



isec

Science & Technology Institute for a Circular Economy of Low Carbon Energy

ISEC - Institut des Sciences & technologies
pour une Economie Circulaire des énergies
bas-carbone

sumglass

September 25-29th 2023





The Marcoule site, a scientific and industrial platform



The site provides employment for nearly 5000 people working for the order-givers and their subcontractors.



Biomedical Tests



Waste treatment



Industrial sterilization



Support

D&D

R&D



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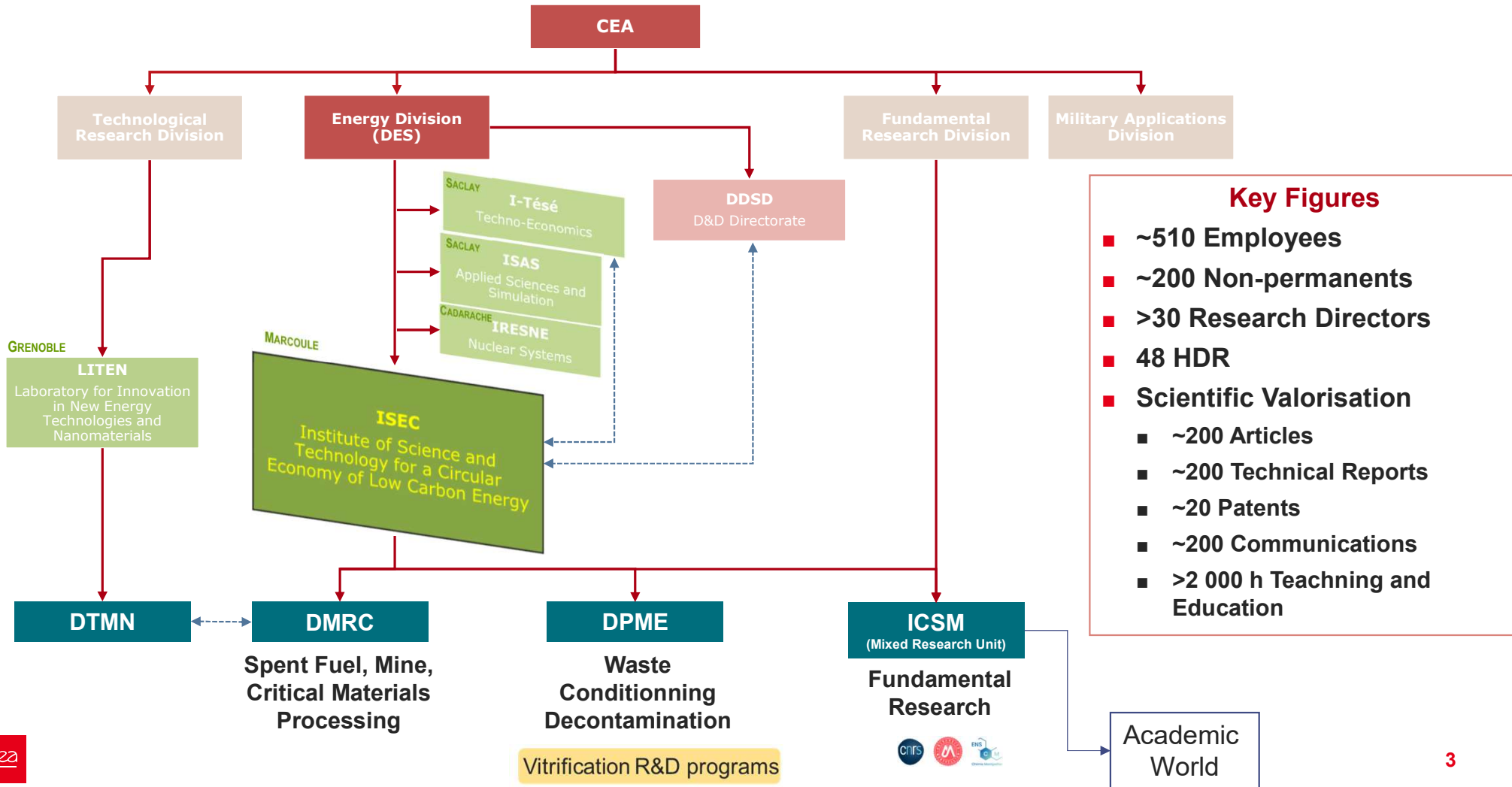
Fuel fabrication

The **2nd** biggest industrial site in the Occitanie region, after the Toulouse-based aeronautic centre.





