ENERGIES
FOR THE FUTURE

CEA Marcoule

THE CEA

ENERGIES **FOR THE FUTURE**

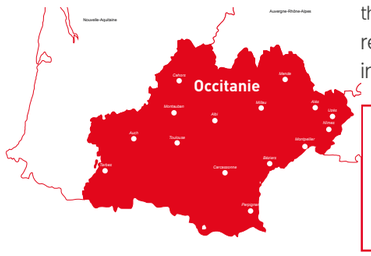
A leader in research, development, and innovation, the CEA is deeply involved in three major transitions that are impacting the world today: the energy transition, the digital transition, and medicine of the future. It is also carrying out missions for national defense. We have 20 000 employees on 9 sites within France.

THE LEADING PLAYER ON THE MARCOULE SITE

Created in 1955 and historical cradle of the French nuclear industry, today the CEA Marcoule is working on the energy-related challenges of the 21st century. It is the main company on the Marcoule site, 2nd largest industrial platform in the Occitanie Region.

With its **1704 employees**, the CEA Marcoule is a world reference center in research and development for a low carbon energies circular economy, and in the dismantling of legacy nuclear facilities. Its expertise is based on a history of know-how developed for the French nuclear fuel cycle industry.

revvity	cyclife GROUPE EDF	STERIS + synergyhealth	cea	orano
145 employees	200 employees	20 employees	1704 employees	950 employees
Biomedical Tests	Waste Treatment	Industrial Sterilization	Research into the circular economy for low carbon energies and dismantling worksites	Fuel Fabrication



the n°**2** industrial area of the Occitanie region, after Toulouse's aeronautics industry.

Nearly 5000 employees on the site working for the main order-givers and their subcontractors.

KEY FIGURES FOR **THE CEA MARCOULE**

1704	**employees**
700	**researchers**
100	**PhD** and **post-doc students**
580 m€	**annual budget**
400 m€	**annual expenditure into the local economy**
30	**research laboratories and facilities**
260	**patents in our portfolio**
300	**scientific publications**

RECOGNIZED EXPERTISE : LOW CARBON ENERGIES CIRCULAR ECONOMY

For over 60 years, the CEA Marcoule has worked on R&D applied to the nuclear fuel cycle, with a circular economy approach. Our expertise is based on a worldwide recognized know-how in separation chemistry.

In 2020, the CEA created the Institute of Sciences and Technologies for a low carbon energies circular economy *(ISEC)*, with a promise:
"Master the cycle of matter to succeed in the climate-energy transition".

The ISEC is in charge of R&D, to meet the **challenges of the future nuclear industry and of other low carbon energies (batteries, solar, wind…)** that are necessary for the energy transition.

ISEC's 500 researchers, engineers, and technicians are continuing their research studies in the nuclear field and deploying their expertise to serve other low carbon energies. They are developing key processes for the 21st Century's low-carbon society, to meet the challenges posed by the resource and material sustainability necessary for the energy transition.

This transition requires major resources in terms of strategic materials and metals. For large-scale development, the production modes must be thought through in the logic of a circular economy. The approach will enable pressure on scarce resources to be limited, the further development of recycling, and the inspiration of new uses. From fundamental research to industrial solutions, the ISEC is deploying its research studies and innovation throughout the value chains: means of production *(nuclear, wind turbines, solar…)*, of storage *(batteries, hydrogen…)*, and of use *(industry, mobility…)*.

On the Marcoule center, the ISEC makes use of outstanding facilities in carrying out its activities.

ATALANTE, the world's largest research laboratory for nuclear chemistry, hosts nearly 200 scientists making full use of its unique infrastructure. Its 20 laboratories and 17 shielded lines enable upstream research into the radiochemistry of radioactive elements, as well as the development of treatment, recycling, or conditioning processes.

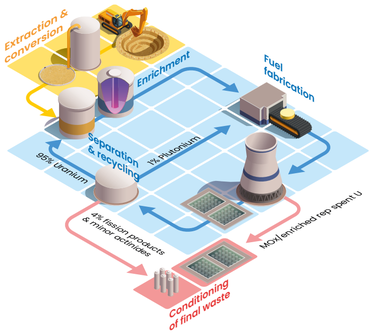
SUPPORT FOR THE INDUSTRY **OF THE NUCLEAR FUEL CYCLE**

The CEA provides its expertise to the French nuclear fuel cycle industry, meeting the challenges of today and preparing for those of tomorrow.

