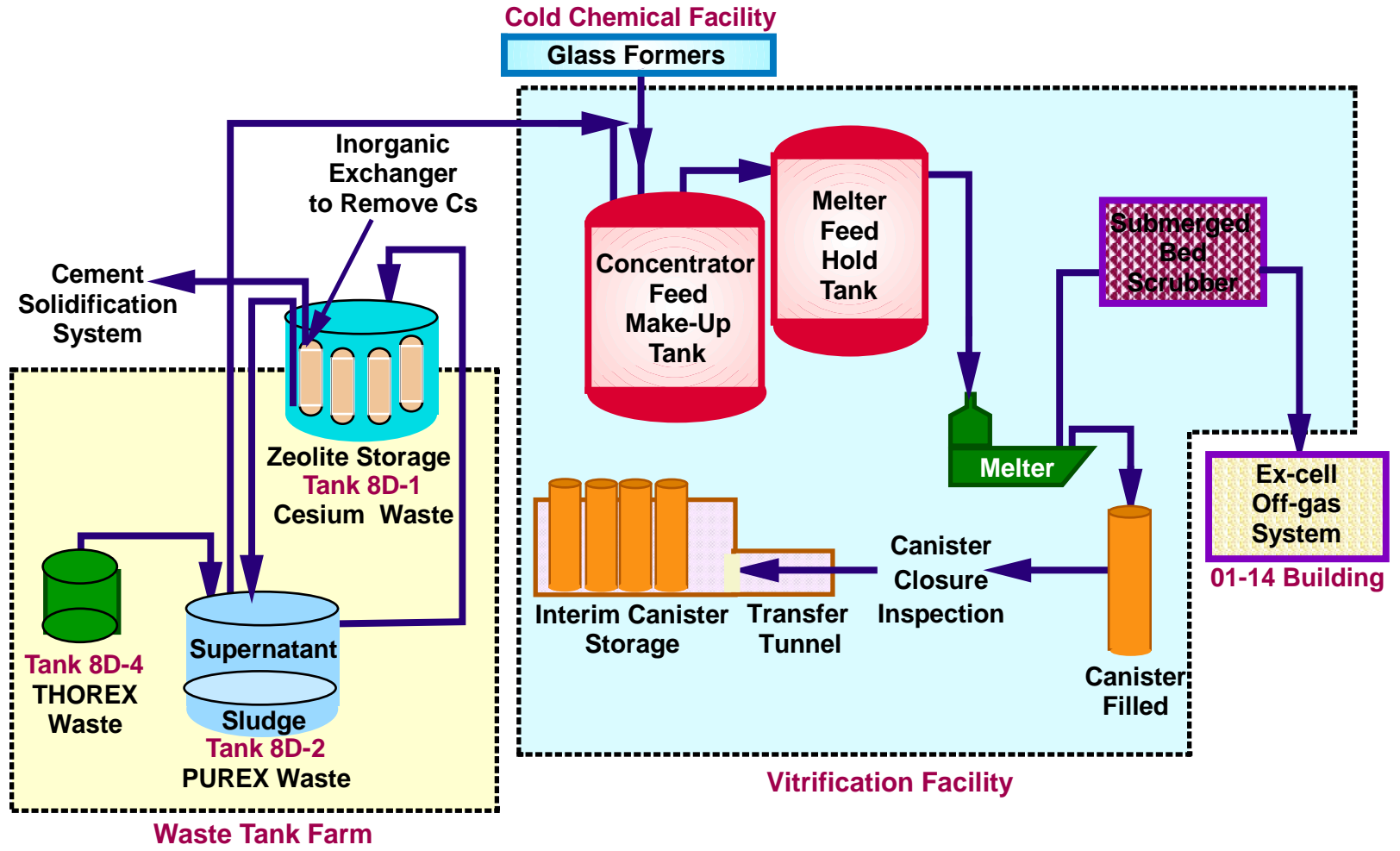


High-level Waste Processing Cycle



HLW Processing Flow Sheet

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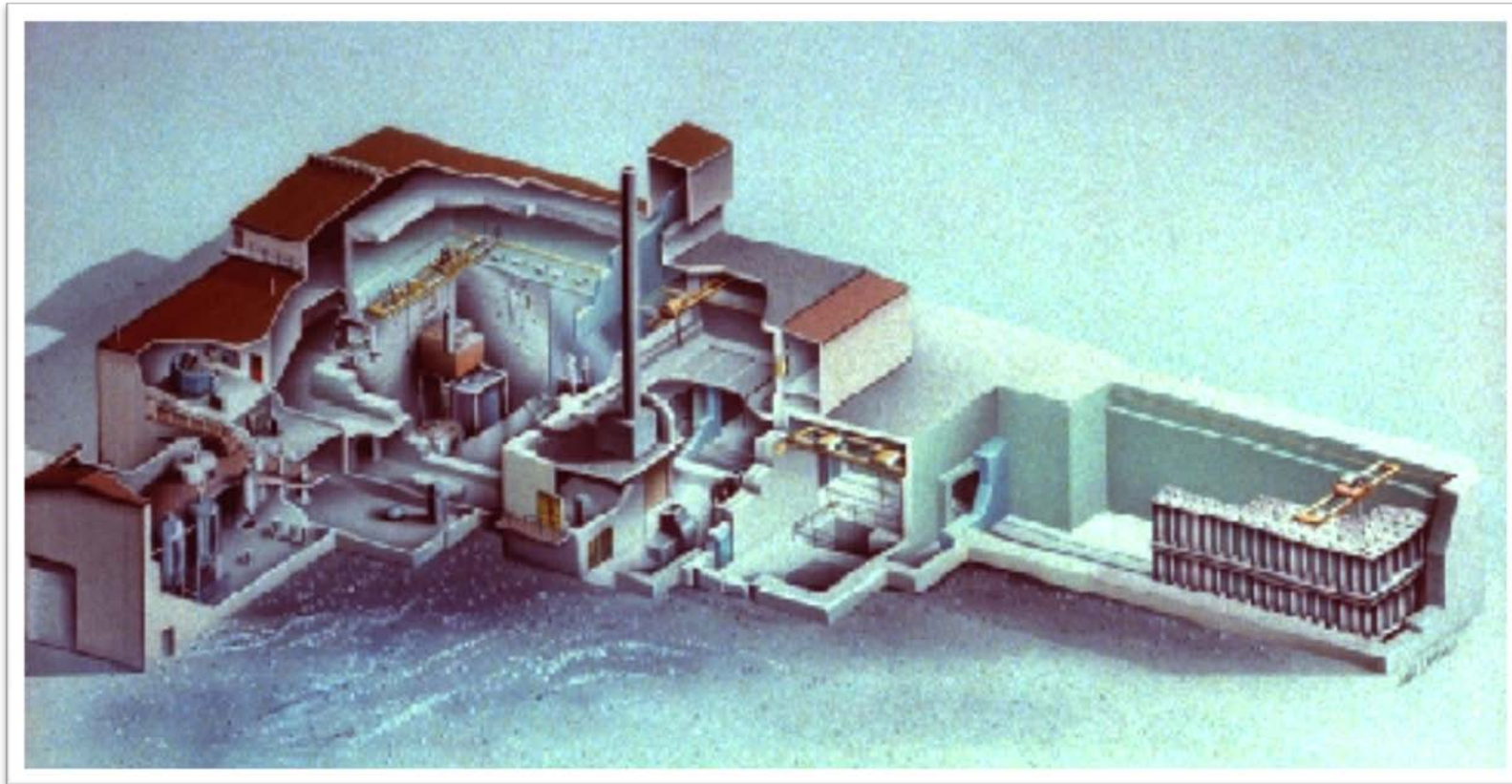


Vitrification Timeline

- 1983 Glass selected as waste form
- 1985-89 Non-radioactive melter testing
- 1990-93 Vitrification facility construction
- 1993-96 Commissioning and start-up testing
- 1996-98 Vitrification Campaign Phase I
- 1998-2002 Vitrification Campaign Phase II



