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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**

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- **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**

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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.**

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ERFB: Functional Diagram 1: Drum Retrieval, Monitoring and Processing

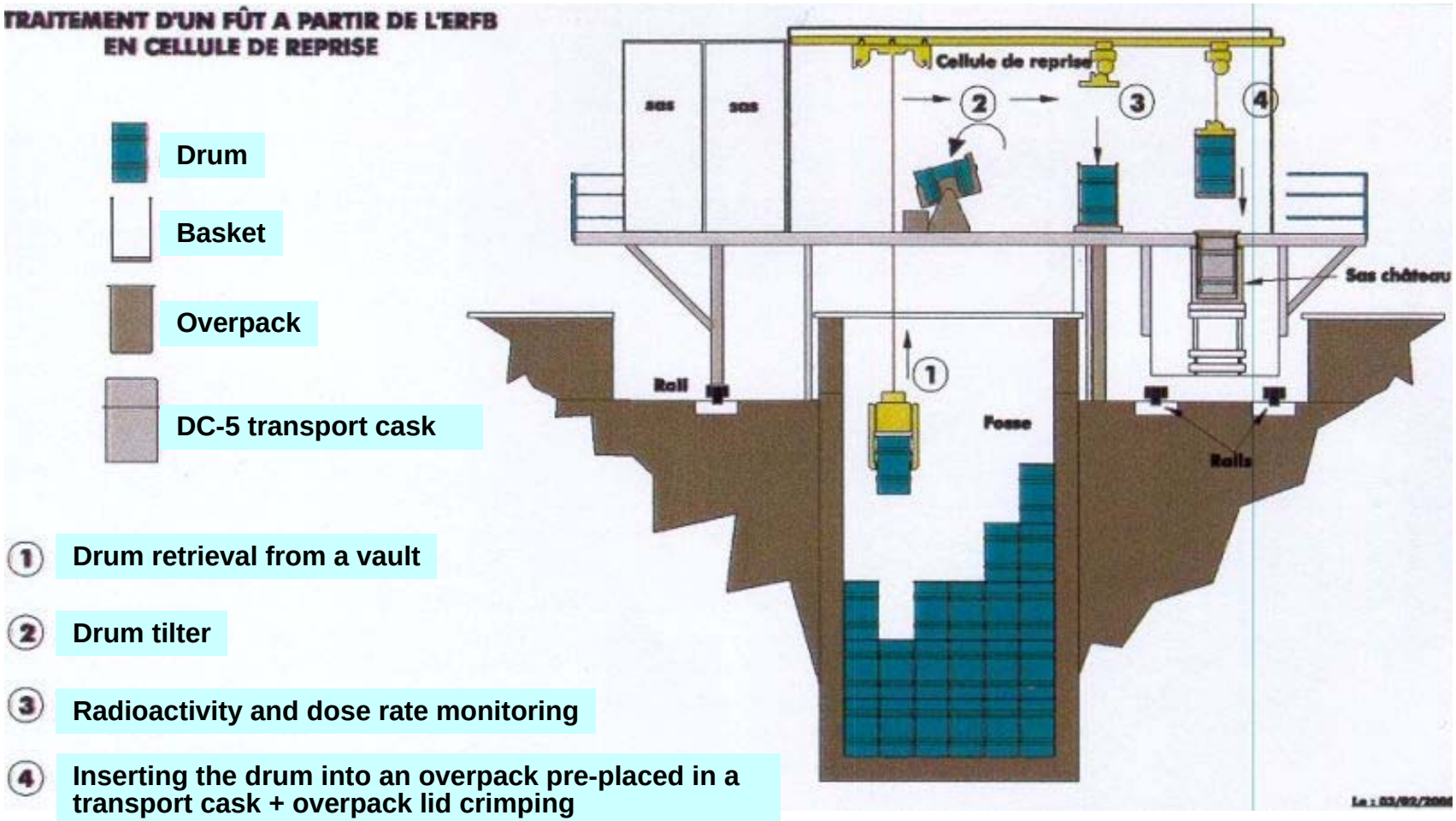
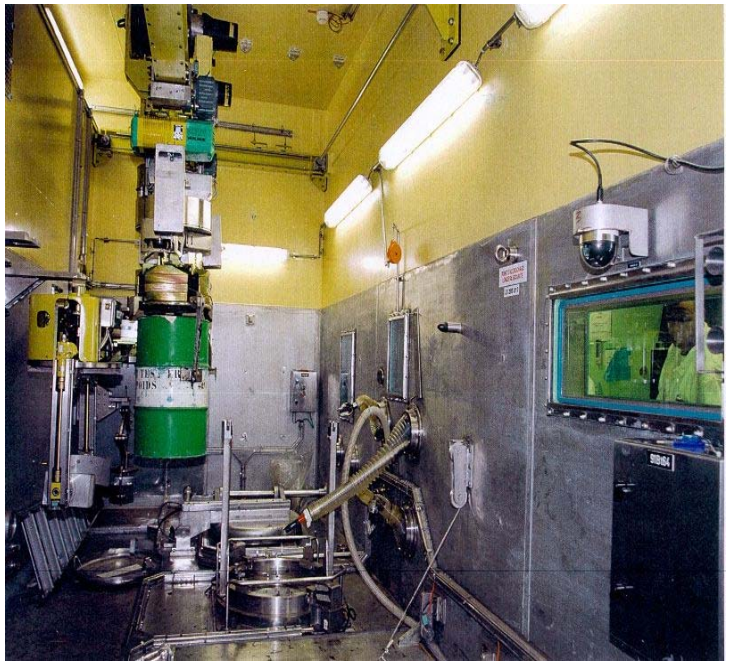


