



Idaho Cleanup Project

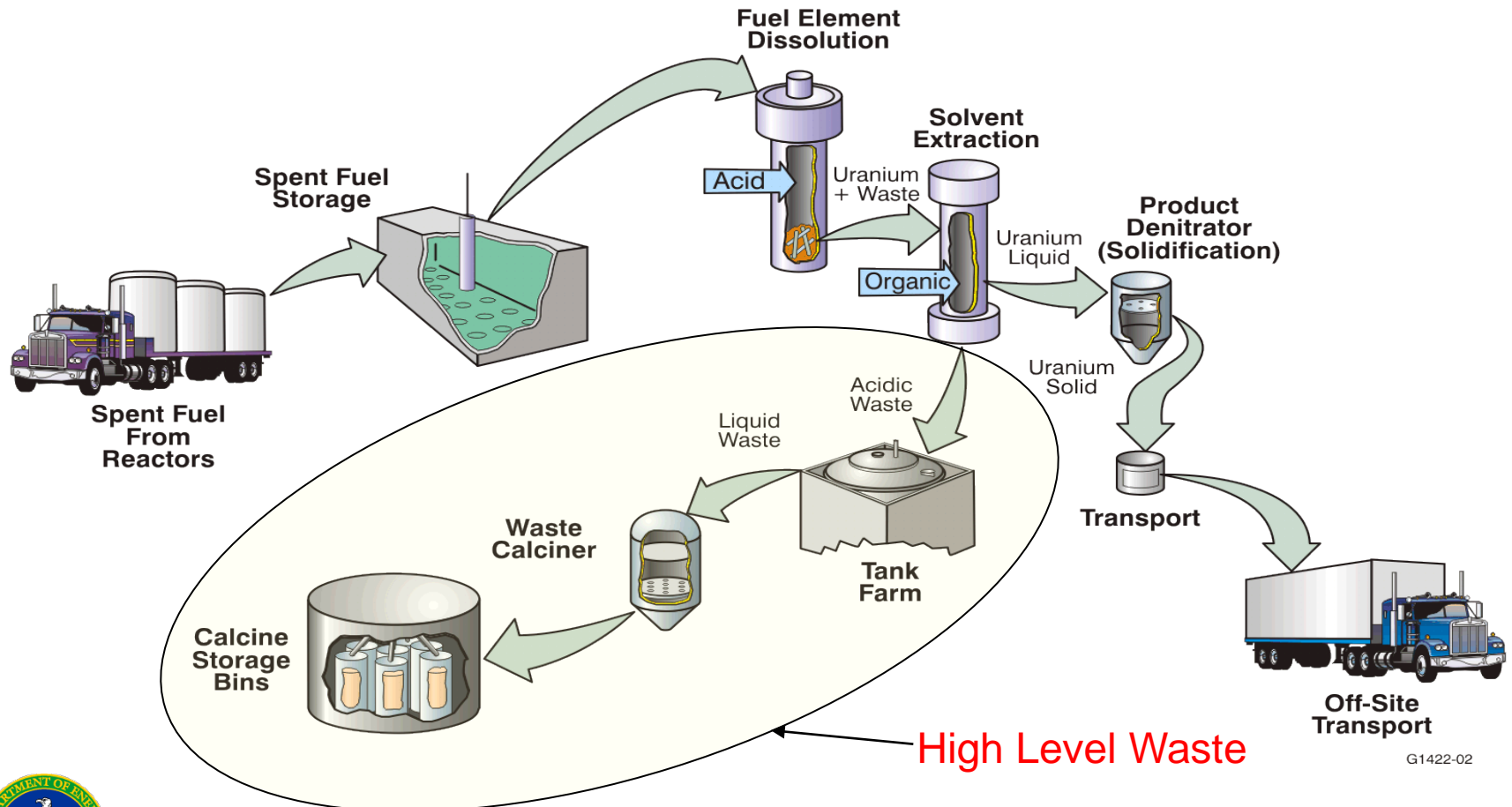
Calcine Disposition Project

**Presented To: INL Citizens Advisory
Board**

**Presented By: Joel T. Case
Federal Project Director
Calcine Disposition Project**