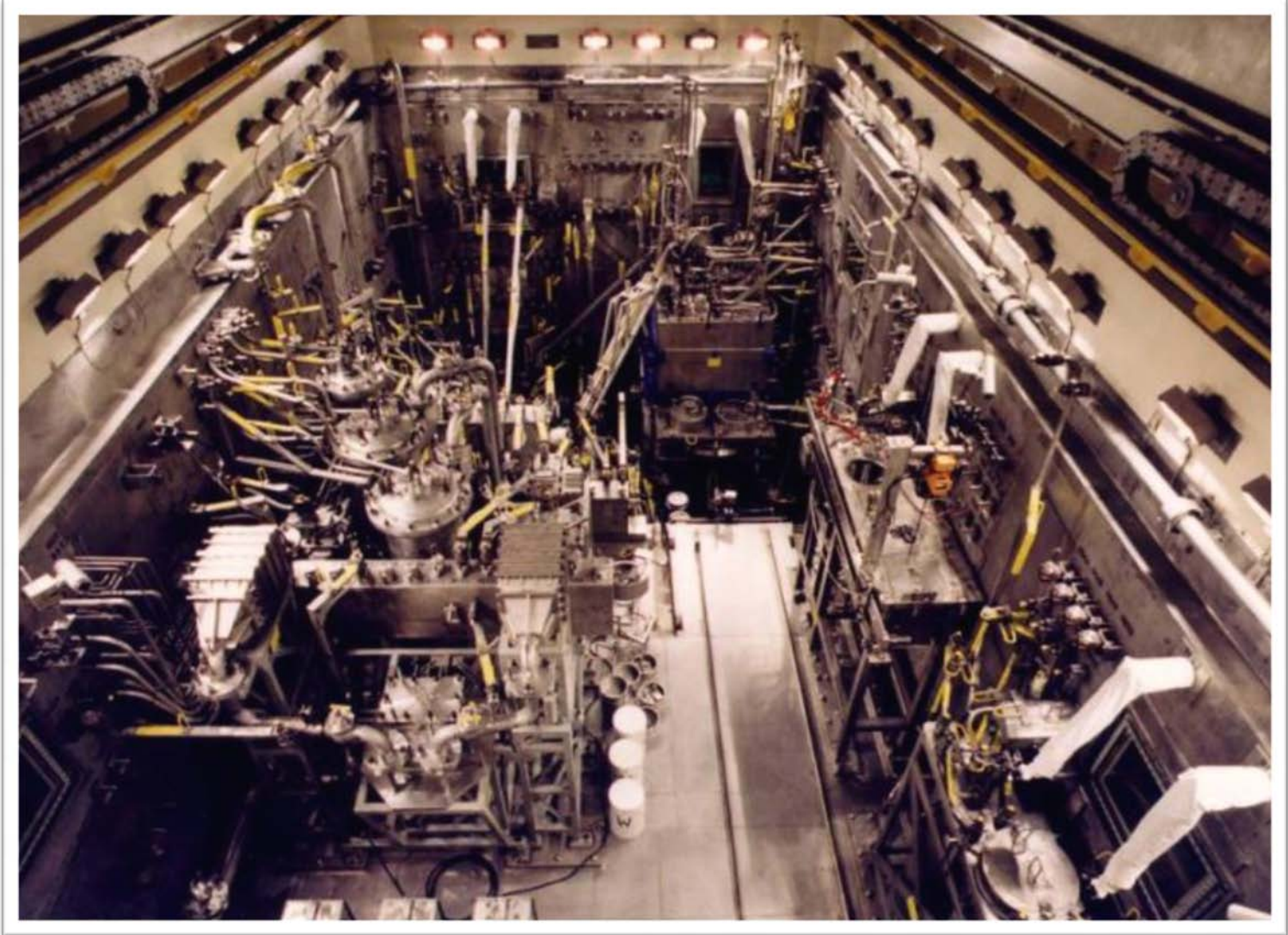
Vitrification Facility





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Vitrification Cell



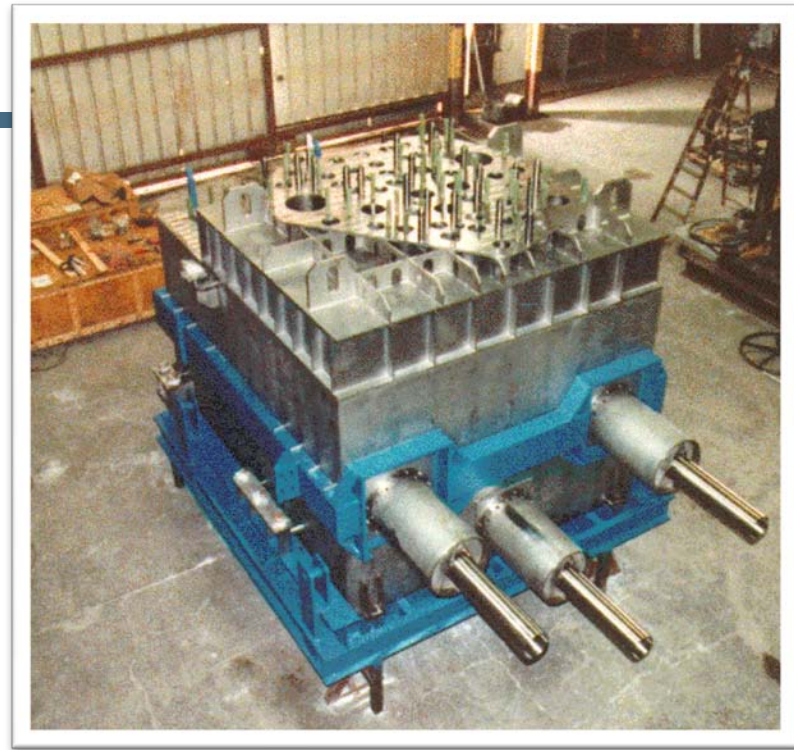


Melter

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Slurry fed , Joule heated