ISEC in CEA's organization chart





ISEC Main Frame - R&D for low carbon Energies

2020 - Creation of ISEC

- CEA accelerator of the **energy-climate transition** at the service of French industrialists and the Government, in a socially responsible approach
- Objective : contribute to **carbon neutrality** in 2050
- DES created in 2020 to support the "**low-carbon energy system**" research offer for the entire CEA (including D&D research and operation)
- ISEC gather all historical R&D activities (nuclear fuel cycle, nuclear waste management, conditioning matrix) and also use its expertise to contribute to national **strategic independence on natural resources and materials** (reducing dependence on fossil fuels, promote the development of new industrial low carbon sectors)

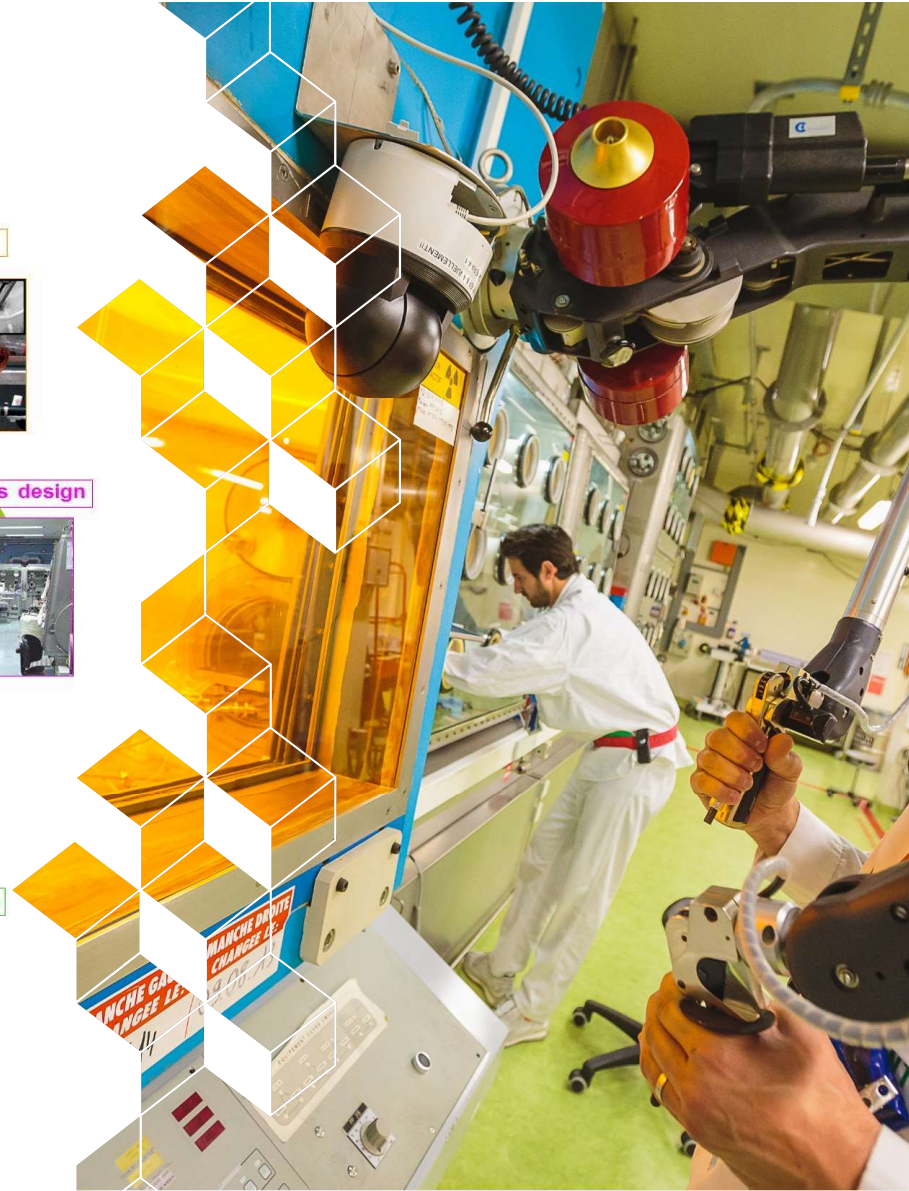
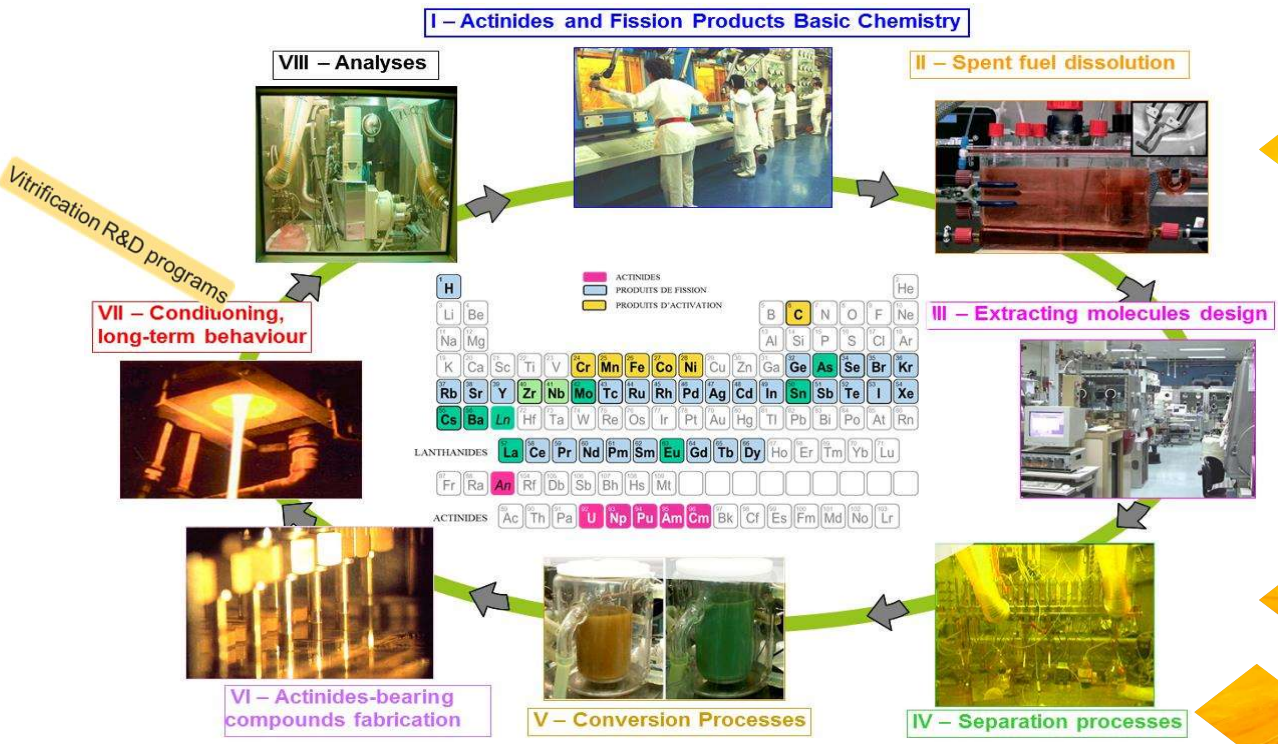