January 23, 2013

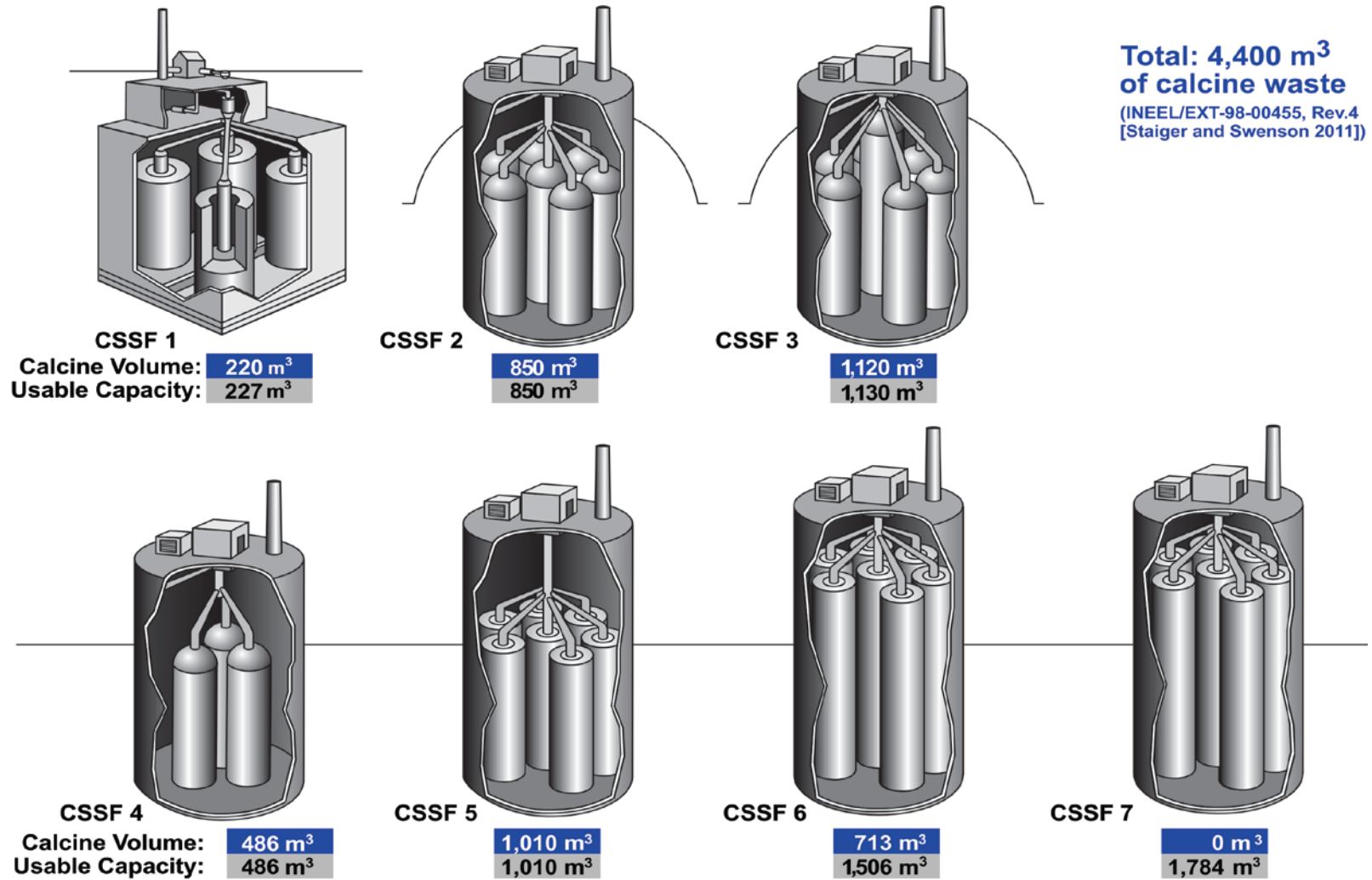
Calcine is Solidified First Cycle Raffinate from Former Reprocessing of Spent Nuclear Fuel



G1422-02



Calcine Solids Storage Facility (RCRA Permitted)