At the front end of the cycle, ISEC teams are thinking of and developing processes *(extraction, conversion…)* giving better access to uranium resources, transforming them with every-greater efficiency and respect for the environment. For the back end of the cycle, the CEA constantly provides scientific and technical support to the ORANO treatment & recycling plant at La Hague and to the MELOX factory, from fuel dissolution to the fabrication of MOX fuel, and including waste vitrification. Adaptation or definition of processes, lab-scale experiments, pre-industrial demonstrations, simulation tool development… all the skills of the CEA Marcoule's scientists are serving a competitive and safe industry.

Resource sustainability, national independence, safety, and preservation of the environment are all at the heart of our single ambition: a sustainable nuclear industry.

The circular economy for Nuclear Fuel



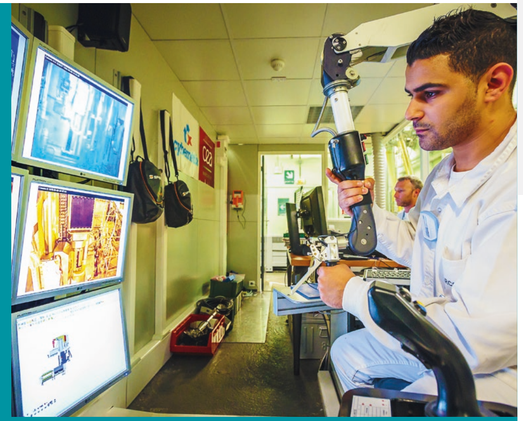
A NATIONAL PRIORITY: RESEARCH INTO RADIOACTIVE WASTE

The CEA Marcoule is deeply involved in the sustainable management of radioactive matter and waste. Our work mainly concentrates on selective sorting of the components in spent nuclear fuel. Thanks to their know-how in separative chemistry, researchers are working on recycled fuels, able to be reused in nuclear power plants. This approach also means the volume and radioactivity of final waste can be reduced.

The ISEC's experts have developed vitrification processes that enable high-level *(HL)* waste to be contained in a durable, resistant material: glass. The safety of the waste packages is therefore guaranteed for the very long periods foreseen for their storage in a deep geological repository. In this field, the ISEC contributes indispensable scientific data concerning the long-term behavior of such waste packages to the National Agency for Radioactive Waste Management *(ANDRA)*. The CEA Marcoule has set up demonstrator workshops for the on-going improvement of the vitrification process. It also has recognized expertise in cement-based matrices for low-level nuclear waste.

MANAGEMENT OF **DISMANTLING**

As the cradle of the French nuclear industry, the CEA Marcoule is now running some of the biggest dismantling worksites in Europe. All the oldest facilities on the site *(Declading, the GI, G2, and G3 reactors, the UP1 factory, the Marcoule Pilot Workshop APM…)* that were commissioned from the 1950s are now shut down. Legacy waste retrieval and cleanup & dismantling operations are under way. The most recent worksite to be launched is the dismantling of the Phénix nuclear power plant, in final shut down since 2009 after 35 years of decisive scientific contributions.



Dismantling **also means innovating!**

Dismantling requires equipment to be designed and set up in the shutdown facilities, as well as the renovation of facilities that enable operational waste to continue to be treated. For example, the NOAH facility has been built to treat the sodium removed from Phénix circuits and to transform it into soda and hydrogen. Similarly, the DIADEM facility will be commissioned in 2025 for the interim storage of waste generated by dismantling operations before its eventual shipment to France's future deep geological repository.

But dismantling also means innovating. To ensure the safety and radiation protection of the teams working in dismantling, the CEA Marcoule has created innovative techniques. Among other solutions it has found, the site has a virtual reality room to test and validate dismantling scenarios, and a robotics laboratory to develop even more efficient remotely handled dismantling equipment.

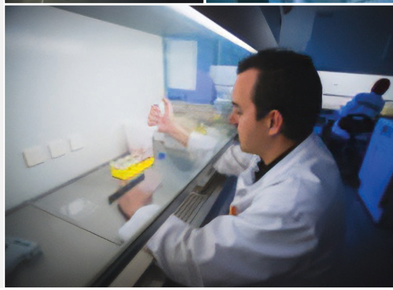
As a nuclear site operator, the CEA Marcoule is responsible for dismantling its facilities, and for the management of the waste generated. Our objective is to carry through cleanup and dismantling programs for our nuclear facilities as safely as possible, while strictly respecting our budgets and schedules.