<https://knowhow.distrelec.com/>



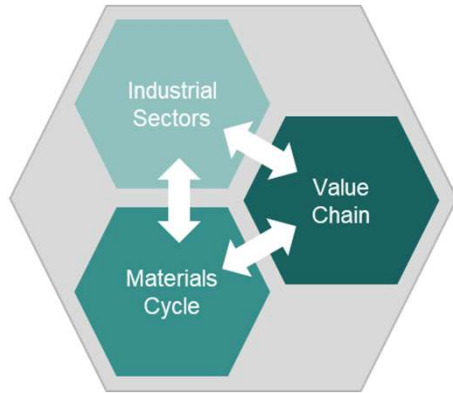
Rationale	
Mastering the Material Cycle Low Carbon Energies Framework	Systemic Approach Technologies - Science - Societal

Historical Activities





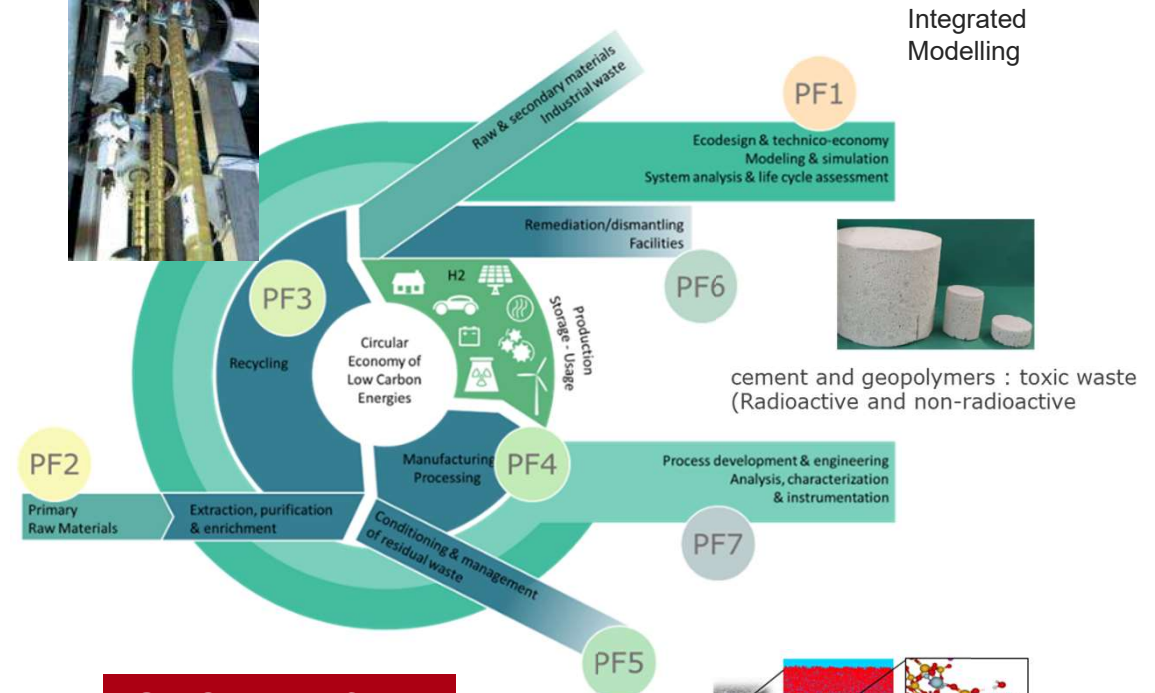
ISEC Organisation toward an integrated Framework



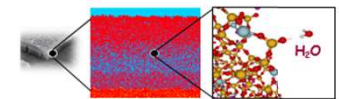
Waste from Yesterday, Today and Tomorrow



