

European Working Group « *HOT LABORATORIES AND REMOTE HANDLING* »

Institute for Transuranium Elements
13-15 OCTOBER 1999 - Karlsruhe (Germany)

HOT LAB Refurbishment

The LECA story

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How to summarise the safety analysis issue:

*"One just cannot design
facilities that already
exist"*



1 - OBJECTIVES

- Refurbishing facilities in operation
- According to a Project → Cost, deadline, dosimetry, availability approach...

2 - THE REFURBISHMENT APPROACH AND OPTIONS

- The approach: facility margin vis-à-vis safety requirements
- Inventory of the works, corrective maintenance, safety analysis review
- Regulations, objectives in the context of new fuels to be analysed
- Analysis method: Safety-critical functions / Safety objectives

3 - IMPLEMENTATION, PROGRESS AND FIRST BALANCE ANALYSIS

- Presentation of the facilities
- Project organisation
- Progress, draining, destorage and renewal, Human Resource training
- Refurbishment particularities, old hot nuclear Facilities



Missions for renewed LECA
Implementing nuclear fuels

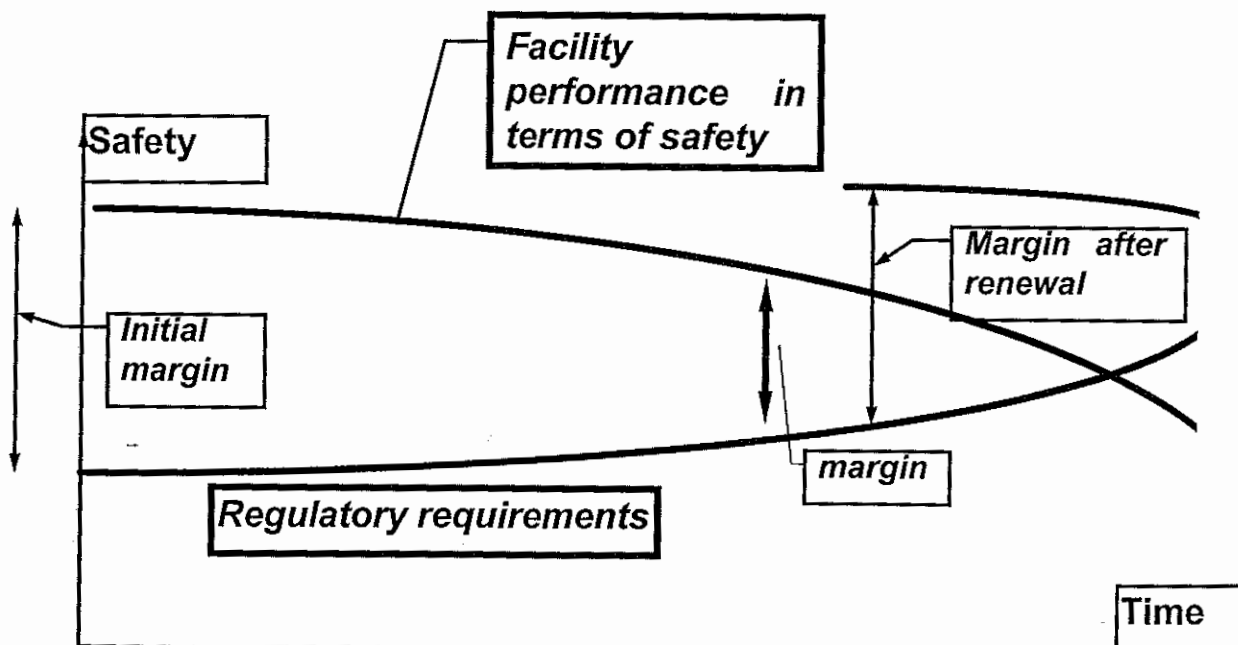
- Preparation, non-destructive analysis and testing, destructive testing, characterisation, remanufacturing, packaging...
- very high Pu and actinide content fuels

Project objectives:
Hot Nuclear Facility Refurbishment

- Maintaining the analysis capacity of an old laboratory, for a given period, taking into account the facility ageing process and the evolution in the safety requirements