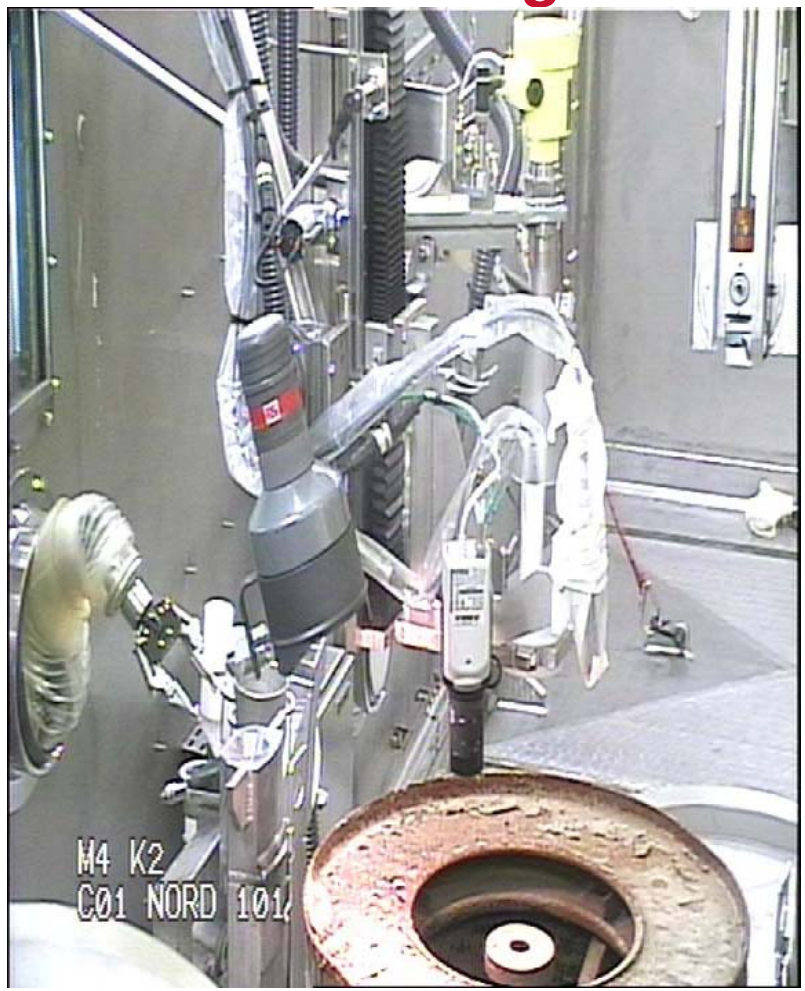
Photo caption - © Copyright

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**

