

DE LA RECHERCHE À L'INDUSTRIE



DIRECTION DE L'ÉNERGIE NUCLEAIRE

MARCOULE CENTRE

www.cea.fr

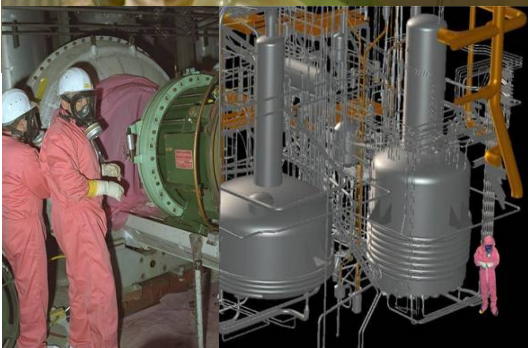
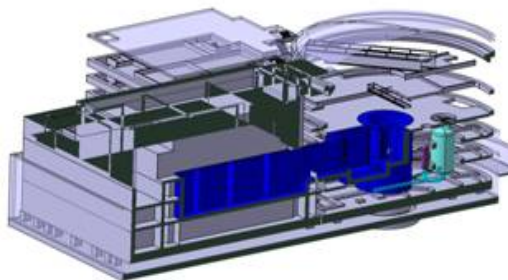
CEA MARCOULE ACTIVITIES & PROJECTS



European ALARA Network
Workshop n°18
March 11th 2019

Jean-Marie CARRERE
CEA Marcoule Program Manager

THE CEA MARCOULE CENTRE



CEA : a public body R&D – staff of 16,000 – 10 centres

- Nuclear Energy Division (DEN) settled at **Saclay, Cadarache and Marcoule centres** is in charge of **R&D for civilian nuclear energy** :
- **Actual and future nuclear systems**
 - Optimization of current industrial nuclear facilities
 - Development and Operation of large scientific tools
- **Nuclear facilities operator** : construction, renovation, dismantling

Marcoule's CEA DEN has 2 missions:

- **R&D on nuclear fuel cycle**
 - **Current needs** : performance & safety
 - **Government's needs** : nuclear waste Acts

>>> a strong and internationally recognized position

- **Dismantling of facilities**
 - UP1, APM, PHENIX programs
 - Innovative technologies and dynamic R&D

>>> Our local D&D programs are among the largest worldwide

A MAJOR SCIENTIFIC AND INDUSTRIAL PLATFORM IN SOUTHERN FRANCE'S OCCITANIE REGION

Key info

DE LA RECHERCHE À L'INDUSTRIE

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- A staff of 1 500, including 700 scientists (20 international experts)
- 30 R&D labs, major nuclear facilities : PHENIX, ATALANTE,...
- 300 publications, a portfolio of 300 patents (20 / year)



R&D for cycle
Dismantling



1,500

Transports
& D&D : 850

MELOX : 725



orano

Waste
treatment



250

Lifesciences



170

Sterilization



10 p.

278 hectares

5 INB
(ASN)

1 INBS
(DSND)

**+ 5,000 staff , 1st industrial site in the Gard
2nd in the Occitanie region (after Airbus)**

Very important economic impact (as of 2012)

- Staff of 1500 : Gard (66%) , 12% in nearby Bagnols sur Cèze
- 367 M€ of orders to supply chain (~ 2200 jobs), 172 M€ in the Gard (1130)

Massive & continuous investment for long term existence

- Site : ~120 M€ since 2005
- Major investment programs : > 200 M€ currently in progress

A recognized scientific actor

- 700 scientists (20 international experts)
- ISITE Muse, CODOR, Chemistry clusters (Montpellier-Toulouse)
- A joint research unit (ICSM) since 2009



UNIVERSITÉ
DE MONTPELLIER



Safety and transparency & public outreach

- Local Information Commissions CLI (INB) & CI (INBS)
- Risk management information available online
(Very low environmental impact (< 15 µSv / year))
- Major projects : public inquiries in 2014
- Showrooms : Visiatome – InfoDEM
- High level public acceptance, locally, for over 60 years

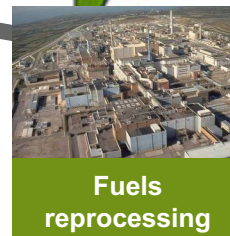
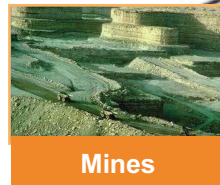


MARCOULE'S MAIN NUCLEAR FUEL CYCLE R&D CHALLENGES

**Today's
cycle**

Improve **extraction-
purification-conversion**
processes

**MOX fabrication management
Adaptation / materials**



Waste volumes,
**conditioning
management**
(glasses, cements)

**Long term behaviour management,
Radionuclides Chemistry/Toxicity**

Recycling processes optimization

**Stored MOX
evolution**



THE ATALANTE LABS : A WORLD-CLASS NUCLEAR FACILITY



**ATALANTE
NUCLEAR HISTORIC
LANDMARK**

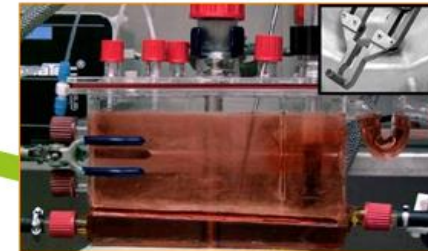


I – Actinides and Fission Products Basic Chemistry

VIII – Analyses



II – Spent fuel dissolution



VII – Conditioning, long-term behaviour



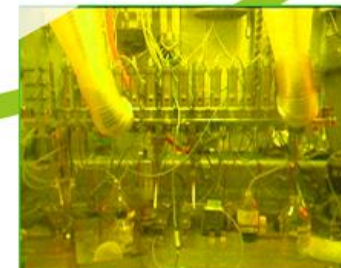
I – Extracting molecules design



VI - MOX Fabrication



V – Conversion Processes



IV – Separation processes

D&D AT CEA MARCOULE (1/2)

