

FROM RESEARCH TO INDUSTRY

cea tech

> **CEA Tech**
TECHNOLOGY
PLATFORMS
speeding innovation
for industry

CEA Tech

SPEEDING INNOVATION FOR INDUSTRY

CEA Tech's proven innovation process harnesses the power of the French Alternative Energies and Atomic Energy Commission's technology platforms in Grenoble, Chambéry, and Paris-Saclay to provide you with **skilled human resources, advanced research and development equipment, and the latest specialized software**—for capabilities unrivalled by any other organization in Europe.

The technologies developed by CEA Tech address the **major challenges facing industry and society**: renewable energy, information and communication technology and information processing, healthcare, the silver economy, the factory of the future, materials, and characterization.

KEY FIGURES:

- *More than 25 technology platforms*
- *Average annual investment in new equipment and resources: €120 million*
- *More than 300 joint R&D contracts with manufacturing companies*
- *More than 4,000 employees*
- *Guaranteed confidentiality for your projects and data*

INTEGRATED CIRCUIT AND EMBEDDED SYSTEMS DESIGN PLATFORM

INTERNATIONAL-CALIBER R&D

The integrated circuit and embedded systems design platform covers the entire development process—from initial specifications through to functional testing on physical prototypes—for both traditional and embedded applications.

The platform leverages €20 million in design, modelling, and technical

and operational testing capabilities to develop latest-generation circuits and systems on bulk silicon, SOI, and organic substrates for foundries of all kinds. And the technologies developed are protected by 30 patents filed each year.

The platform creates value for its industrial R&D partners by drawing

on its rapid design capacities to develop analog, digital, and mixed circuits and very advanced systems offering breakthrough architectures, extreme miniaturization, low power consumption, high performance, reliability, and security. Finally, the platform also addresses hardware-software design and OS/application software integration issues.

PARTNERS

Around 30 industrial partners of all types (corporations, SMBs and start-ups)

LOCATIONS

Grenoble and Paris-Saclay, CEA research institutes Leti and List

NOTABLE EQUIPMENT

CAD toolchain and an industrial emulator/tester for integrated components

KEY FIGURES

- More than 30 circuits developed per year
- 30 patents filed per year
- 3,000 sq. m of R&D facilities
- 300 employees
- €20 million in equipment



leti
list



NANOELECTRONICS AND MICRO- AND NANOSYSTEMS PLATFORM

INTEGRATED CIRCUITS AND MICROSYSTEMS

The nanoelectronics and micro- and nanosystems platform ranks alongside Albany, NY and Leuven, Belgium as one of three major R&D centers worldwide developing integrated circuits and microsystems on 200 mm and 300 mm substrates for industrial rollout within three to five years.

Manned by a staff of 400, 24 hours a day, seven days a week, the platform has set up short-loop fabrication

procedures with plants worldwide. The platform's 150 industrial partners include STMicroelectronics, Soitec, and IBM.

The platform's activities encompass early-stage R&D, technological R&D, demonstrators, and prototyping. Equipment manufacturers can send their staff to validate their future systems on-site, and the R&D conducted at the platform regularly results in

new start-ups. The main R&D topics addressed are advanced-generation integrated circuits, 3D integration, embedded memory, MEMS and NEMS, image sensors, photonics-on-silicon, and power components.

Finally, the platform offers advanced capabilities in electron beam lithography, a potential alternative to optical lithography for ultrahigh resolutions.

R&D

Integrated circuits and microsystems on 200 mm and 300 mm substrates for industrial rollout within 3-5 years

LOCATION

Grenoble,
CEA research institute Leti

NOTABLE EQUIPMENT

500 pieces of large 200 mm and 300 mm equipment

KEY FIGURES

- Operates 24 hours a day, 7 days a week
- 7,200 sq. m of clean rooms
- Staffed by 400 engineers and technicians
- €500 million in investment

PICTIC: LARGE-SURFACE PRINTING PLATFORM

PUSHING BACK THE FRONTIERS OF ELECTRONICS

The Pictic large-surface printing platform develops smart plastics, papers, and textiles produced by printing electronic functions directly on flexible, 320 mm x 380 mm surfaces. The applications for these flexible circuits are complementary to those addressed by silicon-based technologies, and include human-machine interfaces, smart lighting, interactive displays, and environmental monitoring.

