MANAGING THE WASTES ARISING FROM CEA R&D PROGRAMS

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SUMMARY

- Nuclear Waste Management at CEA: Objectives and Strategy
- Nuclear R&D facilities & Waste Treatment Facilities
- Waste Inventories, Categories, Treatments & Conditionnings
- Costs & Fundings for Waste Management
A Sustainable Nuclear Development is also based on a rigorous Waste Management:

- Minimization
- Optimized Categorization (VLLW, ILW, LL-ILW, & LL-HLW)
- On line Evacuation to Available Disposal and storage Facilities, as soon as possible
- Stock reduction of the “Historical” Wastes
- Avoiding the generation of wastes without treatment facilities
- Waste fluxes to be equilibrated from source (R&D Nuclear Facilities) to Treatment Capabilities
- Recycling, under optimized Techn.& Econ. Conditions
Huge diversity of facilities:

- **Reactors**: pond, fast breeders, gas graphite CO\textsubscript{2} cooled,
- **Accelerators and irradiators**
- **Laboratories, workshops, fuel cycle processing units**
- **Effluent treatment stations STEDs & Storages**

**No scale and series effects**: as for NPP’s or Gaseous diffusion plant

Diverse sizes:

- **Reactor**: Ulysse INSTN, Phénix
- **Labs**: LAMA, bat 18 FAR, APM, UP1

History and traceability of R & D facilities, as built drawings?

Chemical processing of SF:

- high potentially contaminated areas

Waste diversity

Historical nuclear Research Centers: FAR, SAC, MAR, etc.
Decrees June, 30th, 2006 imposed End of dismantling works:
- INB 165 process: < mid 2017
- INB166 support: < mid 2018

CEA’ Strategy:
- Site denuclearization and clean up ASAP, to reduce nuclear risk (urban area)
- Redeployment of free surfaces to future activities
Spent fuel from CEA R&D

- Test reactors Cores & Experimental fuels
- **Strategy:**
  1. **Processing in La Hague RP:** Orphée, Osiris,....
  2. **Intermediate Storage** before Processing: CASCAD or CARES
  3. **Old storages:** Removal & Processing through ISAI Marcoule or STAR at Cadarache to respect Storage specifications or La Hague RP:

**Historical Wastes from CEA**

- **Priorities:** Safety
- **Main programs:**
  - Organic liquids: Treatment (mineralization)
  - Solid wastes: **Safe storage, reconditioning** (cimentation)
Main types of Waste Packages Arising from CEA R&D Activities (Past & Present)

- **VLLW**: Big Bags
- **ILW**: Cemented Drums
- **LL-ILW**: Bitumen Drums
- **HLW**: PIVER Glass, AVM Glass, R7T7 Glass, Hulls
THE NATIONAL INVENTORY OF RADIOACTIVE WASTES IN FRANCE

(Distribution by sectors, In Vol.%, from ANDRA, 2012 National Inventory)
Most part of Primary Wastes is generated by DD & R programs
Waste Management Costs Represent ~ 30% of DD&R

L LW (short live)
- Industrial route: since beginning 90’s
- Producers effort: no saturation,
- Pb recycling inside CEA

ILW & HLW (Long-Lived):
- D&D program & waste recovery & storages dimensioned using hypothesis in CIGEO commissioning in 2025.
DISPOSAL FACILITIES

VL-LW
« Morvilliers »
~ 1 k€ /m³

LLW
“Centre de l’Aube »
~ 3 k€ /m³

LL-LLW
?
~ 7 à 20 k€ /m³

LL-ILW & HLW
CIGEO 2025
≥ 80 k€ /m³
1M € /m³

CEA : ~ 15 000m³/y
CEA : ~ 4 000m³/y
EXTERNAL DEMANDS

- Regulatory framework:
  - Law (Transparency and Nuclear Safety)
  - "Wastes" Law of June, 2006

- Technical obligations: PNGMDR, decrees, safety authority prescriptions
  - Waste Management
  - Dismantling decrees & Public inquiries
  - Final cleaning end state

- Financial obligations: Art. 20 of the 2006 Law
  - Future financial DD & R burden must be charged: settling of dedicated funds
  - Control committees (forecasting/execution)
  - Annual reports, submitted to external reviews
CONCLUSIONS

Wastes - The Wide variability and diversity impose some rules:

- Several Waste Treatment Facilities in Operation
- Minimize the Wastes (in Lab)
- Knowledge of the physical and chemical characteristics of the Wastes:
  - Optimize Categorization
  - Importance of final ANDRA disposal date of commissioning (for LL-LLW, LL-ILW and HLW)
- VLLW : Optimize and decrease of amounts needed (DD&R), to avoid the saturation of the Disposal Capacity (~2025)

R&D Programs:

- To Minimize the Volume
- To Optimize the Treatment & Conditioning Routes
WASTE TREATMENT FACILITIES

ISAI Installation de Surveillance des Assemblages Irradiés

CDS Conditionnement Déchets Solides

STEL ➔ Projet STEMA – AMETISTE Station de Traitement des Effluents de Marcoule

ADM Atelier Décontamination de Marcoule

Labo 109 (analyses)

DELOS Destruction de Liquides Organiques (Atalante)

Projet DIADEM Déchets Irradiants Activés de DEMantèlement

ATL Atelier Traitement du Linge

INB35 ➔ STELLA Station Trait. Effl. Liquides Aqueux OPALE (réno)

INB72 Déchets solides ICPE 393 - LANIE

INB37 ➔ AGATE Atelier de Gestion Avancée et de Traitement des Effluents

INB56-37 ➔ CEDRA (INB164) Conditionnement et Entreposage de Déchets Radioactifs

MCMF ➔ MAGENTA MAGasin d’ENTreposage de matières fissiles

INB37 ➔ ROTONDE FA et TFA

INB37 ➔ ARCCAD Atelier Rénové de Conditionnement de CADarache

MMB - ICPE 312- PEGASE

CASCAD (+ CARES)

STAR ➔ STEP
Before

Now