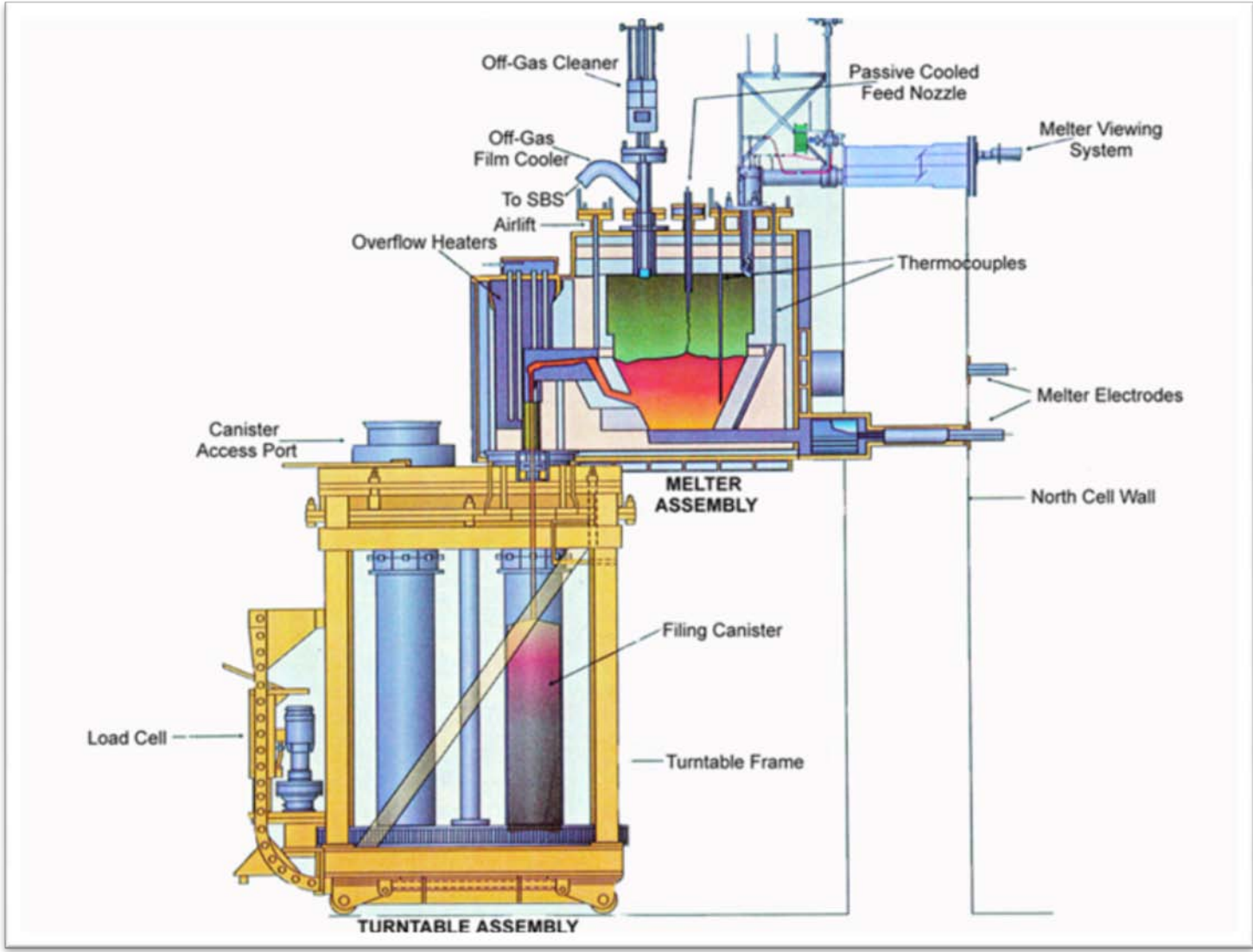
- 3 single-phase circuits
- 3 Inconel electrodes
- 1150°C operating temperature
- 10' X 10' X 10', water-cooled jacket
- 60 tons
- Capacity: ~5,000 pounds of glass
- Production: ~1 ton/day