A LABORATORY **FOR THE MEDICINE OF THE FUTURE: LI2D**

It is less well known, but the CEA Marcoule is also working on the detection and diagnosis of emerging infectious diseases. Thirty collaborators work in the **Laboratory of technical innovations for Detection and Diagnosis (Li2D)**.

Part of the CEA's Frédéric Joliot Living Sciences Institute, its mission is to meet challenges related to the diagnosis of infectious pathologies, ensuring a continuum between discoveries and health applications. The laboratory carries out technological and methodology developments for the detection of pathogens or toxic agents present in the environment or in samples or biological tissues, as well as research into biomarkers for diagnostics.

All this work is intended to support the regional and national industrial network, by encouraging the transfer of innovations and reagents. The laboratory has in particular been deeply involved in research into the Ebola virus and COVID-19, and more recently in the creation of fast tests for Monkey Pox.



RESEARCH COLLABORATIONS AND TRAINING: AN OPEN CENTER

Founding member of the Balard Chemistry Pole, Marcoule is a committed player for scientific excellence in the Occitanie region.

Inaugurated in June 2009, the Marcoule Separative Chemistry Institute (ICSM, in French) unites the CEA, the CNRS, Montpellier University 2, and the Montpellier National Chemistry School. The ICSM is a European excellence pole in the field of separative chemistry. Its fundamental research laboratories are part of the panel of tools deployed by the CEA Marcoule to serve in developing the energies of tomorrow. Attached to the ISEC, the ICSM also works in the field of the circular economy for low carbon energies.

The INSTN was created in 1956 to train engineers and researchers in the field of nuclear sciences and techniques, in particular to meet the needs for skills in the nuclear industry.

Each year, the INSTN *(National Institute of Nuclear Sciences and Techniques)* located on the Marcoule Center, welcomes over 1 300 students for training in nuclear professional skills. It can be proud of its teaching platform grouping different worksite-schools, reproducing typical nuclear environment work conditions for D&D skills, radiation protection, and for interventions in limited workspaces or in glove boxes. It has also developed academic partnerships with the region's Universities and Engineering Schools. The CEA Marcoule site always has more than a hundred PhD students, post-docs, and tertiary education level trainees in the INSTN's research training programs.

SAFETY AND SECURITY, OUR N° 1 PRIORITIES

The safety of our personnel and of the neighboring population, as well as on-going monitoring and management of environmental impacts, are absolute priorities for the CEA.

The CEA Marcoule has efficient, suitably adapted means of protection and of emergency intervention for the mainly chemical and radiological risks present on the site.

The CEA Marcoule has a Local Safety & Security Force (FLS) carrying out missions in emergency first aid, for security aspects, and in fire prevention /firefighting.

The Center also has an Occupational Health Service looking after 5 000 personnel *(CEA and subcontractor enterprises)*.

The nuclear safety of our facilities is also a major priority.

Beyond the CEA's in-house checks and management, the independent civilian *(ASN)* and defense *(ASND)* Nuclear Safety Authorities monitor our facilities' nuclear safety.

Inspections, audits, checks, and safety drills are an everyday part of the routine for CEA Marcoule teams.

SERVICES FOR **OPERATIONAL SUPPORT**

The Logistics and Technical Service, as well as the Information Technology & Communication Service, the Markets & Purchasing Service, the Human Resources & Social Relations Service, and the Financial & Management Control Service contribute the support necessary for all the units to carry out their missions.

THE ENVIRONMENT PRESERVED

The CEA Marcoule Radiation Protection Service carries out 30 000 analyses of water, air, sediments, ground water, vegetation, and the food chain.

The results, which confirm the absence of any significant impacts, are available online on the public site: **https://www.mesure-radioactivite.fr/** and on the CEA Marcoule's internet site.

You can find all the CEA Marcoule official publications on our internet site at **https://marcoule.cea.fr/Marcoule/**

DID YOU KNOW?

The CEA Marcoule's radiological impact remains **very much lower** than the radioactivity that is naturally present in the environment.

PUBLIC INFORMATION

The CEA regularly informs the Local Information Commission *(CLI)* of Marcoule-GARD concerning the health and environmental impact of its activities. Each year, a "Transparency and Nuclear Safety" report is prepared and made publicly available on the internet via the site Centre CEA Marcoule – Accueil *(home page)*.

You can also follow us on X CEAMarcoule!

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