The platform is Europe's only specialized R&D facility to bring together all of the necessary printing techniques—screen printing, inkjet, gravure, flexography, and slot-die—under one roof. The platform also has characterization, assembly, encapsulation, and other equipment.

The platform develops formulations for electronic inks, scales up printing processes for industrial rollout, and

manufactures prototypes and preseries, working with corporations worldwide, as well as with Grenoble, France-based start-up Isorg.

The processes developed at the platform stand out for their precision and competitive pricing. Electronic functions are deposited on the substrate in a single step, eliminating the need to use lithography and other subtractive processes.

NOTABLE EQUIPMENT

Slot-die, gravure, and flexography process equipment

LOCATION

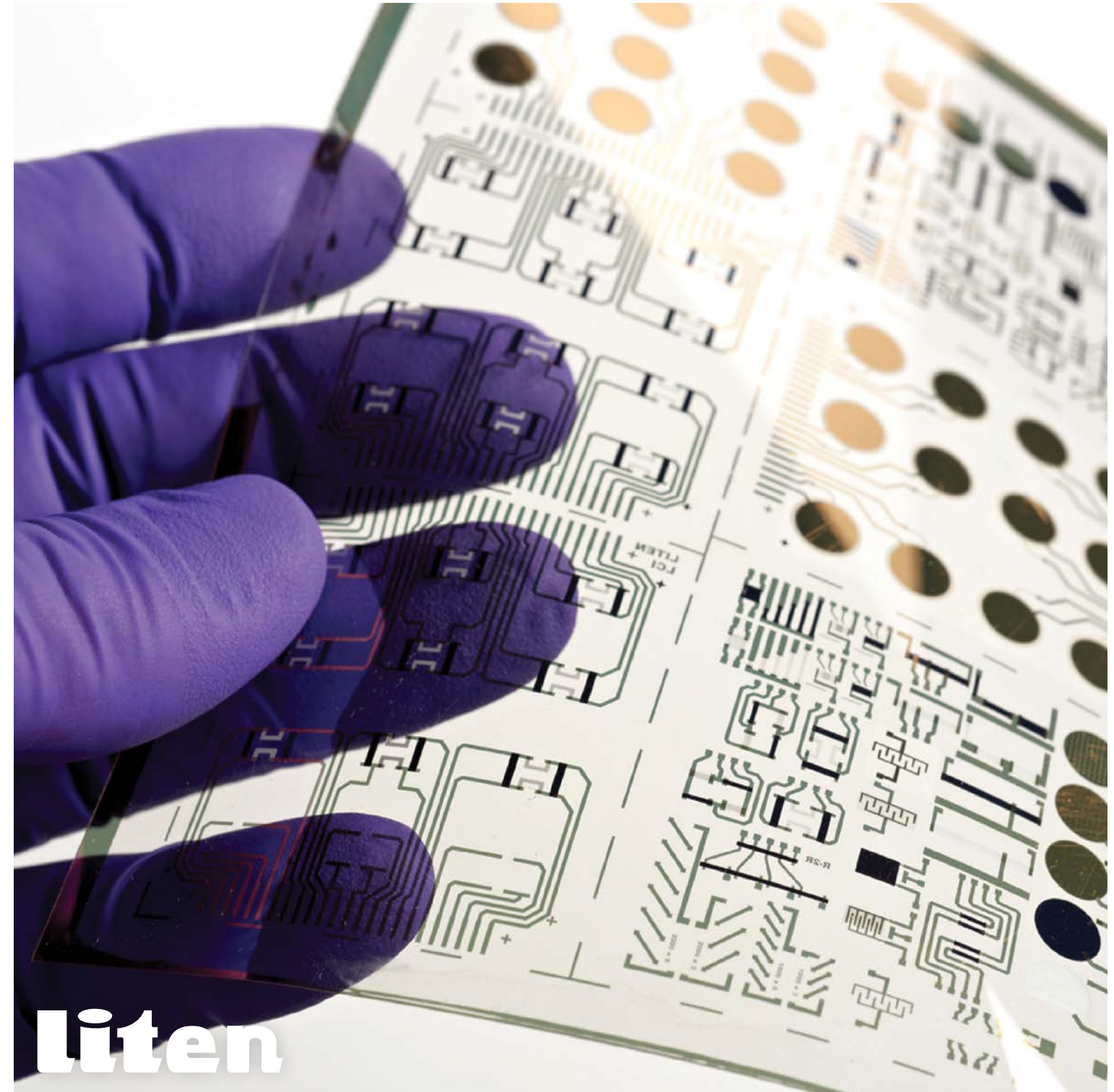
Grenoble,
CEA research institute Liten

R&D

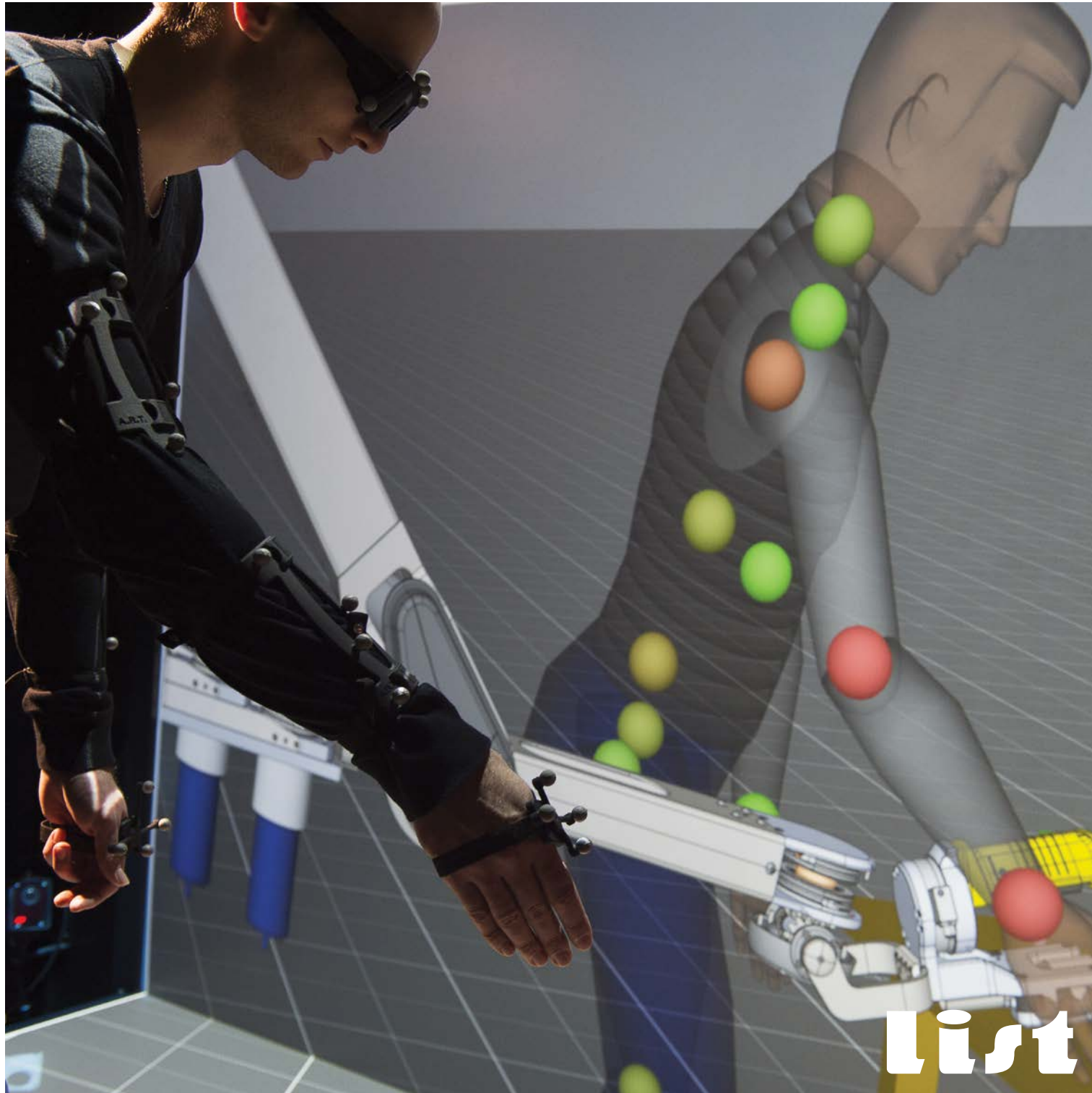
High-precision processes: alignment of electronics layers to within 10 microns; uniform deposition thicknesses (for example 3% for thicknesses of 1 micron)