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Vitrification Process Melter/Turntable



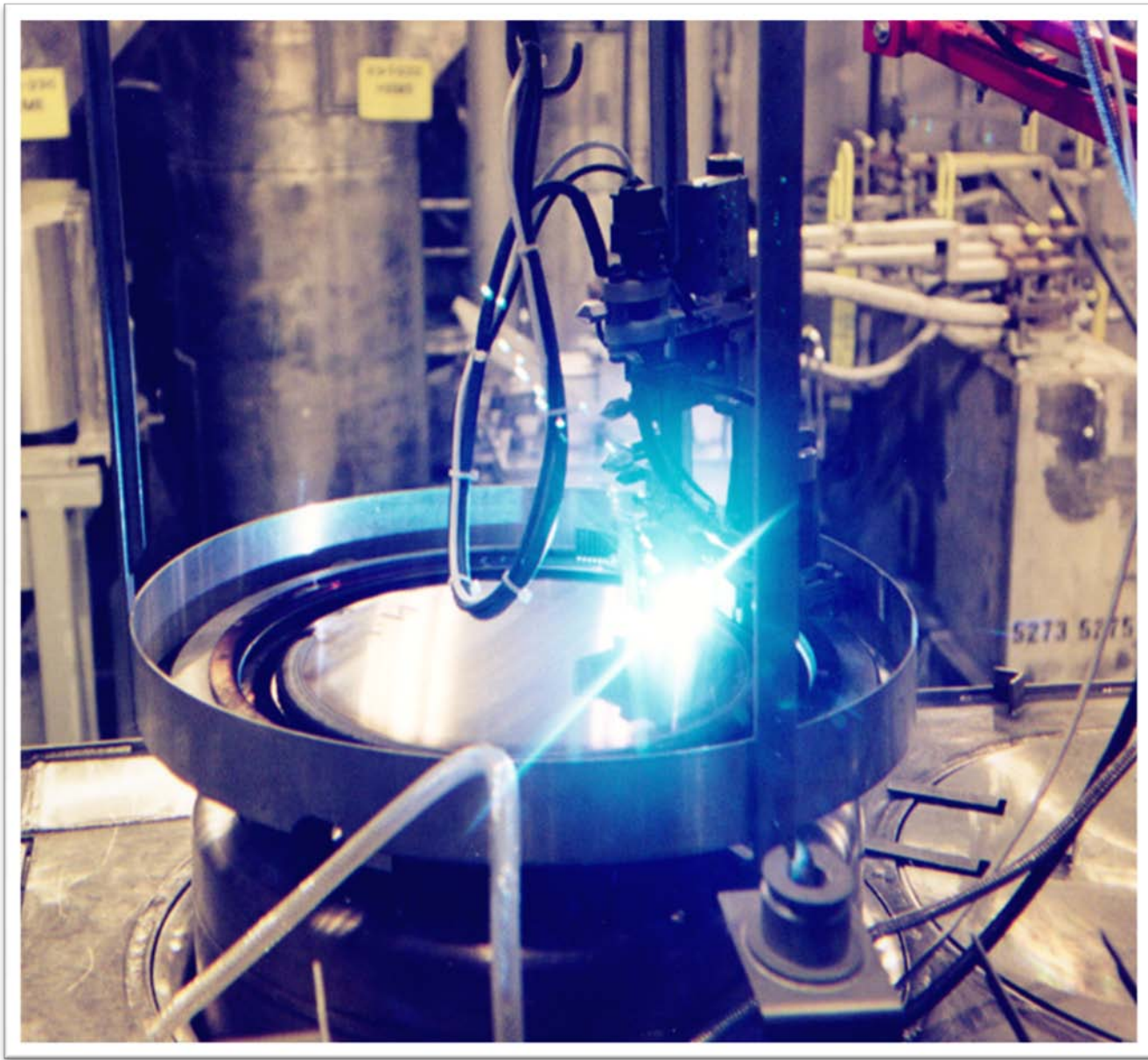
Turntable & Infrared Level Detection System





