



# SOLAR ENERGY

## FOR ENERGY TRANSITION

Limiting global warming and accelerating the energy transition is a major concern. In that respect, despite its intermittency, photovoltaic (PV) energy is one of the renewable energy sources with the highest potential in terms of cost and deployment. In the near future, photovoltaics is expected to become the world's leading source of electricity in parallel with the massification of storage solutions to manage its intermittency. From a technological point of view, production is dominated by crystalline silicon-based technologies (nearly 95% market share), which have demonstrated their ability to reduce costs and increase productivity and efficiencies.

CEA Tech has been carrying out R&D work on PV energy for nearly 15 years on the INES campus. In line with the evolution of the world market, it has built up strong expertise in the silicon-based PV sector in

order to keep France present in an extremely competitive sector where technological differentiation through continuous innovation is of paramount importance. In this challenge, the CEA Tech target is to achieve ever higher performance in order to reduce the carbon footprint together with the cost of modules. The studies focus on quality improvement of PV materials, high-performance cells of different technologies (homojunction with passivated contacts, heterojunction, perovskite, tandem), development of advanced modules both for mass energy production (solar plant) and specific uses (space, drone, building, mobility ...) and the recyclability of the end of life products by applying in particular eco-design approach.

### WHY A PHD RELATED TO SOLAR ENERGY AT CEA TECH?

PhD students will work as part of a team of 170 researchers active in the field of PV energy production on the INES campus and carrying out collaborative R&D projects with national and international academic partners and industrial leaders in the field.

PhD students will also have access to technological platforms at the highest level of the state of the art: (1)

material platform including crystallization furnaces, wafering tool, and characterization devices, (2) clean room for passivated contact cells and tandem cells, (3) pilot plant for heterojunction cells, and (4) module platform including production facilities, characterization devices and tools for accelerated ageing.

Finally, PhD students will benefit

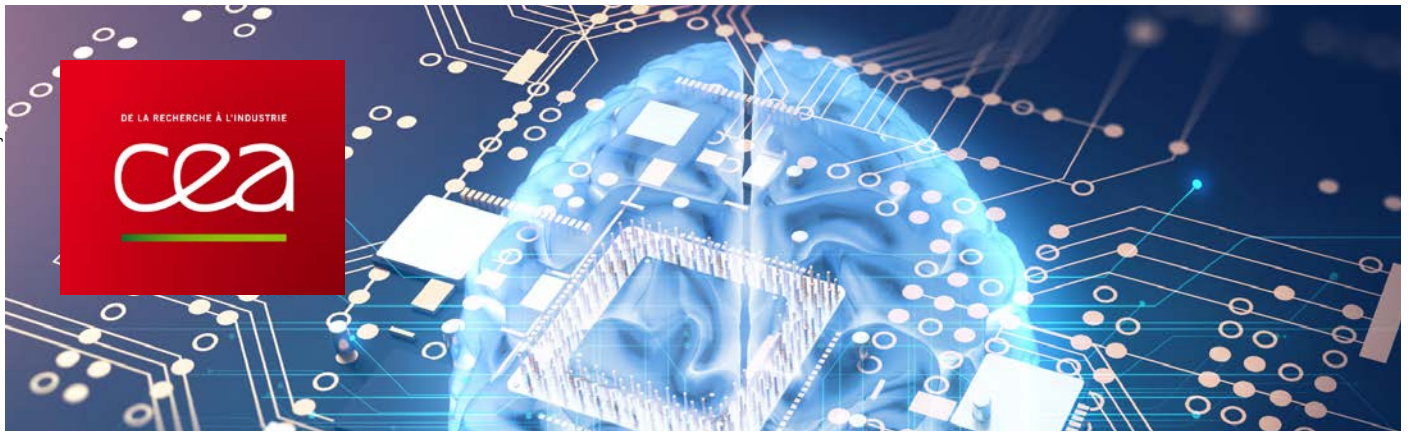
from the large R&D infrastructure of CEA Tech which covers the entire value chain of PV production and integration: materials, cells, modules, systems, storage, smart grids, vehicle integration and building integration. It will give them the opportunity to interact with researchers or students working in other areas of PV energy.



CEA-Liten Institute in Le Bourget du Lac (Savoie) on INES campus



30 ongoing PhD projects



# CEATECH SCIENTIFIC AND TECHNOLOGICAL CHALLENGES

CEA Tech tackles the three key and ongoing transitions of the 21st century: numeric, energy and medical ones. For each, CEA Tech research teams innovates within a vibrant network of academic and industrial partnerships, to develop the technologies of the future.

CEA Tech, one of the four CEA research divisions, relies on three large research Institutes, two in Grenoble, Leti and Liten and one in Saclay, List, and a network of technology transfer facilities in Bordeaux,

Nantes, Toulouse, Metz, Cadarache and Lille.

Close to 500 young researchers, prepare their PhD in CEA Tech Labs, with a major contribution to the research teams. They share the successes of the CEA, embodied in leading publications, patents, technology transfers to industry, business and start up creation. For years, Reuters ranks CEA as one of the top three most innovative research organizations in the world (1st, 2nd or 3rd).

## WHY A PHD AT CEA TECH?

Regardless of the field of research you are looking for, willing to explore prospective ideas or to further advanced technologie, you will likely find among CEA Tech doctoral positions the one that meets your expectations.

Then you can join either Leti (1800 p.) and focus on micro and nanotechnologies, embedded electronics, communications, components for the Internet of Things (IOT), cybersecurity, medical devices and healthcare outpatients (at Clinattec) - or Liten (950 p.) to face the challenges of non-CO2 emitting energies (solar, batteries, hy-

drogen, biomass or smart grids) - or List (750 p.) to innovate in terms of data intelligence, cybersecurity and IOT software, manufacturing (4.0 industries), radiotherapy, health data processing - or a research team located in one of the technology transfer facilities (Bordeaux, Nantes, Toulouse, Metz, Cadarache and Lille).

Whatever the topic you select, whatever the career path you envision, joining CEA Tech for your PhD has a deep meaning. On the one hand, you will be dealing with one major societal challenge, deeply rooted in science

and technology. On the other hand, your PhD will be at the heart of highly innovative ecosystems, each offering unique opportunities in research and career paths.

Indeed, CEA Tech offers a highly efficient mix of digital and hardware skills, world-class facilities such as state-of-the-art 300 mm clean rooms, and integration facilities for hydrogen and battery technologies, and many others. CEA Tech's teams form active partnerships with other research organizations and universities, as well as active cooperation with more than 500 industrial partners in France, Europe, North America and Asia.

We will do our best to accompany your success.



CEA-List Institute in Paris Saclay or CEA-Leti Institute in Grenoble Alpes or CEA-Liten Institute in Grenoble Alpes



500 ongoing PhD projects