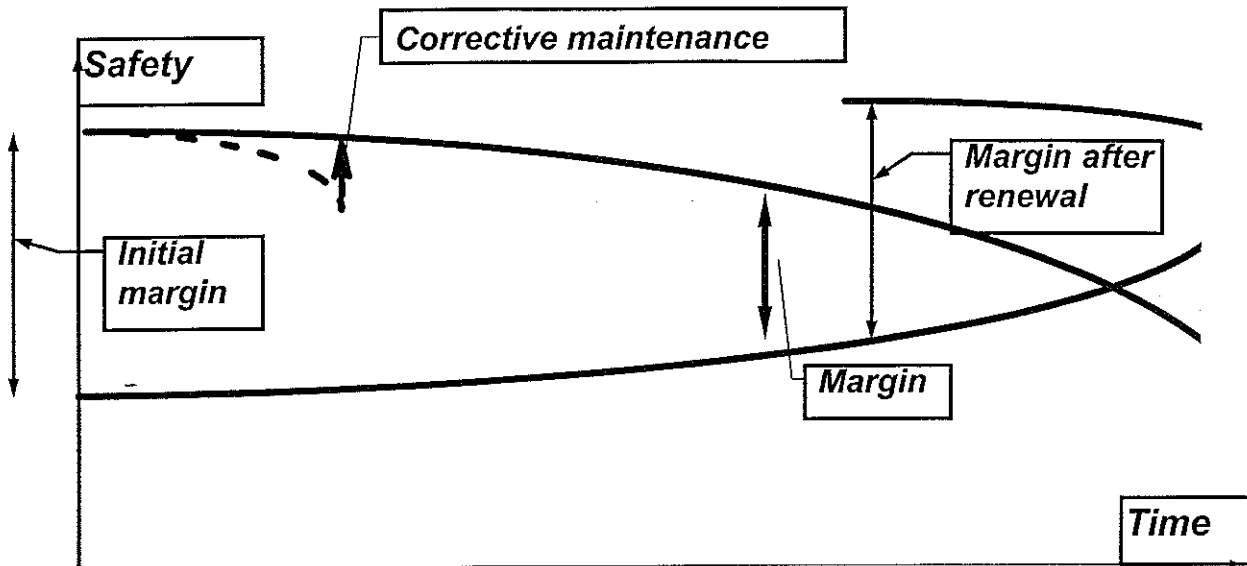


Renewed LECA method
Hot Nuclear Facility Refurbishment



Renewed LECA method

→ *inventory of the works, corrective maintenance, renewal*



Renewed LECA method

inventory of the works, corrective maintenance, renewal

- publications (*including 1st update of the safety documents*)
 - civil engineering
 - electricity
 - ventilation
 - firefighting, radiation protection
 - handling, fluid networks
 - criticality
- Experience feedback (formalised)

Renewed LECA method

Inventory of the works, corrective maintenance, renewal

- documentary reference update (RdS, RGE, PT)
 - electricity
 - firefighting
 - ventilation
 - handling
 - criticality



R&D and Safety requirements

- Requirements pertaining to fuels:
45 % Pu fuels, High burn-up

- Regulation:

Safety Rules (French "RFS"):

Quality, ventilation, firefighting, seismic risks

Other regulations

EEC 96-29, dosimetry



Approach for renewed LECA safety analysis

- 1) *Serious accidents, of low probability → earthquake*
- 2) *Normal and incident operation*

Safety-critical functions

Criticality

Irradiation

Containment:

- dynamic

- static

Prevention

Detection - monitoring

Effect limitation



Safety-critical functions, in-depth defence and renewal options

1/3

→ limitation of source term and work modes

Criticality

- analysis currently in effect (a few operation compensation steps) → little or no constructive provisions → studied consequences
- "up-to-date" file review

External exposure limitation - irradiation

- dose objective (max 2.5 mSv/year - compare t 2.5 mSv/year in average recommended) and zoning
 - weak points of protections, hot points of the facility
- shielded waste channel, equipment and personnel circulation
 - redesigned monitoring