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Remote TIG Welder





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Movement of Canisters to Interim Storage



Interim HLW Canister Storage

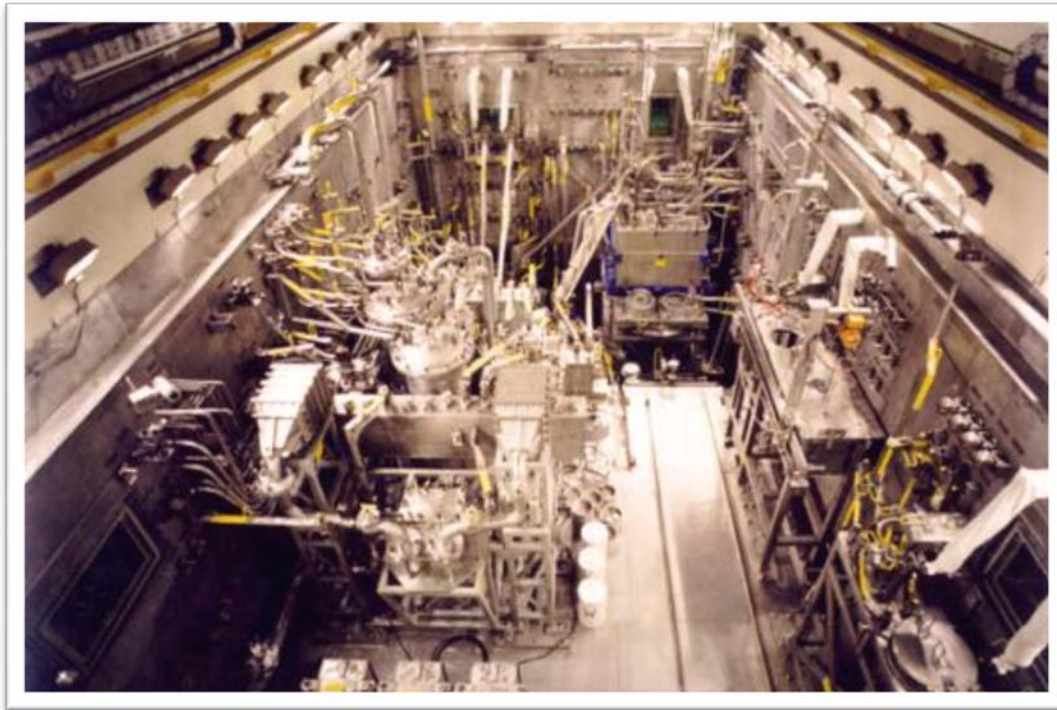




Vitrification Facts

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- Approximately 600 tons of glass produced; 24 million curies; 275 canisters
- Average canister dose rate: 2,600 R/hr; maximum 7,500 R/hr
- More than 80 months of safe, successful radioactive operations