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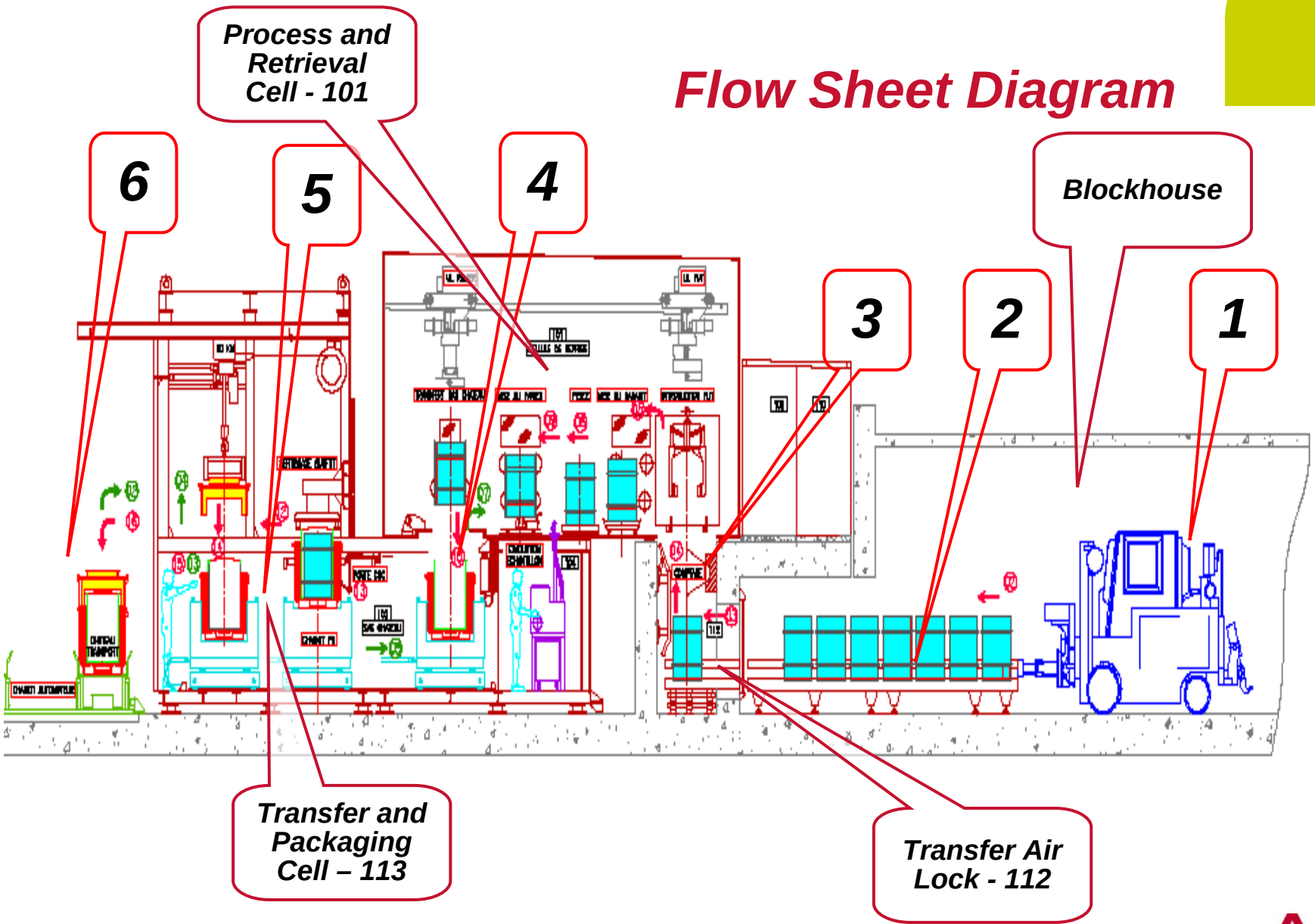
Second Generation: ERCF Bituminized Waste Drum Retrieval Facility