Safety-critical functions, in-depth defence and renewal options

2/3

Internal exposure limitation - containment

→ personnel circulation paths and cloakrooms

static containment, first barrier

sealed waste channel, equipment circulation, local provisions on 1st barrier

reinforced sealing cells

additional filtration stage

dynamic containment, first barrier

classification and vacuum cascade

creation of a network dedicated to 2x100% cells

firefighting: partitioning, detection, intervention



Safety-critical functions, in-depth defence and renewal options

3/3

Support system: Electrical power supplies and distribution networks

Normal/standby: 2x100 % on external power supplies and 1 internal supply + 1 available within four hours

permanent: on monitoring function, and a few actuators → four hours

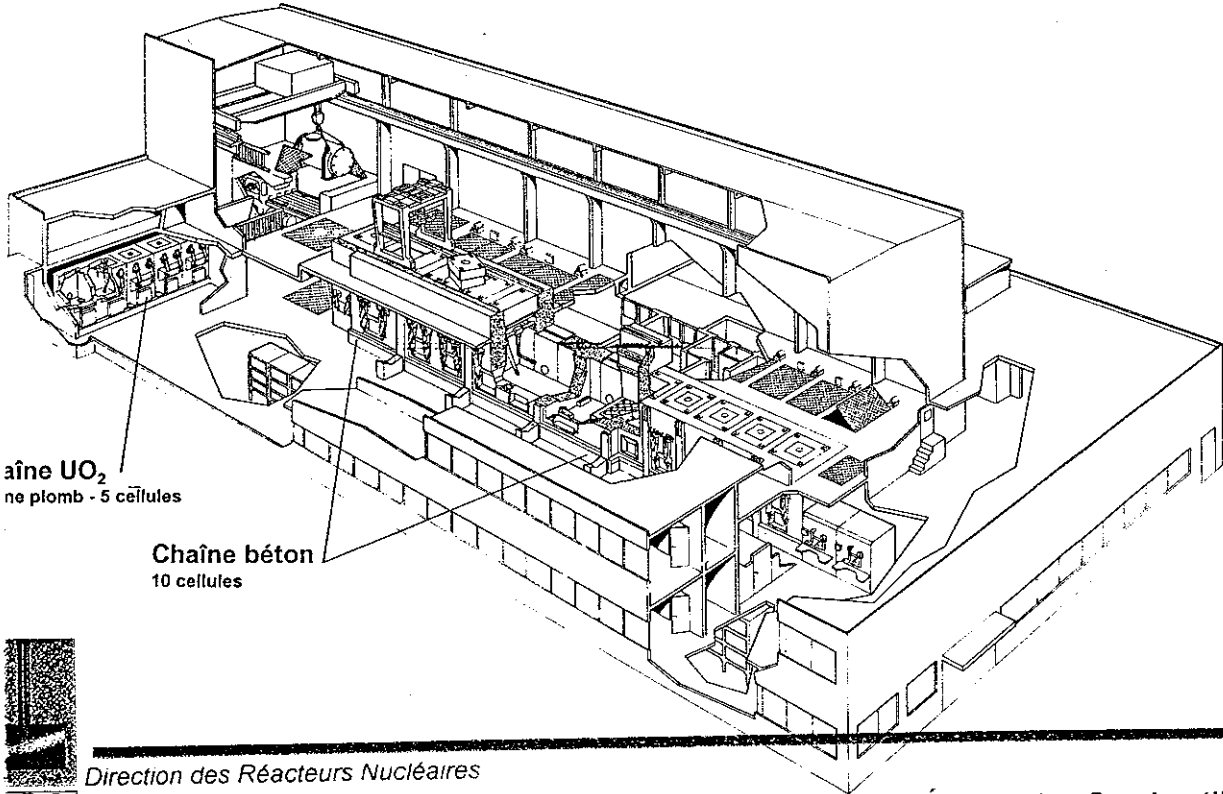
External aggressions

aircraft crashes, flood, fires

earthquake: impact study and a few 1st-barrier support steps



Laboratoire d'Examen des Combustibles Actifs



aîne UO₂
ne plomb - 5 cellules

Chaîne béton
10 cellules



Direction des Réacteurs Nucléaires

Département d'Études des Combustibles

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Planning

Ownership/purchasing, basic nuclear facility (INB), and prime contracting for LECA renewal

External supports:

Expert and assistance secondment

Inspection:

LSC ✓
Local Safety commission

GSC ✓
General Safety commission

GPLU
National Safety Authority

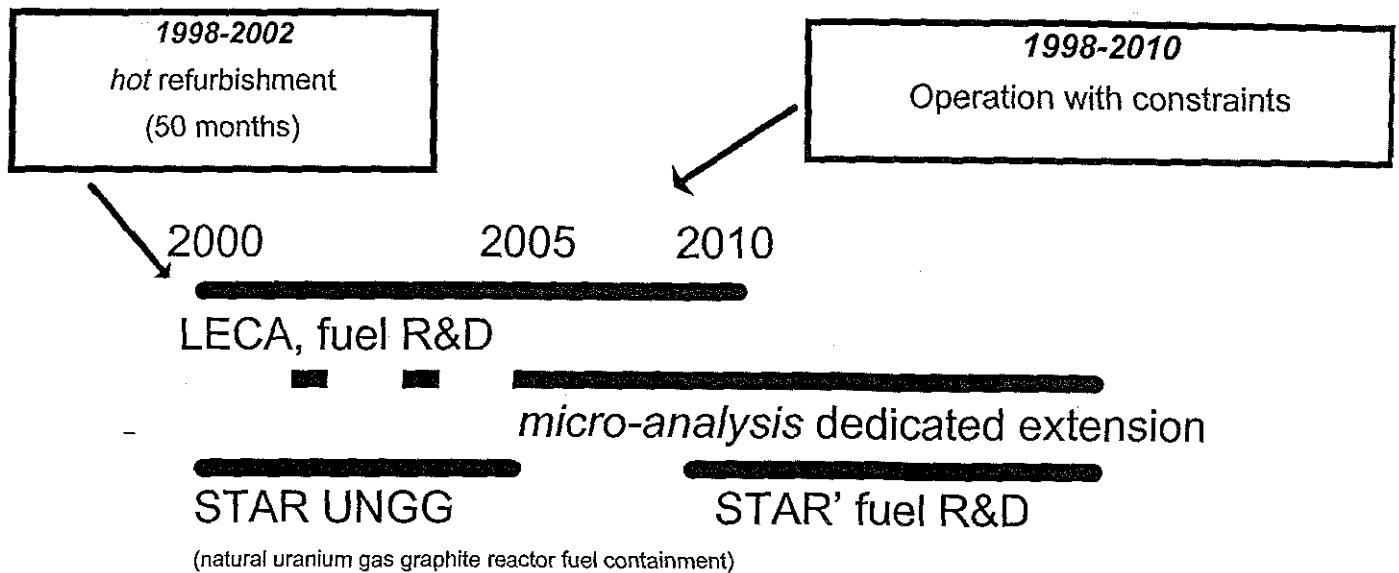
Ownership/Purchasing

Project Leader
Safety Deputy
General coordination
Safety files

INB 55 / safety, security
General ownership/purchasing
Technical coordination
intervention in the facilities

Prime Contractor
and
Contractors

General Project schedule



Relations with the Safety Authority

Three-step approach

- 1 - advice - based on the updated documentary reference system for a "three to five years' operation", during the renewal works
- 2 - approach acceptability advice - based on an impact study and earthquake diagnosis program
- 3 - National safety commission expected for the "beginning of 2000 " on the "renewed LECA safety" topic

In parallel, work clearances can be granted based on "phase files "



Renewed LECA progress
draining, destorage, renewal

Source term evaluation and draining :

labile contamination inventory, limited to 38 TBq, including 3 TBq alpha

(starting from 60/120 TBq and at 25/50 TBq, *reassessment under way* -
significant effort due to the high toxicity of future fuels)



Renewed LECA progress
draining, destorage, renewal

Fissile materials held in the facilities

1996 = 35 kg

1/10/1999 = 20 kg

future authorisation = 10 kg

A tedious, time-consuming job!



Renewed LECA progress
draining, destorage, renewal

Renewal under main contracting control:

- 1998 Summary draft project
- 1999 Detailed draft project, safety file
- and corrective maintenance



Main teachings after 30 months of work

1/2

- 1) *Need for an accurate previous knowledge of the existing facilities*
- 2) *Renewal requires a more detailed draft project phase than in the case of new facilities (controlling interfaces with existing equipment)*
- 3) *The safety analysis is more complex and intricate than in the case of new facilities (there remains deviations from regulations)*



Main teachings after 30 months of work

2/2

- 4) *Co-activity in a hot nuclear facility (hence in evolution)*
- 5) *More expensive and longer than expected → but this is the case with every project*



How much does-it cost?

Compared to the price of a new facility

- | | |
|---|-------|
| 1) <i>Inventory of the works</i> | 1 % |
| 2) <i>Corrective maintenance</i> | 2 % |
| 3) <i>Studies and project</i> | 20 % |
| 4) <i>Renewal</i> | 40 % |
| <i>(Draining, source term reduction</i> | 10 %) |

