

## CEA / ISEC

French Alternative Energies and Atomic Energy Commission / Science & Technology Institute for a Circular Economy of Low Carbon Energy, Chusclan, France



## ABOUT

CEA / ISEC was founded in 2020 with the purpose of mastering the materials cycle for a successful energy transition, contributing to reaching carbon neutrality in 2050 as well as national strategic independence on resources and materials.

ISEC is based at CEA Marcoule. It gathers CEA historical R&D activities (nuclear fuel cycle, nuclear waste management such as separation processes used to recycle uranium and plutonium in La Hague reprocessing plants, conditioning matrix) to transfer proven expertise towards other materials cycles. It develops three fields of research:

- closing the nuclear fuel cycle in a circular economy approach,
- implementing circular economy for other low-carbon energies (batteries, wind, solar, hydrogen...): life cycle assessment, metals and materials recovering from wastes, collaborations and partnerships with industrials,
- supporting nuclear clean up & dismantling activities and R&D for radioactive waste management (ex. support to Japan for the Fukushima site cleaning).

ISEC is able to draw on the strength of 7 purpose-built technology platforms as well as over 700 scientists, technicians and support staff. ISEC provides expertise with an integrated approach to processes (from fundamental research to industrial transfer). With European and international collaborations, it is also valuable for the training of young foreign researchers.

Besides Prometia and several other European networks, CEA is also member of [Metnet](#).

## EXPERTISE

ISEC and CEA Marcoule knowhow are based on:

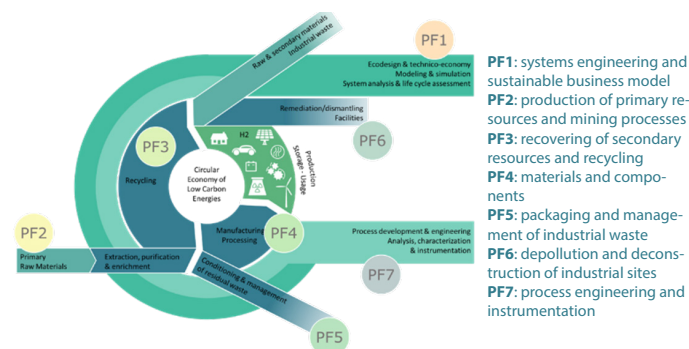
- closing the cycle in a circular economy approach: front-end cycle - research on the extraction, the purification and the enrichment of uranium, improvement of existing fuel reprocessing and MOX manufacturing processes, research on the multi-recycling of fuel for the future generations of reactors,
- knowledge in solution chemistry of numerous elements of interest existing in spent nuclear fuel like actinides, rare earths and platinum group metals, as well as in secondary material deposits,
- 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...,
- Clean-up and dismantling of the site's oldest facilities and management of their waste,
- Transversal skills (multi-scale modelling, expertise in analysis),
- Multiple and high-performing experimental means (experimental and analytical laboratories, test-loops, modelling and simulation platforms),
- Eco-conception approach for minimising environmental footprints,
- Monitoring methodology based on datamining and data refining for analysing the materials cycle.

## 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,
- Virtual reality room to validate dismantling scenarios and qualify equipment by digital twin, augmented reality technologies for facilitating human interventions in severe environment, dedicated robotic platform to support nuclear clean up & dismantling activities.



## MORE INFORMATION

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**CEA / LITEN**

French Alternative Energies and Atomic Energy Commission  
/ Liten, Grenoble, France

**ABOUT**

Located at CEA Grenoble and INES (Chambéry) centers, CEA / Liten is dedicated to the energy transition. It is spearheading the EU's efforts to limit dependency on fossil fuels and reduce greenhouse gas emissions in three key areas: renewable energy, energy efficiency/storage and development of materials, spanning the entire value chain from the development of materials to pre-industrialization.

Its activities focus on several key areas: solar energy, network management, batteries storage and hydrogen in order to improve energy efficiency and circular economy approach. CEA-Liten covers a wide range of applications in energy production and distribution, transportation, industrial processes, and environment markets.

CEA / Liten strategic research axes are the following:

- Renewable energy production: high performance photovoltaics, photovoltaics everywhere,
- Storage and flexibility solutions: batteries, hydrogen vector,
- Systems, networks and energy efficiency: energy systems and networks, thermal energy management, power electronics,
- Circular economy: eco-innovative materials and process (additive manufacturing, processes and assemblies, structural electronics), chemistry and recycling, carbon circular economy.

The institute is able to draw on the strength of 12 purpose-built technology platforms as well as over 1000 scientists, technicians and support staff. The combination of this enviable array of equipment and the scientific expertise of CEA-Liten's scientific teams results in a powerful R&D tool that can help overcome complex technological hurdles and help build the products, components and industrial processes of the future.

**EXPERTISE**

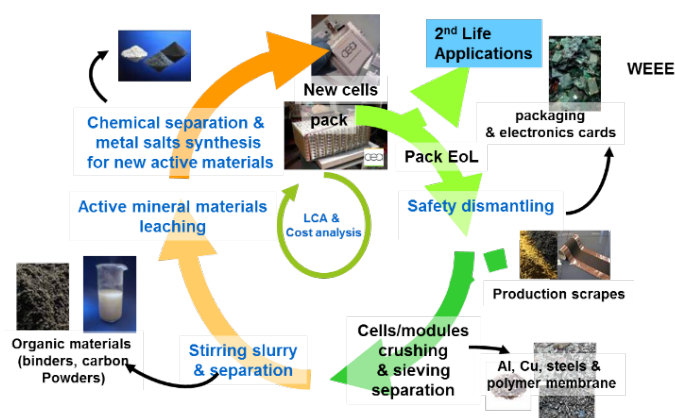
CEA / Liten knowhow is based on:

- 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**

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