KEY FIGURES

- 500 sq. m of clean rooms
- €10 million in investment
- 50 researchers and technicians
- A portfolio of 50 patents



liten



ADVANCED MANUFACTURING PLATFORM

FOR MORE POWERFUL, AGILE MANUFACTURING

The advanced manufacturing platform helps businesses hone their production processes for greater agility, responsiveness, quality, and performance. The platform works with some 240 manufacturers to implement IT, software, and robotics solutions.

The platform's non-destructive testing technologies leverage the CEA's regularly-updated CIVA software, which is already in use at more than 150 companies in 25 countries,

and GERIM non-destructive testing equipment. Virtual reality is a key resource at the platform; it is used to examine things like workstation ergonomics, production-line design, and maintenance feasibility, and to develop large-scale training resources that can be rolled out before the actual physical equipment is built.

Interactive robotics is another major application developed. Robotic systems like exoskeletons can be used to help carry heavy loads, while

collaborative robots can be used to control the force and precision of an operator's movements, even for high-precision tasks.

These R&D activities are backed by world-leading capabilities in augmented reality algorithms, knowledge management, and process orchestration. The platform also possesses solid know-how in civil nuclear operations, developing instrumentation and metrology for ionizing radiation.

R&D

3 R&D fields: virtual reality, interactive robotics, and non-destructive testing

LOCATION

Paris-Saclay,
CEA research institute List

NOTABLE EQUIPMENT

GERIM non-destructive testing equipment; interactive robotics lab; immersive virtual reality room; real-time interactive simulation environment

KEY FIGURES

- 2,000 sq. m of R&D space
- €20 million in investment
- 200 researchers and technicians

NANOBIOTECHNOLOGY PLATFORM

A BROAD SPECTRUM OF BIOTECH APPLICATIONS

The 5,500 sq. m nanobiotechnology platform houses all of the know-how required to develop innovative medical systems, with surface and sample preparation, biology, substrate functionalization, packaging, microfluids, microsystems, biological detection systems, and component reading capabilities. The R&D carried out at the platform benefits researchers, hospitals, and biomedical firms.

The innovative imaging solutions developed cover X-ray, gamma-ray, fluorescence, visible, and lensless techniques with a broad range of applications, from observing large surfaces to examining tissue, particles, cells, and bacteria.

The platform's embedded and implantable *in vivo* microsystems respond to the new challenges of personalized medicine,

nanomedicine, and point-of-care diagnostics. The platform is located near Clinatec. It is also near and works closely with iRTSV, further developing the basic research results produced by this life sciences research and technology center. The platform files some 35 patent applications per year, including under joint R&D projects with around 30 industrial partners.

25 PIECES OF LARGE EQUIPMENT

X-ray measurement chambers and screen printing, milling, and stamping machines

LOCATION

Grenoble,
CEA research institute Leti

PARTNERS

Around 30 industrial partners, including Fluoptics, Trixell, Siemens, and bioMérieux

KEY FIGURES

- 5,500 sq. m of facilities, including 2,500 sq. m of lab and clean room space
- €6 million in equipment
- Staff of 200
- 35 patents filed each year



leti



CLINATEC PLATFORM

A CROSS-DISCIPLINARY BIOMEDICAL RESEARCH CENTER

The Clinatec biomedical research center, which opened in September 2012, is unique in the world. From doctors and surgeons to biologists and engineers, Clinatec brings together all of the necessary know-how for innovation in micro- and nanosystems for healthcare. The platform possesses advanced imaging equipment and molecular, behavioral, and electrophysiological observation capabilities, as well as a preclinical unit, an operating room,

and six patient beds. Clinatec's mission is to speed proof-of-concept for new testing, diagnostic, and treatment methods and promote the emergence of novel solutions by bringing together a range of disciplines.