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***

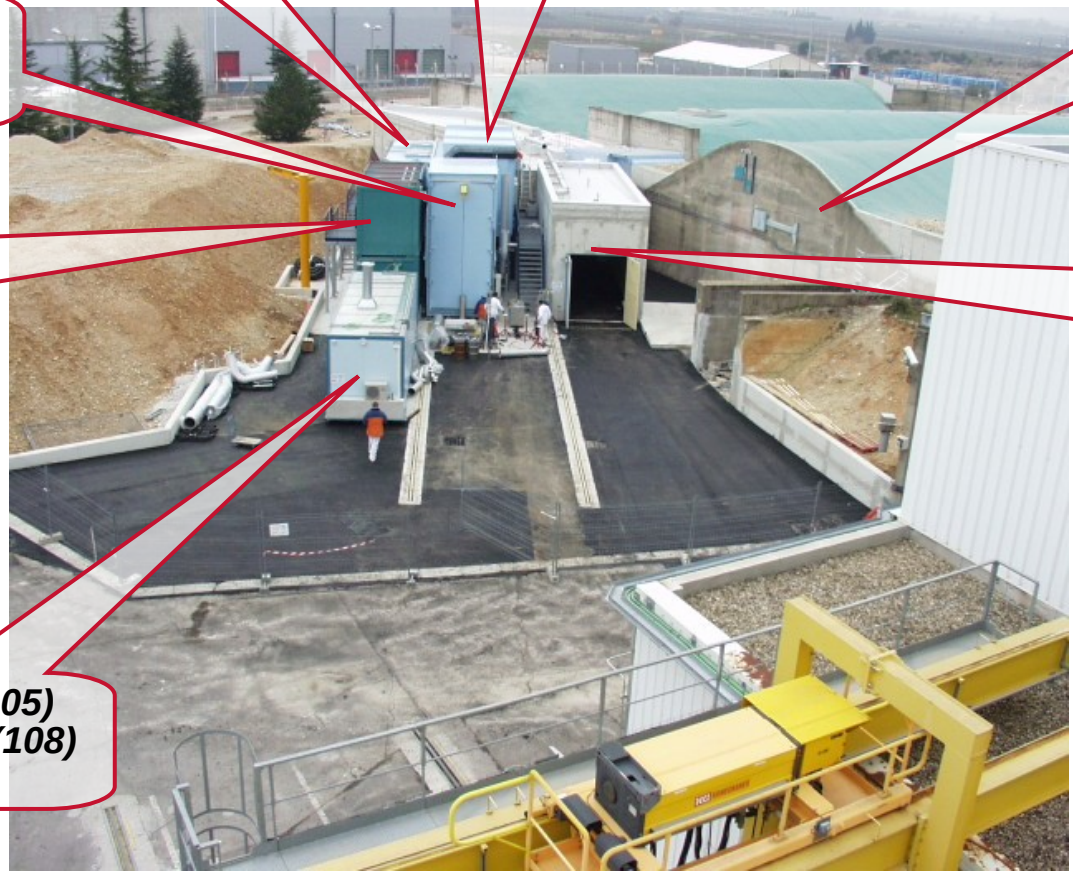
Flow Sheet Diagram



Flow Sheet Diagram

- 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



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

Process Hot Cell

High part of Transfer and Packaging Cell

Installation of Remote Control Room

Retrieve Drums From Blockhouse

REMOTE CONTROL ROOM

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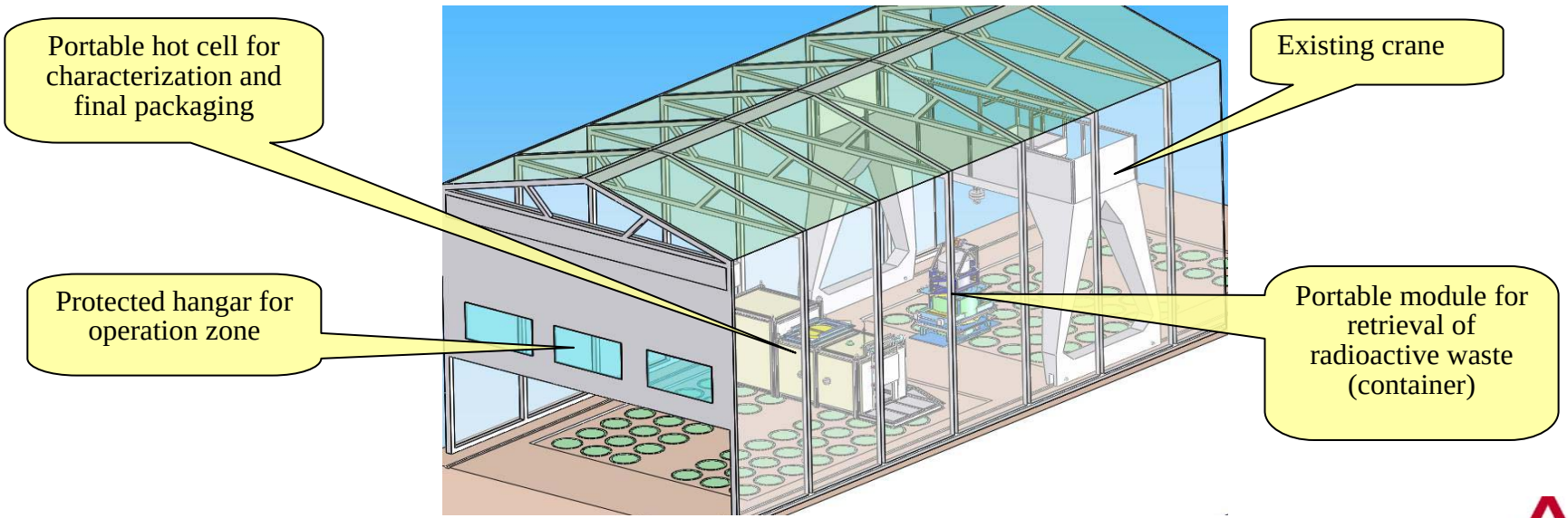
Movement of Modules