CEA's goal : rigourously manage the back-end of cycle

- Dismantling of shutdown facilities (INB)
- Legacy waste retrieval



Manage, with respect to safety, costs and schedules, the D&D programs. Namely at Marcoule:

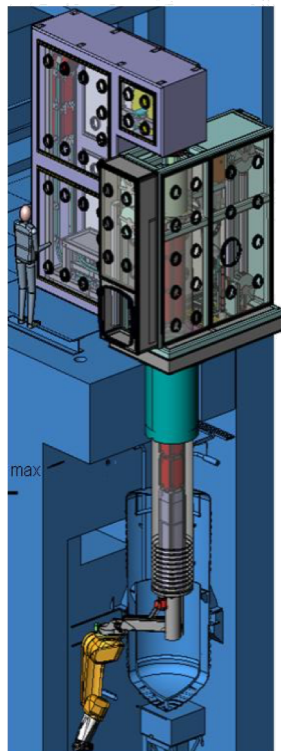
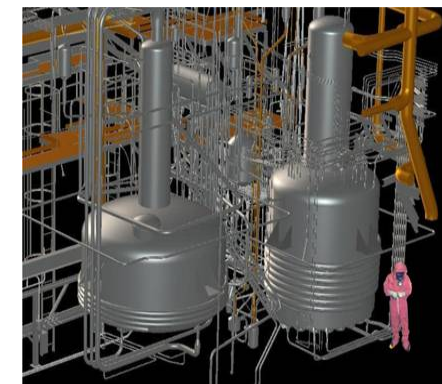
- UP1 plant + legacy waste retrieval
- APM pilot plant
- PHENIX reactor



CEA's strategy (legal framework : 2006 national act on transparency & waste) :

- Immediate and comprehensive D&D when achievable
- Final status : Dangerous substances evacuated (incl. radioactive ones).
 - In case of technical impossibility : decommissioning with servitude
- Safe interim storage and final disposal of waste
- An objective of technical & economical optimization





3 main issues :

- Experimental reactors D&D
- Labs, workshops, plants, waste units
- Legacy waste retrieval

Specificities :

- Historical nuclear site
- No series effects – various sizes
- Very different facilities and waste
- Fuel chemical treatments

ORGANIZATION



: R&D for D&D

: Owner & operational pilot

: Nuclear operator – Waste producer

Technical assistance, studies & project management :
Engineering companies

D&D on site operations : Decontamination, Robotics, Safety companies,...

*Acceptance
Commission
for
Radioactive
works*



MAIN FACILITIES AT MARCOULE SITE



R&D facilities

Currently under dismantling

To be dismantled

Nuclear services

Irradiator GAMMATEC (SH)

MOX fuel plant (AREVA)

R&D FOR D&D programs

Objectives :

- Reduce costs, schedules & waste. Improve safety
- Valorize R&D & CEA's feedback towards industrials

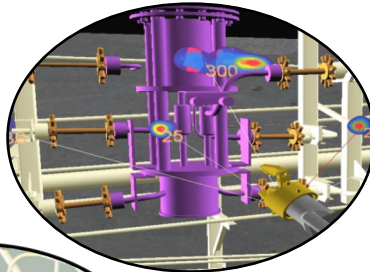


PVSI

PÔLE DE VALORISATION
DES SITES INDUSTRIELS

6 R&D development axes :

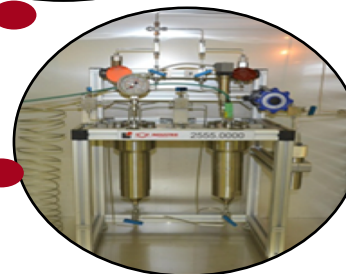
*Initial status
evaluation*



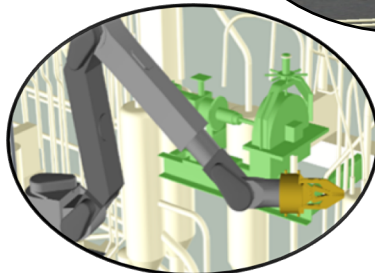
*Waste
characterization*



*Grounds and
structures
decontamination*



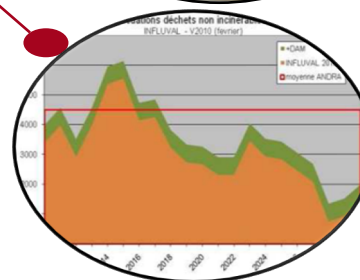
*Hostile
environment
work*



*Effluents & waste
treatment and
conditioning*



*Methods
and
management
of D&D*



MARCOULE A PLACE TO CREATE INNOVATION FROM EXPERTISE IN SEPARATIVE CHEMISTRY & DISMANTLING



Large **R&D on fuel cycle**



Major **decommissioning projects**
among the largest in Europe

Expertise in separative chemistry
and **materials recycling**



expertise in waste management,
deconstruction and depollution



TRAINING CLUSTER – RESEARCH – INDUSTRY



R&D  with applications in
circular economy, green
chemistry, waste treatment &
environment
(CTE / Cleantech Vallée)



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Thank you for your attention