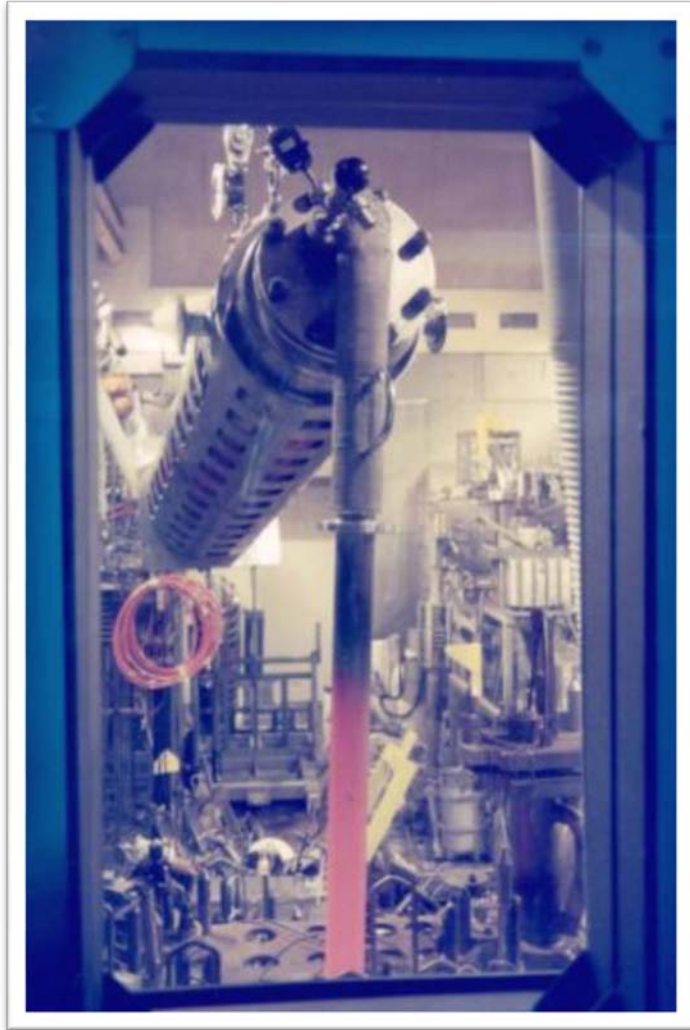
Inside the Vitrification (Vit) Cell before system startup



One of the test canisters before hot ops



Vitrification Flushing



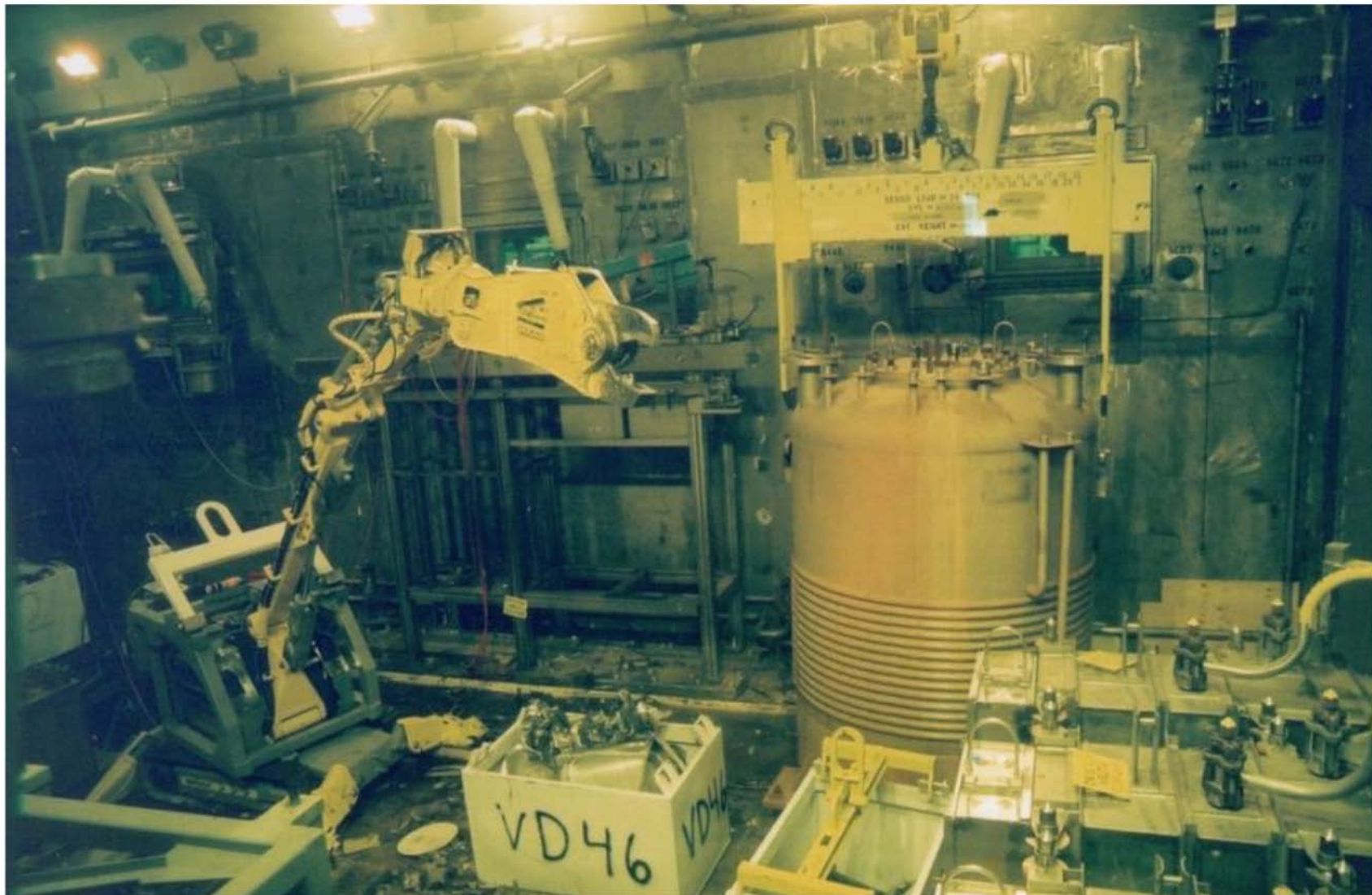
Final molten glass being removed from vitrification melter