Materials and Technologies of Today and Tomorrow



ISEC Platform Organisation



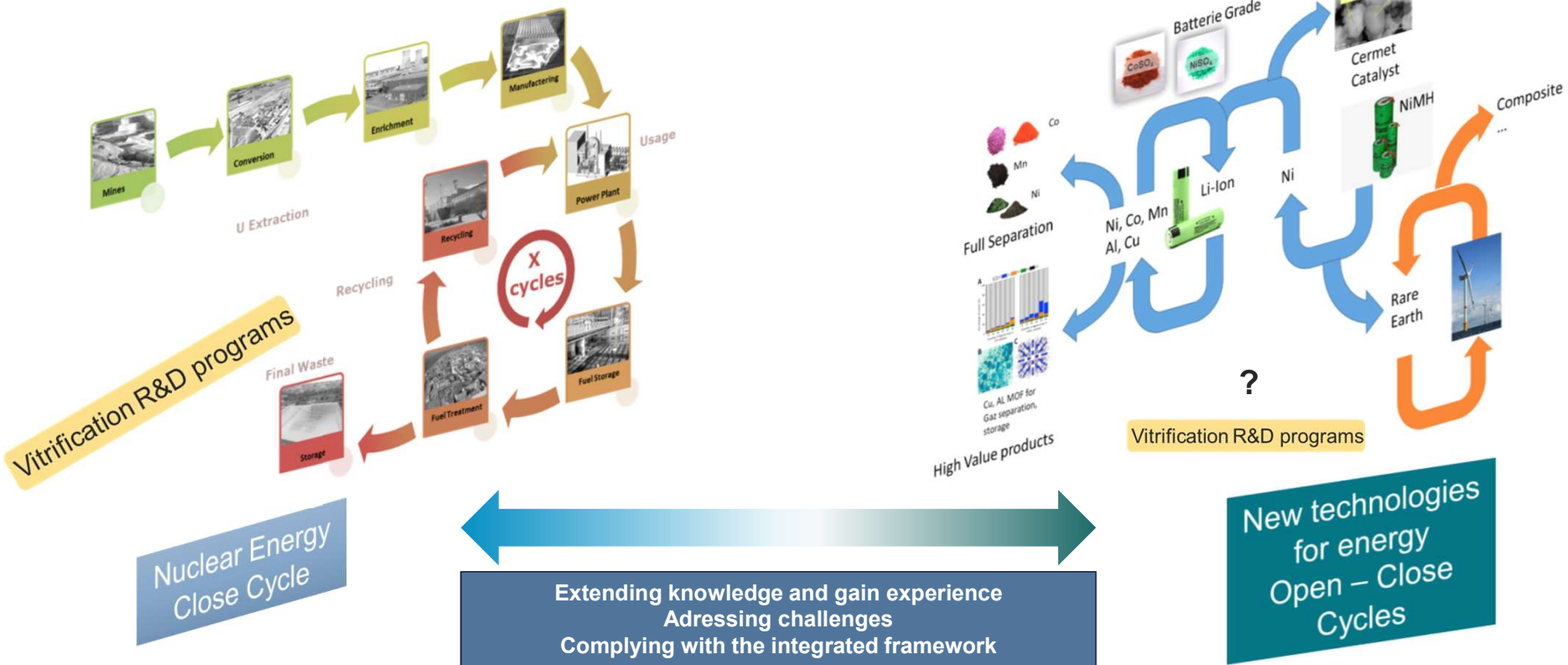
Vitrification R&D programs



Long term HAW Glasses

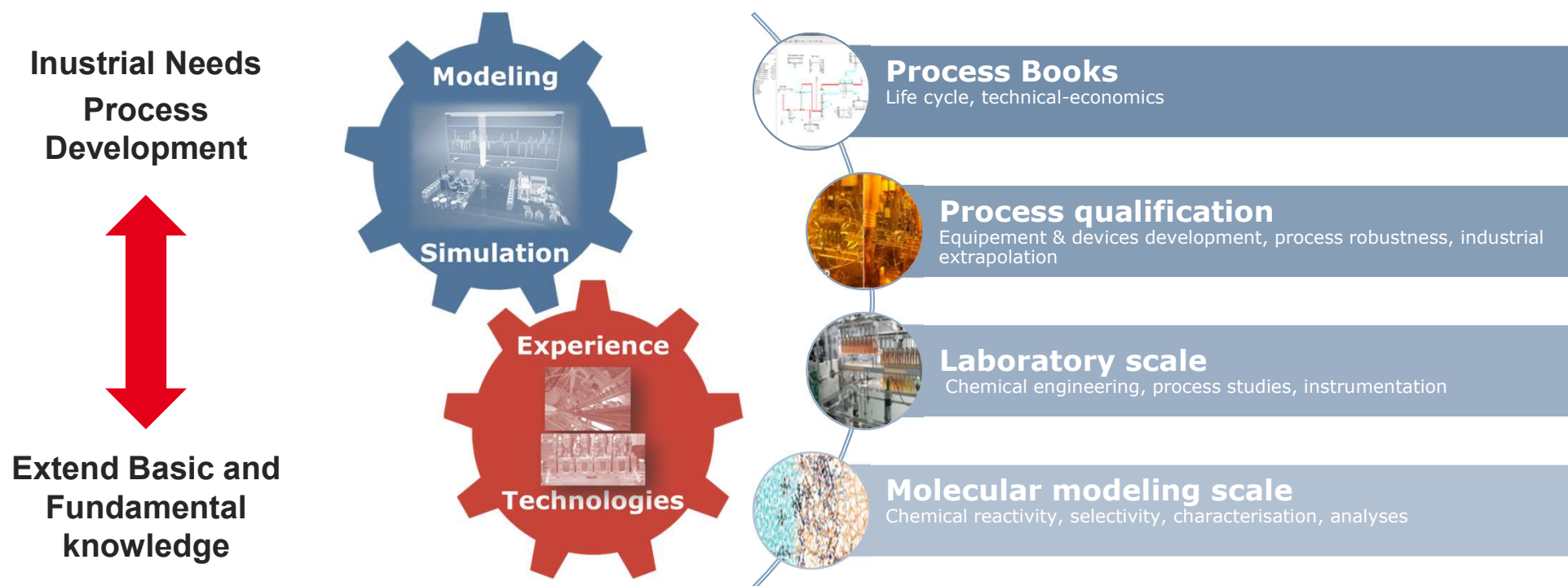


Circular Economy for Low Carbon Energies Implementation



Contribute to the industrial development of the circular economy of the low carbon energies