Calcine Solids Storage Facility



U.S. Department of Energy
Idaho Operations Office

Calcine Disposition Project Scope

- *Design and construct processing facility using existing facility (Integrated Waste Treatment Unit) to the maximum extent practical*
- *Retrieve and transport 4,400 cubic meters of calcine from current storage in the Calcine Solids Storage Facilities*
- *Treat calcine to meet revised LDR requirement*
- *Package resultant treated waste form in canisters*
- *Ship for disposition or storage outside of Idaho*



Calcine Disposition Project Milestones

- *Critical Decision (CD)-0 (Approve Mission Need) was signed June 29, 2007*
- *An amended Record of Decision (ROD) selecting Hot Isostatic Pressing (HIP) treatment technology was issued by DOE on December 23, 2009, meeting the December 31, 2009, milestone in the Idaho Settlement Agreement and the Idaho Site Treatment Plan*
- *Submittal of a RCRA Part B permit application for the Calcine Disposition Project by December 1, 2012*
- *Submit Site Treatment Plan Schedule by December 31, 2012 to include:*
 - *Procure contracts*
 - *Initiate construction*
 - *Conduct systems testing*
 - *Commence operations*
- *All calcine must be road ready in compliance with the Idaho Settlement Agreement by December 31, 2035*

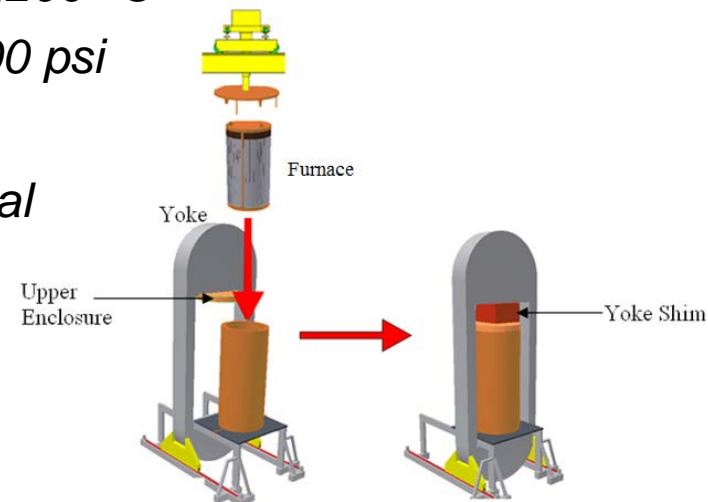


Hot Isostatic Pressing

- *HIP in commercial use since 1941*
 - *Commercial temperatures to 2,550 degrees C and pressures to 60,000 psi*
- *Technology consists of a pressure vessel containing an electrically heated furnace.*
- *Components are placed in a sealed can inside the furnace and isostatically pressed with argon gas to maximum density*
- *Temperature range for Calcine treatment 1,050-1,200 °C*
- *Pressure range for Calcine treatment 7,200-15,000 psi*
- *Produces glass-ceramic waste form*
- *Results in large life-cycle cost savings through final disposition*
- *Volume reduction expected to be 40% to 60%*



Lab Scale HIP Can Testing Before and After
(AVURE June 2011)



The diagram illustrates the High Pressure Hydrothermal (HIP) process, divided into four main stages: 5.0 Retrieval, 6.0 Treatment, 7.0 Packaging, and 8.0 Shipping. Each stage is further divided into subsystems and components.

5.0 RETRIEVAL (6 SYSTEMS / 29 SUBSYSTEMS):

- 5.1** CALCINE BIN SET (TYPICAL CSSF)
- 5.2** ADDITIVE TRAIN A
- 5.3** CYCLONE TRAIN A
- 5.4** CALCINE RECEIPT TANK TRAIN A
- 5.5** FINES RETURN FILTER TRAIN A