- Vit system was extensively flushed before being shut down
- Evacuated Canisters
 - Melter emptied on Sept 5, 2002, using two evacuated canisters
 - Approximately 2,200 kg (88%) of material removed from melter



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Remote Dismantlement Operations



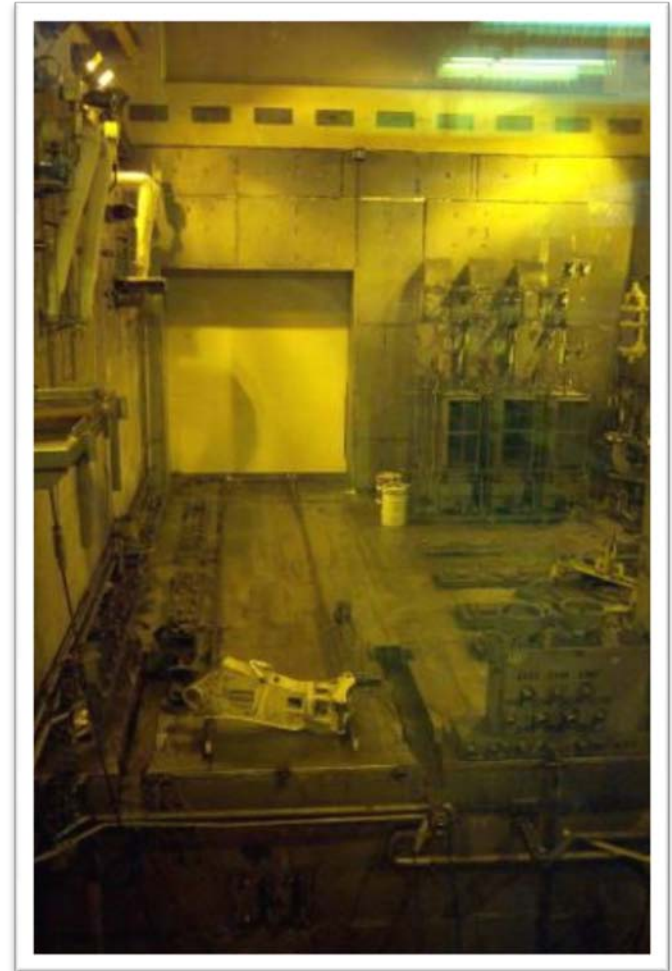
Floor mounted manipulator (Brokk®) modified for full remote operations



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Vitrification Facility Dismantlement

- Dismantlement began Oct 2003
- Work Scope
 - Removed and packaged expended equipment and material
 - Completed dismantlement by 2005
 - 10 to 100 R/hr general radiation field at completion





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Cemented Waste Shipped for Disposal



Shipping campaign – 2006-07