Clinatec also leverages the full potential of Grenoble's high-tech ecosystem, looking at way to integrate MEMS, NEMS, nanomaterials, and IR, X-ray, and

terahertz imaging techniques into the solutions it develops. Current research projects focus on implantable neurostimulation devices and biomarkers for brain cancer, Parkinson's, and Alzheimer's.

Researchers from other disciplines can also come to Clinatec to work on their own projects, as can R&D professionals from biomedical equipment manufacturers.

PATHOLOGIES ADDRESSED

Cancer, neurodegenerative diseases, spinal cord injuries

PARTNERS

A biomedical research center run by the CEA, Grenoble University Medical Center, INSERM, and Grenoble University's Joseph Fourier School

KEY FIGURES

- 5,000 sq. m of facilities
- 100 researchers
- €27 million in equipment

NOTABLE EQUIPMENT

Intraoperative MRI, SPECT-CT scanner

LOCATION

Grenoble, CEA research institute Leti

BIOMASS PLATFORM

CONVERTING BIOMASS TO ENERGY

The biomass platform is unique in France in terms of the sheer scope of its R&D activities, which cover biomass grinding, torrefaction, and gasification processes from an analytical scale up to 100 kg per hour—with results that can be extrapolated to industrial processes. The platform's overriding purpose is to produce high-yield energy while eliminating waste and controlling emissions of substances

like heavy metals and sulfur. The platform's equipment includes several reactors, a grinding unit, and torrefaction and gasification furnaces. Beyond the traditional sources of biomass, like wood and farm and forest byproducts, researchers at the platform are looking at household waste, pulp and paper byproducts, wastewater treatment sludge, and micro-algae as additional biomass

sources. These materials are used to produce fuel in either liquid or gas form, as well as useful byproducts of the biomass conversion process.

The research aims to make biomass a viable source of energy by 2020. The platform works with around fifteen industrial partners, including GDF Suez, Air Liquide, CMI, Leroux et Lotz, and Valoéno.

R&D

Biomass drying, grinding, injection, torrefaction, gasification, and liquefaction