- 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

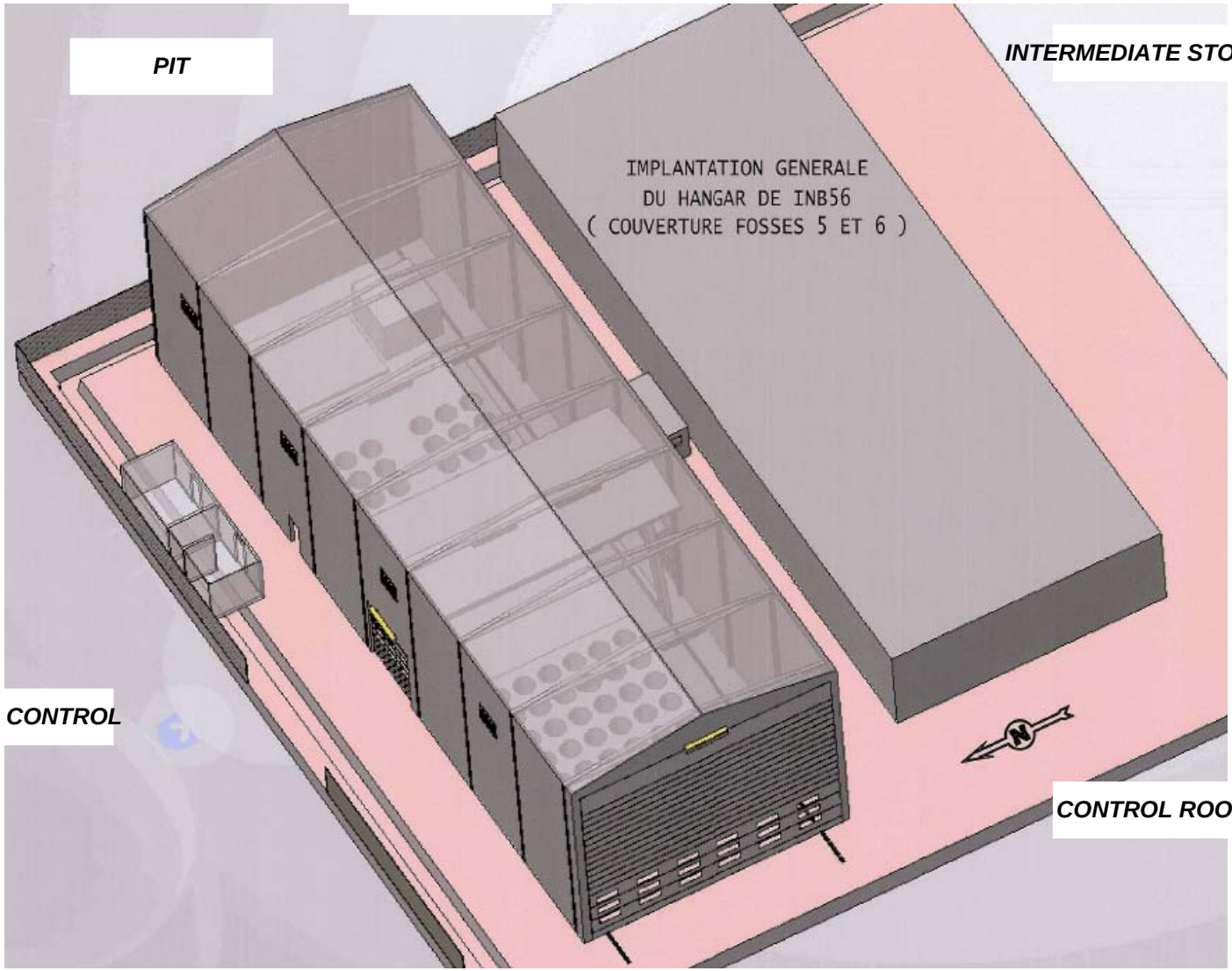
Third Generation: FOSSEA Decommissioning and Evacuation of Pits

