# CEA
## French Alternative Energies and Atomic Energy Commission
## Marcoule, France

## ABOUT

For nearly 50 years, CEA Marcoule has been in charge of the development of efficient industrial separation processes used to recycle uranium and plutonium in the La Hague reprocessing plants. More recently, it has been involved in the studies on minor actinides separation following the 1991 French Act long lived-nuclear waste.

Its experience in the field of recycling processes of valuable materials from waste guarantees maximum industrial efficiency at low production cost, low secondary waste production and low environmental footprint. Moreover, the success of these R&D studies makes CEA Marcoule a major player worldwide in minor actinide and fission products chemistry, including among other rare earths and platinum group metals.

CEA Marcoule leadership in these areas has gradually directed its activities toward the competitive recovery of strategic metals.

The centre's dynamism, through many European and international collaborations, is also valuable for the training of young foreign researchers who find here unique tools to address all of these issues.

## EXPERTISE

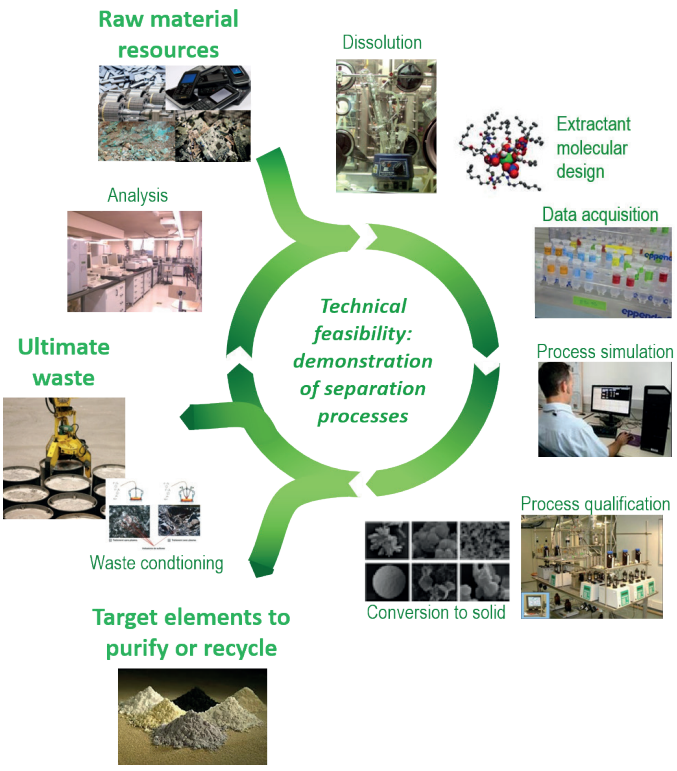
The CEA Marcoule knowhow is based on:

- Its knowledge in solution chemistry of numerous elements of interest existing in spent nuclear fuel like actinides, rare earths and platinum group metals
- A proven separation process development method based on an integrated approach of the core process, head-end and ancillary steps, up-scaling with a strong coupling between modelling and experience
- Large type of separation processes like solvent extraction, solid separation, coprecipitation…
- Transversal skills (multi-scale modelling, expertise in analysis)
- Multiple and high-performing experimental means (experimental and analytical laboratories, test-loops, modelling and simulation platforms)
- Ecoconception approach for minimising environmental footprints

## FACILITIES & SERVICES

With three research facilities, CEA Marcoule is fully equipped for performing studies from the lab scale up to the process feasibility demonstration at small pilot scale (around 1l/h) covering:

- Extracting molecules design (synthesis, molecular modelling)
- Metals recovery and recycling (tests from batch to continuous)
- Efficient technology development
- Process modelling and simulation (process code for flowsheet design)
- Process instrumentation




## MORE INFORMATION

**Website:** www.cea.fr
**Contact:** Eugen Andreiadis
Eugen.ANDREIADIS@cea.fr

# CEA
## French Alternative Energies and Atomic Energy Commission
## Grenoble, France

## ABOUT

Located in a favorable scientific, industrial and academic environment, CEA Grenoble focuses its research activities towards the development of new technologies, in the field of energy, health, information and communication. From batteries for mobility to the nanotechnologies through materials and biotechnologies, CEA Grenoble is at the cutting edge of technological research and contributes actively to the technological transfer to industry.

CEA Grenoble leverages a unique innovation-driven culture to develop and disseminate new technologies for industry and delivers unrivalled experience in technology research with benefits for all industries, from the traditional to the high-tech.

Technology platforms allow to cover all of the value chain from materials, through components to fully integrated systems or devices. The expertise ion materials (design of novel materials, processing and shape forming) especially in the field of New Technologies for Energy has led to pay more attention to material efficiency all along the life cycle.

Actions are conducted in the field of minimisation or replacement of critical raw material, as well as on the reuse (2nd life) or recycling of various systems or components based on CEA technologies.

## EXPERTISE

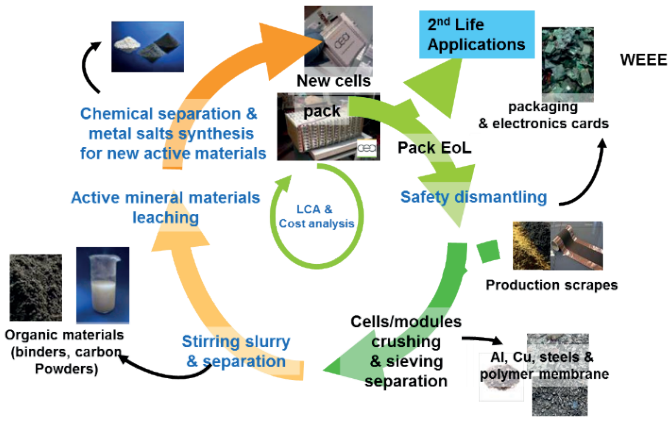
The CEA Grenoble knowhow is based on:

- Material science and engineering driven by applied technological development (from modelling to processing, prototyping & scaling up)
- Eco-design of materials without (or with low content of) CRM
- Strong teams on fine materials characterisation
- Integrated approach from material to system applied to technological development (thanks to devoted platforms)
- Technico-economic & environmental assessment (e.g. LCA) on developed technologies

## FACILITIES & SERVICES

CEA Grenoble hosts several technological platforms including industrial tools to support an integrated approach on specific applications. One of them is dedicated to material efficiency where production scrap or EoL products are treated to valorise the most valuable substances contained in it, such as CRM. The secondary raw materials are qualified in other local platforms (Battery, printed electronic, powder metallurgy…)

- Lab scale facilities for recycling (dismantling, material preparation, sorting, hydro/iono-metallurgy, validation & testing of recovered materials)
- Material (nano-)characterisation facilities strongly linked with European installation (ESRF, ILL)




## MORE INFORMATION

**Website:** www.cea.fr
**Contact:** Etienne Bouyer
etienne.bouyer@cea.fr