LOCATION

Grenoble,
CEA research institute Liten

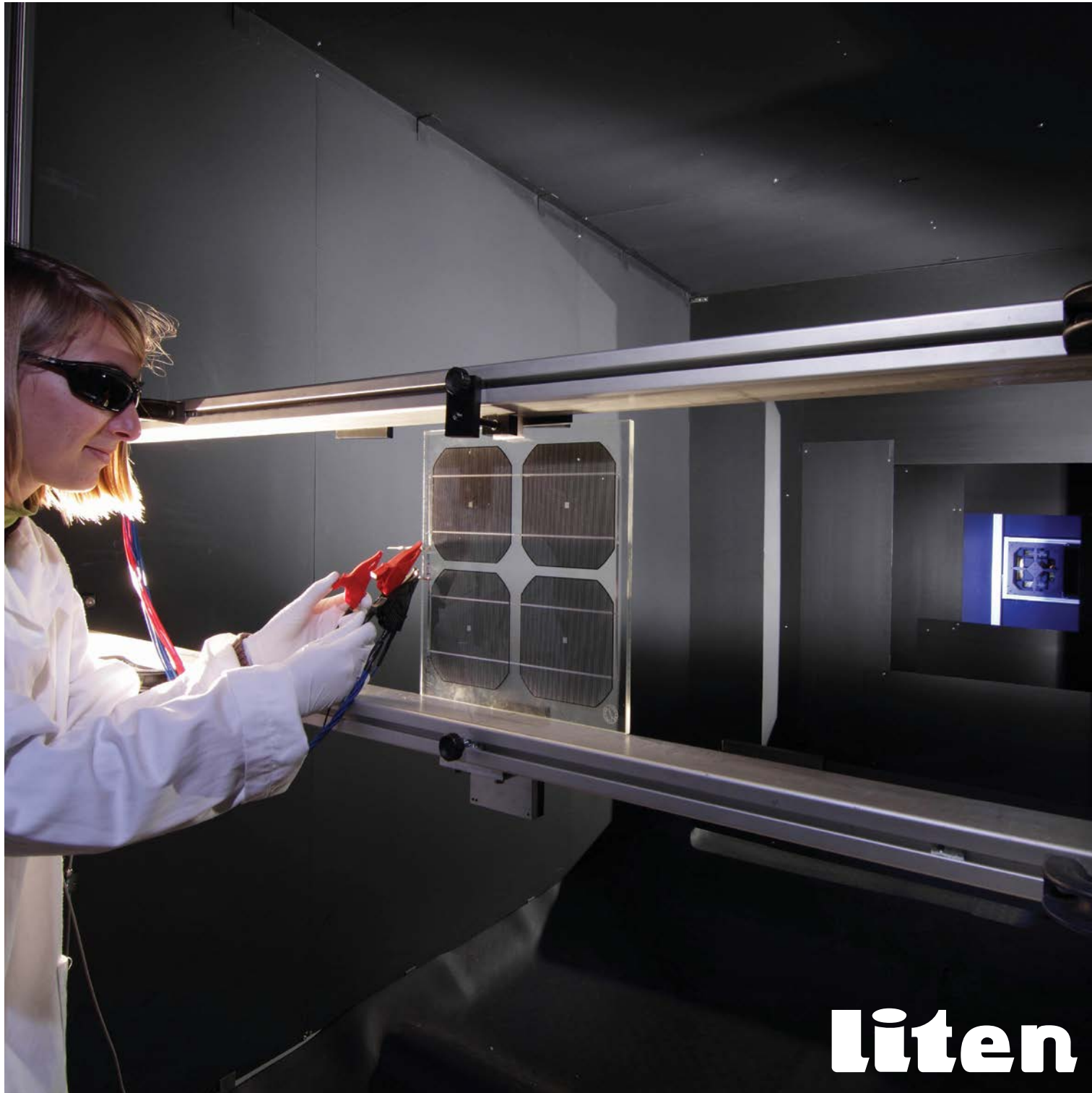
NOTABLE EQUIPMENT

An 11-meter-high, 3.5-meter-diameter torrefaction furnace; a high-pressure, high-temperature gasification furnace

KEY FIGURES

- 800 sq. m
- €7 million in investment
- 40 engineers and technicians
- A portfolio of 20 patents; 8–10 new patents per year





PHOTOVOLTAIC SOLAR PLATFORM

AN INDUSTRY RIPE FOR GROWTH

The photovoltaic solar platform's mission is to contribute to the development of a solar industry in France. And, with more than 200 employees and 100 industrial partners from SMBs to corporations, the platform is one of Europe's largest PV R&D facilities.

The platform's PV R&D focuses on materials, with particular

attention given to developing high-performance, competitively-priced silicon; PV cell technology and yield-enhancement; and solar modules and optimization. Applied research takes place at experimental PV facilities and at reduced-scale and life-sized solar power plants.

The platform also works on scaling up the technologies developed for

industrial rollout. The Heterojunction LabFab—a pilot production line capable of manufacturing heterojunction PV cells with yields of over 20%—boasts a theoretical capacity of 30 MW.

The platform also helps France-based solar-energy SMBs develop their export sales and build turnkey PV solar plants.

R&D

Materials, equipment, and processes for photovoltaic (PV) solar

LOCATION

Chambéry,
CEA research institute Liten

NOTABLE EQUIPMENT

The Heterojunction LabFab, the materials platform, the PV module platform, the CPV platform, the organic PV platform, and the outdoor experimentation platform

KEY FIGURES

- 15,000 sq. m of facilities
- 200 researchers and technicians
- €100 million in investment

SMART-GRID SYSTEMS PLATFORM

SCALING AND OPERATING NEW ENERGY SYSTEMS

The smart-grid systems platform works with fifteen industrial partners on how to scale, operate, and optimize energy systems for individual homes, buildings, or entire neighborhoods.

These energy systems can be connected to intermittent energy sources (PV solar panels or electric vehicles) and electricity storage systems—all of which must be

managed optimally to ensure that electricity is available when needed. R&D work at the platform encompasses modelling, virtual and real-world component testing, software development, and materials selection.

The platform leverages a real-time grid simulator showing converters, consumption, rooftop PV panels,

and various electricity-storage systems. The simulator can be used to test different grid configurations, determine operation strategies, and optimize profits. The platform's industrial partners include energy-industry leaders like Véolia, Alstom, Alcen, and Séché Environnement.