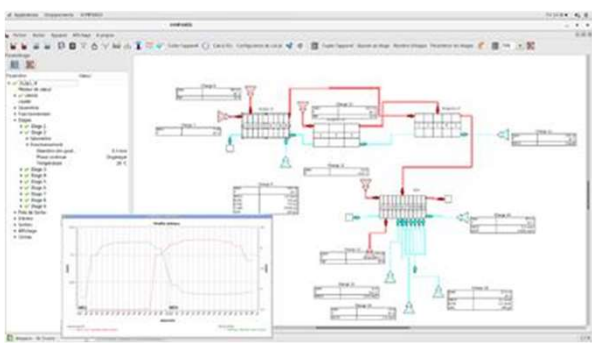
Circular Economy for Low Carbon Energies Implementation



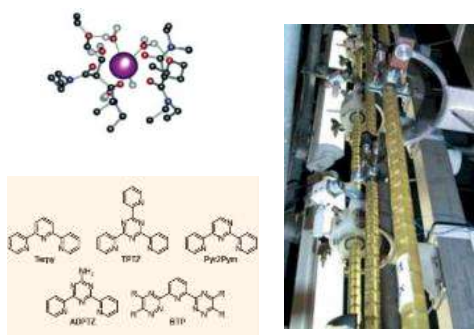


Innovation Valorisation

Example
From spent fuel recycling to Ln recycling from secondary sources



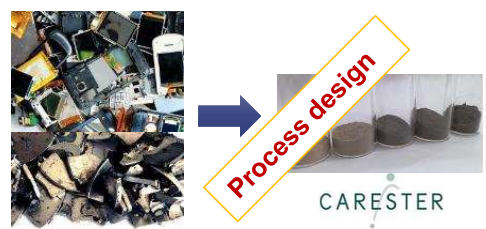
**Spent Fuel Treatment
Process design**



Molecular to Process Design



Magnet Recycling



Long Route Ln Recovery

R&D facilities



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Experimental R&D facilities to support ISEC activities

Cold Experiments

- Synthesis
- Physical & chemical charact.
- Chemical engineering
- Equipment development
- virtual reality /augmented reality platform

**ICSM, CD, LE,
HERA, Grenoble**



Experiments with Uranium

- Equipment & process qualification
- Scale Up
- Physical & chemical characterizations
- Basic Research (Uranium)

ICSM, G1



High Level Radioactivity Experiments

- Equipment & process qualification
- Physical & chemical characterizations
- MOX manufacturing
- Production

ATALANTE





R&D technology platforms

- **Development of vitrification & thermal treatment processes for nuclear waste** produced by spent fuel reprocessing, D&D and Defense industrial activities
- **Study of glass type conditioning materials** : formulation, chemistry, properties characterization, long-term behavior in disposal facilities
- **Valorization** of know-how & technical means in the field of circular economy for low-carbon energies



Historical competence in vitrification ⇒ *large formulation of glasses database, for wastes*



ISEC's R&D : Focus on Dismantling, Waste retrieval & conditioning

► Objectives

- Optimizing and securing D&D project deadlines, costs and final waste
- Improving conditions for carrying out operations

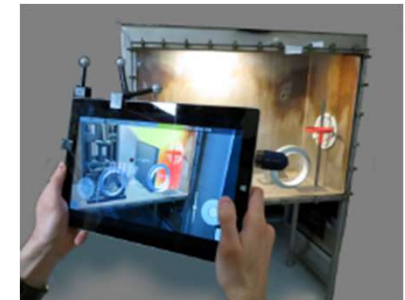
► R&D contributions to D&D activities

- Tools and methods for costing and managing materials, waste, transport, etc.
- Assessment of the radiological state of facilities and soils
- Decontamination of structures and soils
- Operations in hostile environments, robotics, drones, virtual reality
- Treatment of waste and effluents
- Waste characterization



**Contributing to carrying out CEA D&D projects
Promoting the CEA's experience towards industry**

D&D :
+1100 CEA employees (working directly or indirectly)
36 facilities being dismantled



Collaborations



Territorial

National

14

International

Internal CEA

Europe



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Thank you for your attention