LESSONS LEARNT FROM DIADEM MEDIUM-LEVEL WASTE INTERIM STORAGE’S CONSTRUCTION

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HOW TO DETERMINE THE BEST DECOMMISSIONING POLICY?

The choice of the most relevant waste treatment schemes:

- First an assessment of the main radioactive features of the waste
- Often a couple between containers types and storage concepts

R&D facilities
Currently under dismantling
To be dismantled
Nuclear services and interim storages

G1
IZEN
CDS
HERA
UP1 plant
VITRIFICATION
APM
ATALANTE

ICSM
STEL
IZOS
MAR 400
CELESTINS

G2 – G3
CEDRA (CADARACHE)
EIP
MELOX
DIADEM
Impact assessment studies highlighted centralized interim storage for CEA sites, near the largest waste producer.

Identified Material, whose high enough radioactive features neither authorize an interim storage in existing facilities nor an evacuation to a French operational disposal (ANDRA).

For the whole Program, key Features are:
- Activity
- Fissile Material
- Dose
- Thermal Power
WASTE FEATURES IN CONTAINERS

### Activity

- >1000 Tbc
- 400 Tbc - 1000 Tbc
- 176 Tbc - 400 Tbc
- 10 Tbc - 176 Tbc
- 6 Tbc - 10 Tbc
- 1 Tbc - 6 Tbc
- 185 Gbq - 1 Tbc
- 0 - 185 Gbq

### Fissile Material

- >300g
- 200g - 300g
- 110g - 200g
- 50 - 110g
- 10g - 50g
- 1g - 10g
- <1g

### Dose

- 500 - 1000 Gy/h
- 100 - 500 Gy/h
- 50 - 100 Gy/h
- 10 - 50 Gy/h
- 1 - 10 Gy/h
- 0.1 - 1 Gy/h
- <0.1 Gy/h

### Thermal Power

- 1500 - 2000 W
- 1000 - 1500 W
- 100 - 1000 W
- 50 - 100 W
- 10 - 50 W
- 1 - 10 W
- < 1 W
DIADEM’S FEATURES AND STORY

Building dimensions are W 51 m x L 57 x H 24 m
5 floors
Total useful area 5000 m²
Total poured concrete 10 000 m³, General earthworks 23000 m³
Nuclear ventilation 33000 m³/h

1. Reception
2. Monitoring
3. Lorry Transfer
4. Hot Cell
5. Packaging
6. Shielded transfer Machine
7. Storage

252 Racks for 2000 containers
CEA’s handling patent

3 types of containers
with identical diameters (external Ø 498 mm)
and increasing heights (620mm, 1060mm and 2120mm)

316 L Stainless Steel
Extra thickness 8 mm
Higher falls and corrosion resistance

Lid welding
leak tightness for several decades

Metal filters
will allow gaseous releases caused by radiation to escape
ROBUSTNESS OF CONTAINERS

CEA has carried out studies using FEM and fast dynamic calculations.

Prototypes of containers and shock absorbers have been constructed to perform representative fall and handling tests.
To avoid corrosion issues due to HCl, a study started to select a filtering media according to the requirements of nuclear standards and DIADEM’s exploitation.

The filters will be screwed on the lid of the container with metallic seal to ensure the tightness and will be changed during storage. Filter replacement will be ensured by operators in the DIADEM’s hot cell.
Remoting operations on containers:

- Welding of the lid
- Decontamination of the container’s external surfaces,
- Monitoring,
  - such as acoustic measures for corrosion detection
Foundations, heavy base mat, perimeter walls, hot cell rooms completed

Storage hall construction in progress

the hall features a 1.4 m-thick concrete slab

- weighing more than 1000 tons
- with 252 holes interfacing with tall vertical racks
• **interface** between **racks**, **slab** and **connections** is really **delicate**

• need for **fine tailored reinforcements** and **pouring schemes** + **mock-ups**

• last step: massive **concrete roof** for the **storage area**
KEYS ELEMENTS

- configuration and interface management, assisted by 3D models
- tolerances requirements versus reality, design versus construction
- concrete composition and stability all along long pouring sessions
- high reinforcement complexity and density management (up to 200kg of steel/m3)
- coactivity and its drive on scheduling all along the construction period
- synchronization of concurrent design activities by different suppliers
THANKS FOR YOUR KIND ATTENTION

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[Logos of various companies]