R&D

Energy-system scaling and management optimization encompassing production, storage, and use for both off-grid and grid-connected systems

NOTABLE EQUIPMENT

Remotely-managed 85 kW/160 kWh lithium-ion batteries, a real-time 45 kW grid simulator, flywheel, 160kW of PV capacity, 4 test houses, 350kW hookup

KEY FIGURES

- 300 sq. m of facilities; a 4,000 sq. m outdoor testing platform
- €2 million in investment
- 30 engineers and technicians
- A portfolio of 30 patents; 7 new patents filed per year

LOCATION

Chambéry,
CEA research institute Liten



liten



**leti
list
liten**

TECHNOLOGICAL INNOVATION SHOWROOM

AN INTERACTIVE, EDUCATIONAL EXPERIENCE

NOTABLE EQUIPEMENT

- 60 technology demonstrators
- 20% new demonstrators per year

KEY FIGURES

- 400 sq. m of exhibit space
- €2 million in investment
- Nearly 4,000 visitors per year from around the globe; 40% of visitors are professionals from industry

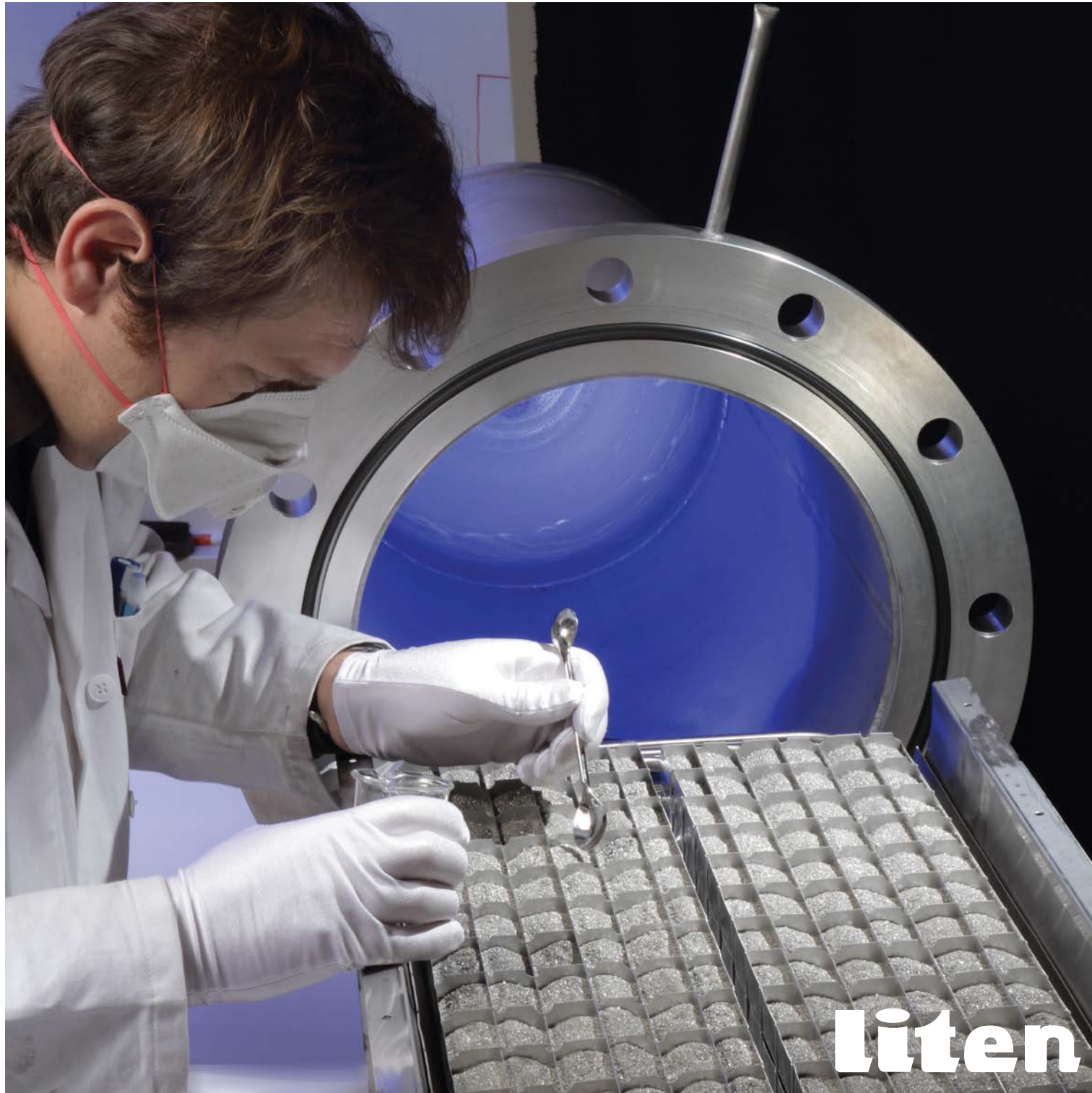
LOCATION

Grenoble,
CEA research institutes
Leti, Liten and List

The technological innovation showroom highlights the latest technologies developed by the three CEA Tech institutes: Leti, Liten, and List. The 60 demonstrators in this interactive, educational exhibit are updated regularly. The 400 sq. m showroom welcomes 4,000 visitors per year, from industrial and institutional decision-makers to the general public.

The demonstrators show how the latest innovations could be integrated into products in industries as diverse as healthcare, in-home technologies, mobility, and energy. Tours vary in length and technical difficulty depending on the group of visitors. Professionals from industry can end their tour with a creativity session facilitated by innovation experts.

A multidisciplinary team builds the demonstrators and designs the exhibits, leveraging know-how in mechanical engineering, electronics, 3D prototyping, design, and user-centered innovation to make the technologies accessible to a broad audience. The showroom also showcases start-ups spun off from CEA labs and the results of successful joint R&D projects with industrial partners.



HYDROGEN PRODUCTION AND STORAGE PLATFORM

GETTING THE MOST OUT OF A NEW SOURCE OF ENERGY

The mission of the hydrogen production and storage platform is to develop innovative hydrogen production, conversion, and storage processes so that hydrogen can be effectively used as a source of energy. The platform develops and tests demonstrators of significant size in partnership with manufacturing companies.