6.0 TREATMENT (7 SYSTEMS / 14 SUBSYSTEMS):

- 6.1** HIP CAN FILL STATION TRAIN A
- 6.2** HIP FURNACE
- 6.3** HIP MACHINE (3 units)
- 6.4** HIP CAN TRAIN A

7.0 PACKAGING (5 SYSTEMS / 19 SUBSYSTEMS):

- 7.1** CANISTER LOADING HOIST
- 7.2** HIP MACHINE (3 units)
- 7.3** HIP MACHINE (3 units)
- 7.4** HIP MACHINE (3 units)
- 7.5** HIP MACHINE (3 units)
- 7.6** HIP MACHINE (3 units)
- 7.7** HIP MACHINE (3 units)
- 7.8** HIP MACHINE (3 units)
- 7.9** HIP MACHINE (3 units)
- 7.10** HIP MACHINE (3 units)
- 7.11** HIP MACHINE (3 units)
- 7.12** HIP MACHINE (3 units)
- 7.13** HIP MACHINE (3 units)
- 7.14** HIP MACHINE (3 units)
- 7.15** HIP MACHINE (3 units)
- 7.16** HIP MACHINE (3 units)
- 7.17** HIP MACHINE (3 units)
- 7.18** HIP MACHINE (3 units)
- 7.19** HIP MACHINE (3 units)

8.0 SHIPPING (2 SYSTEMS / 6 SUBSYSTEMS):

- 8.1** SHIPPING CASK CRANE
- 8.2** SHIPPING CASK CRANE

Process Flow Details:

- Calcine Flow:** From the Calcine Bin Set (5.1) to the Calcine Receipt Tank (5.4), then to the Calcine Bakeout Train A (6.1), and finally to the HIP Can Fill Station Train A (6.1).
- Gas Flow:** From the Calcine Bakeout Train A (6.1) to the FOG Filters Train A (5.5), then to the GAC Bed Train A (5.5), and finally to the Off Gas Cooler Train A (5.5).
- Argon Flow:** From the Off Gas Cooler Train A (5.5) to the NOx SCR Train A (5.5), then to the Hg Condenser Train A (5.5), and finally to the Heater Train A (5.5).
- High Pressure Argon:** From the Heater Train A (5.5) to the Hg Amalgamation Process (5.5), then to the Argon Let-Down HEPA Filter (5.5), and finally to the Shipping Cask Crane (8.1).
- Retrieval Flow:** From the Calcine Receipt Tank (5.4) to the Retrieval Train A (5.5), then to the Retrieval Filters Train A (5.5), and finally to the Shipping Cask Crane (8.1).
- Canister Loading:** From the HIP Can Train A (6.4) to the Canister Loading Hoist (7.1), then to the Shipping Cask Crane (8.1).

Legend:

- Red = Calcine
- Yellow = Gas
- Green = Argon

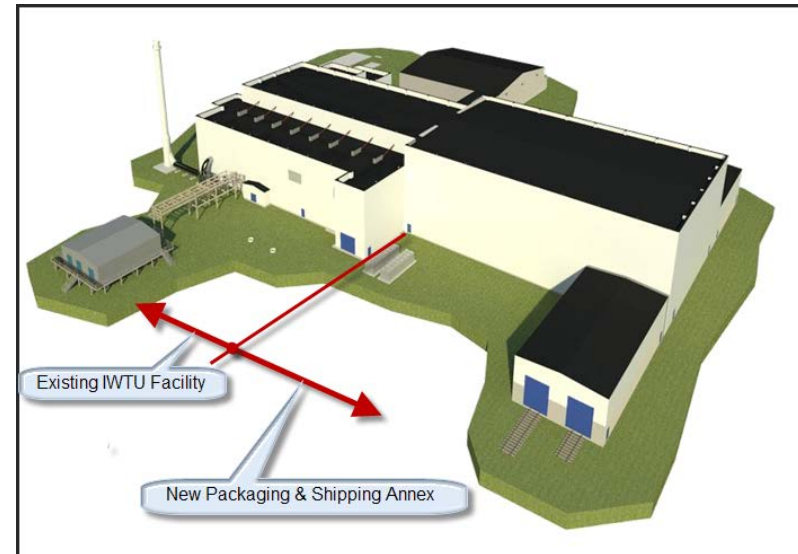
IWTU Facility



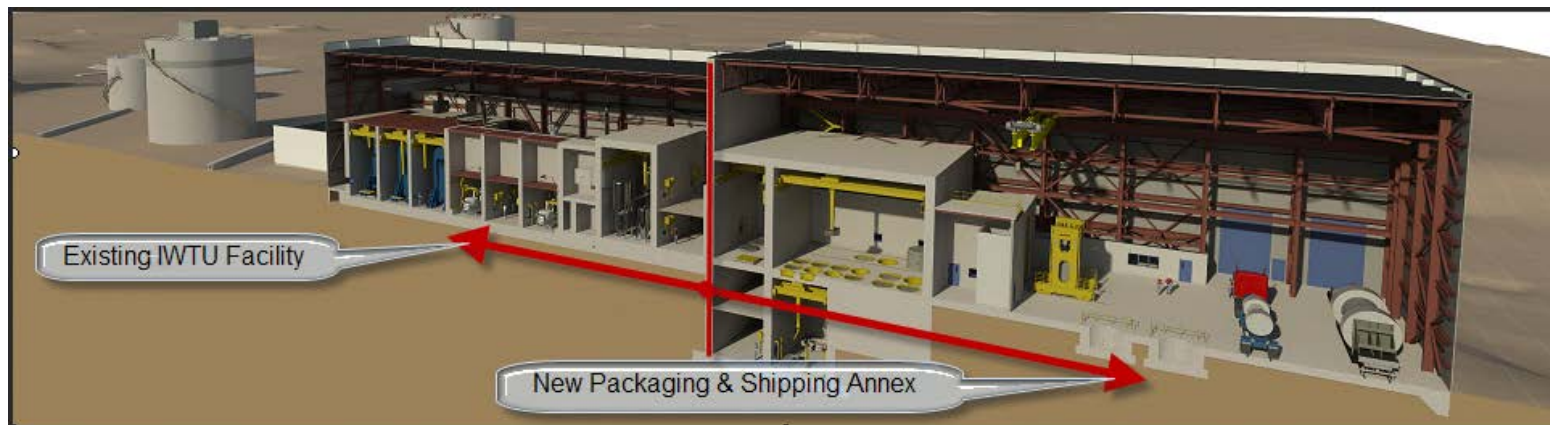
*U.S. Department of Energy
Idaho Operations Office*

Facility Overview

- Fully utilizes existing IWTU PC-3 cells for HIP machines
- Re-uses the existing IWTU canister fill cells for HIP Can fill
- Calcine Surge (day) storage and bake-out cell within IWTU footprint
- Packaging and shipping located in new east annex



PERSPECTIVE VIEW OF EXISTING IWTU WITH EAST ANNEX



SECTION VIEW OF IWTU'S PROCESSING CELLS



Calcine Disposition Project Status

- Completed HIP can qualification tests up through ½ scale can (20 inches tall by 30 inches in diameter)
- Completed nine lab scale waste-form tests
- Completed furnace filter tests
- Completed HIP can profile testing
- Commenced HIP can modeling tests
- Completed design at a level to support submittal of RCRA Permit
 - 45 system & facility design descriptions
 - 1,060 drawings
- Completed material balance for process
- Completed and validated calcine inventory and composition data base



RCRA Part B Permit

- *The CDP Permit Application was submitted to the DEQ on November 27, 2012 as a new RCRA permit application following the standard application format as agreed upon with the DEQ. Submittal as a new application allows for a project-specific document that only addresses the future CDP units, rather than modification to an existing permit which would then contain both active units and future units that will occupy the same building footprint.*
- *The application addresses the design for retrieval of calcine from the existing CSSFs, transport to the CDP, bakeout, additives, HIP treatment, packaging for shipment, and treatment of the process off-gas. Current storage of calcine within the CSSFs is addressed under an existing RCRA permit.*
- *The permit application also contains reports which detail the testing done to date on the development of the final waste form, PE-certified design information, risk assessment evaluation, and waste form and technology readiness strategy plan.*



Next Steps

- *The state will evaluate the permit application for administrative completeness.*
- *If the permit application is determined to be administratively complete, the technical review will be conducted by DEQ.*
- *DOE-ID will respond to any Notices of Deficiencies or other requests consistent with the permitting review process.*