MOBILE HOT CELL

- **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)**



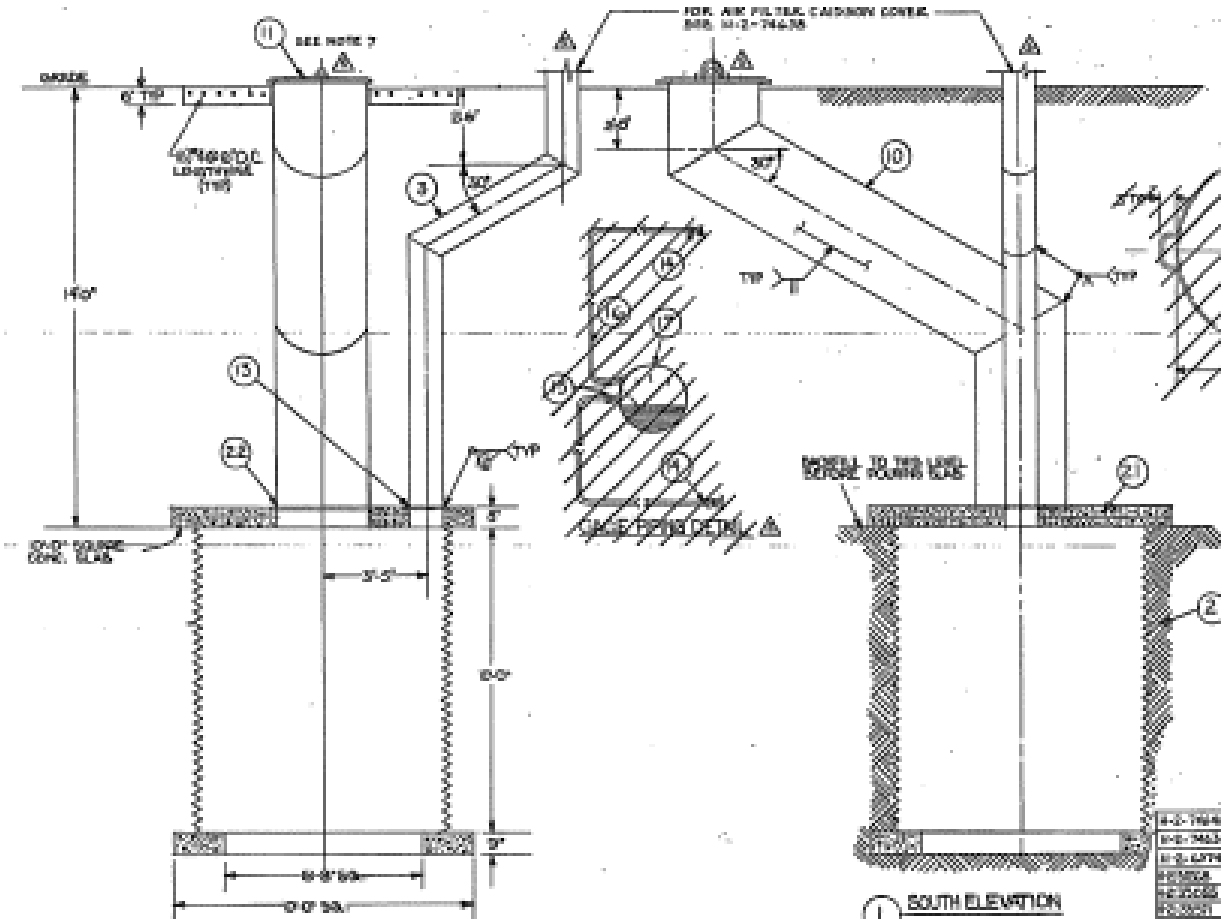
GENERAL OVERVIEW



NDA FOSSEA TECHONOLOGY

- **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


SEE NOTE 7
14'-0"
5'-3"
6'-0"
SOUTH ELEVATION

Proposed Modular Hot Cell at 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**

