Retrieval and Repackaging of RH-TRU Waste - GENERAL PRESENTATION
MODULAR HOT CELL TECHNOLOGY

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ADAPTING AREVA’S TECHNOLOGY

► AREVA Worldwide

- Nuclear Lifecycle
- Transmission & Distribution
- Renewable Energy

► AREVA US

- Nuclear Fuel Services
- Nuclear Engineering Services

► AREVA Federal Services, LLC. (AFS)

- Federal Services
- Major Projects
  - MOX-MFFF
  - Yucca Mountain Project
  - DUF6
  - Plateau Remediation Contract
  - Washington River Closure Project
  - SRS Liquid Waste
ADAPTING AREVA’S TECHNOLOGY

AFS Technology Provider

- SRS - MOX Technologies (Adaptation of European Technology)
- SRS - Enhanced Chemical Cleaning
- ART - Cold Crucible Induction Melting
- Hanford – Lithium Hydrotalcite
- Hanford – Mobile Hot Cell
Hanford CH PRC Mobile Hot Cell

AFS – Pre-Selected Major Subcontractor to CH2M Hill

- Provide Mobile Hot Cell as a Technology Driven Solution to Clean-up challenge
- Step change to current baseline procedure
- Proven Technology with operations Lessons Learned
- Demonstrated re-use and mobility
- Demonstrated capability to transition to future missions
- Process waste on-site without building new facility
- Minimize D&D activities through small foot print
MOBILE HOT CELL
PROGRESSIVE TECHNOLOGY

► FIRST GENERATION: ERFB UNIT (MARCOULE, FRANCE)
  ► First application – 1996 / 2006 (RH-TRU bituminized waste drums)
  ► Second application – 2008 (Clean Up concrete vault)

► SECOND GENERATION: ERCF UNIT (MARCOULE, FRANCE)
  ► Current application – 1996 / 2010 (Vaults 1 and 2)
  ► Future application – Post 2010 (Vaults 3 and 4)

► THIRD GENERATION: FOSSEA
  ► Construction Phase

► ADAPTION TECHNOLOGY TO PRC: HANFORD
  ► Safety Crosswalk Evaluation
  ► Initiated Design Phase
First Generation: ERFB
Bituminized Waste Drum Retrieval Facility
Purpose of the ERFB Unit

Retrieve, Characterize, Process and Repackage

- 6,200, 55 gallon aging ML and RH-TRU bituminized waste drums stored in 35 below-grade concrete vaults
  - Waste drums were produced between 1966 and 1978 (bituminization of liquid waste produced during the operation of the Marcoule UP1 Spent Nuclear Fuel Reprocessing Plant)
- Repackaged into new stainless steel over-packs
- Placed into transport casks and transported by truck to a safe on-site storage facility.
ERFB: Functional Diagram 1: Drum Retrieval, Monitoring and Processing

1. Drum retrieval from a vault
2. Drum tilter
3. Radioactivity and dose rate monitoring
4. Inserting the drum into an overpack pre-placed in a transport cask + overpack lid crimping

Photo caption - © Copyright
ERFB Marcoule – A Modular Free Standing Unit

ERFB is a modular, autonomous and contained unit comprising 7 cells welded and bolted around a metallic structure.
ERFB Marcoule – Processing Area

- All operations are remotely controlled from an adjacent control room (right side of the picture).
ERFB Marcoule – A Mobile Unit

- ERFB moving on rails laid on both sides of the storage vaults.
ERFB Marcoule – Operation Records

- Started operations on January 21, 2000
- Operated in 2 shifts, 5-days/wk (4 person crew + supervisor + an HPT)
- Retrieved, processed and repacked 37 waste drums per week
- No overpack, atmospheric, or surface contamination detected outside of the processing cell
- No personnel contamination was detected
- Operated until November 2006
- Results:
  - TECHNOLOGY APPLICATION ON A NEW PROJECT: ERCF
  - REUSE OF THE EXISTING MOBILE HOT CELL
Second Generation: ERCF
Bituminized Waste Drum Retrieval Facility
UP1 Dismantling – ERCF

Retrieval, Characterization and Repackaging of ILLW radioactive wastes conditioned in bitume drums:

- **Conducted Studies: (2004 – 2007)**
  - Developed Safety Reports and Analyses
  - Conducted Conceptual Study of the process equipment based on ERFB Design and Lessons Learned
  - Design studies (process, electrical, nuclear ventilation, I&C, handling and packaging)
  - Constructed MHC
  - Tested MHC (inactive and active)

- **Operating on Vaults 1 and 2 since September, 2007**
- **Transfer to Vaults 3-4**
Flow Sheet Diagram

1. Blockhouse
2. Transfer Air Lock - 112
3. Transfer and Packaging Cell – 113
4. Process and Retrieval Cell - 101
5. Transfer Air Lock - 112
6. Blockhouse

1 - Retrieve drums from the blockhouse
2 - Placement of drums on conveyor
3 - Monitor radioactivity and dose rate
4 - Insert drum into an overpack
5 - Pre-placed in a transport cask
6 - Unload transport cask
GENERAL OVERVIEW ERCF

- Remote Control Room - 102
- Process and Retrieval Cell - 101
- Packaging Cell – 103
- Blockhouse
- Electrical Rooms – 106/111
- Maintenance Air Lock (Access fork-lift truck ) 113
- Ventilation (105) and Filtration (108) Rooms
Modular Design

- Assembled and set to work off site.
- Mobile Hot Cells for process with risk of contamination and/or irradiation
- Individual unit for non nuclear equipment (Electrical panels, utilities,...)
- Footbridges
- Dimension compatible with transport by truck
Retrieve Drums From Blockhouse
Movement of Modules

Move facility as a mono-block for short distances

Assumptions for moving the facility:
- Cleanup of the ERCF after Vaults 1 and 2 mission completion
- Disassemble fragile or delicate equipment (e.g. personnel air locks, footbridges)
- Removal of Ventilation, Electrical and I&C Connections
- Placement of equipment on metal frame, beams, supports on ERCF
  - Uncouple desired modules
  - Provides support for the wheel shafts to move the assembly
- Install wheel shafts and move facility
- Fasten ERCF to new site previously prepared

ERCF can be moved by disassembly and reassembly
- Unit designed for truck transport
Third Generation: FOSSEA
Decommissioning and Evacuation of Pits
F5 and F6 pit at Cadarache are interim storage facilities for remote handled mixed and radioactive waste

Project: Design, Construct (current phase), test and operate MHC to:

- Retrieve radioactive waste with portable module
- Characterize and repackage waste and transfer to a transport cask for final disposal (CEDRA)
GENERAL OVERVIEW

VENTILATION BUILDING

PIT

INTERMEDIATE STORAGE

IMPLANTATION GENERALE
DU HANGAR DE INB56
(COUVERTURE FOSSES 5 ET 6)

ACCESS CONTROL

CONTROL ROOM
NDA FOSSEA TECHNOLOGY

NDA and Packaging cell:

- Process:
  - Cask interface
  - Decontamination
  - Characterization:
    - HGRS (High Resolution Gamma Spectroscopy)
    - IPAN (Imaging Passive-Active Neutron)
  - Packaging (if needed)

- Control Room
- Electrical Rooms
- Ventilation building
Adaptation of European Technology:
Processing of Remote Handled TRU Waste Hanford
Value Engineering study concluded the MHC will be an integral part of the Alpha Caisson Waste Retrieval System that will:

- Enhance Operations and Maintenance
- Maximize use of proven technology
- Facilitate re-use with other site caisson cleanup in mind
- Optimize Cost and Schedule effectiveness
- Mitigate Risk
MHC Mission at Hanford

 Produce Certifiable RH TRU Waste Packages:

- Retrieve Remote-Handled TRU Waste
- Sort all waste
- Characterize (VE/NDA and Physical Sampling)
- Reduce size
- Package (WIPP Certifiable)
ADVANTAGES OF AREVA TECHNOLOGY

- Existing technology in operation by AREVA (design not based on development or references)
- Specific design using lessons learned from existing operations - proven technology lowers project risk
- Waste can be processed “on-site” (shipping across site not necessary)
- Does not require the D & D of existing facilities and associated worker dose
- Does not require the construction of any new fixed facilities
ADVANTAGES OF AREVA TECHNOLOGY (cont)

- Process can be entirely qualified in cold tests
- Limited on-site fabrication/construction activities (Minimal impact on site operations)
- Modular process
- Reusable for other cleanup missions