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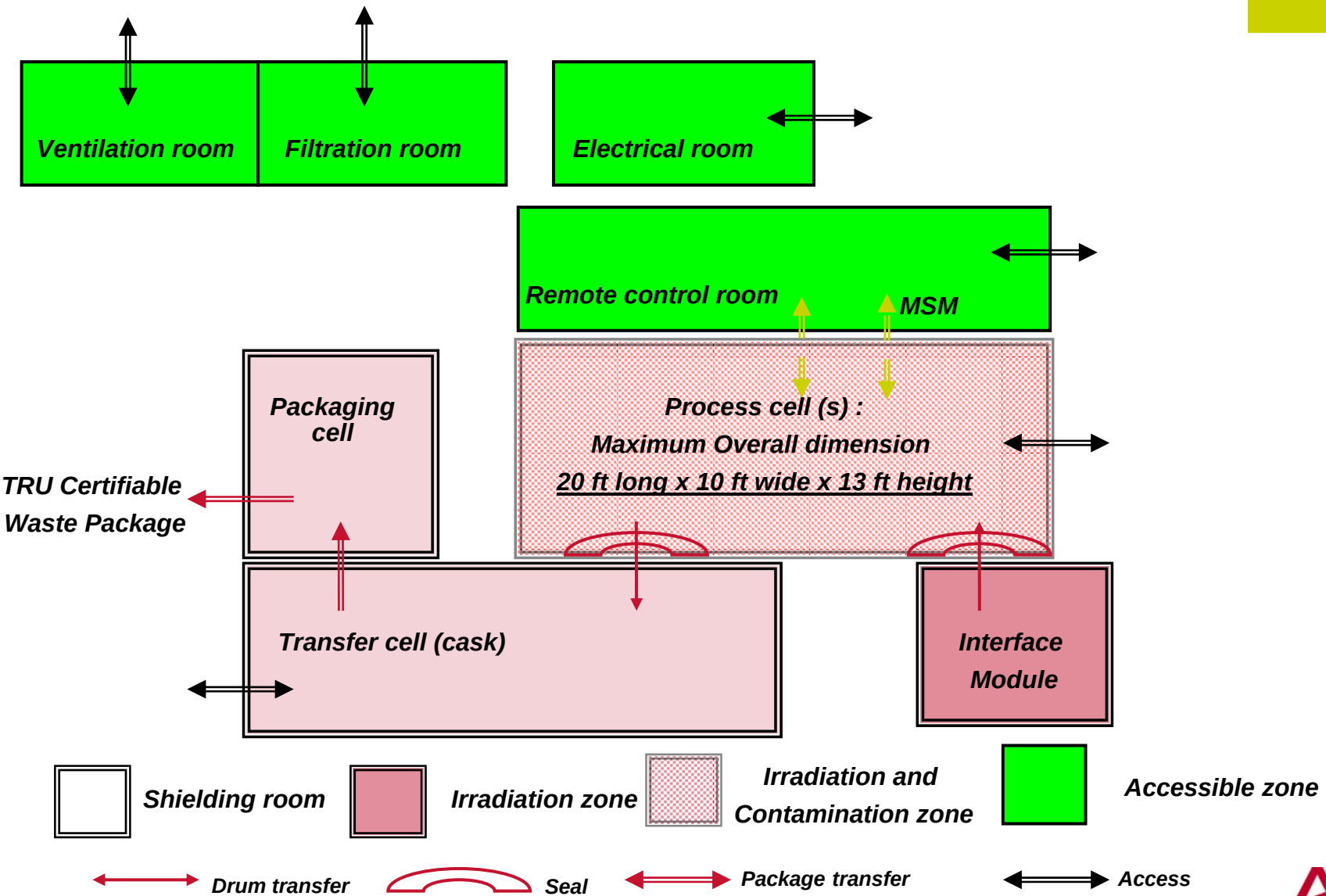
HANFORD: Functional Diagram



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)**

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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**