The platform's hydrogen-production research focuses on high-energy-

yield, high-temperature (700°C to 800°C) water-vapor electrolysis. The other applications for this technology include power-to-gas conversion via water-vapor/carbon-dioxide electrolysis.

Solid oxide fuel cells (SOFCs) are the main area of conversion research at the platform. SOFCs operate at high temperature and can use hydrogen or other gases (such as natural

gas and biogas). Cogeneration is currently the priority application for SOFCs.

The platform is also working on low-pressure solid-hydrogen storage processes for stationary and transportation applications. In a world first, the platform joined forces with France-based McPhy Energy to test a 15-kg solid-hydrogen storage tank.

PARTNERS

Around ten industrial partners

LOCATION

Grenoble,
CEA research institute Liten

NOTABLE EQUIPMENT

Electrolyzer and tank performance and durability testing capabilities

KEY FIGURES

- 700 sq. m facility, plus a 120 sq. m outdoor testing area
- €6 million euros invested
- 40 researchers and technicians
- A portfolio of 45 patents; 7 new patents filed each year

BATTERY PLATFORM

FOR BETTER LITHIUM-ION BATTERIES OF ALL SIZES

The battery platform boasts all of the know-how and heavy equipment required to develop and produce small runs of lithium-ion batteries.

R&D at the platform starts with identifying and synthesizing materials to optimize battery performance, and encompasses manufacturing the various components (such as battery electrodes and electrolytes), assembling the battery packs, and

integrating them into complete systems. Battery safety is assessed via a range of tests that include total destruction of the battery.

The platform has around 20 pieces of heavy equipment, including coating and filling machines and a pre-industrial assembly line. The platform's work focuses on lithium-ion batteries of all sizes, from tiny hearing-aid batteries weighing in at

just a few grams to 300-kg electric-bus batteries.

The platform's size and scope make it unique in Europe. With a strong commitment to industrial R&D partnerships, the platform works with around 30 manufacturers, including Renault, Prayon, Umicore, and Solvay (on battery materials), as well as with Prollion (on batteries and systems).

R&D

Develops, produces small runs of, and integrates lithium-ion batteries of all sizes

LOCATIONS

Grenoble and Chambéry, CEA research institute Liten

NOTABLE EQUIPMENT

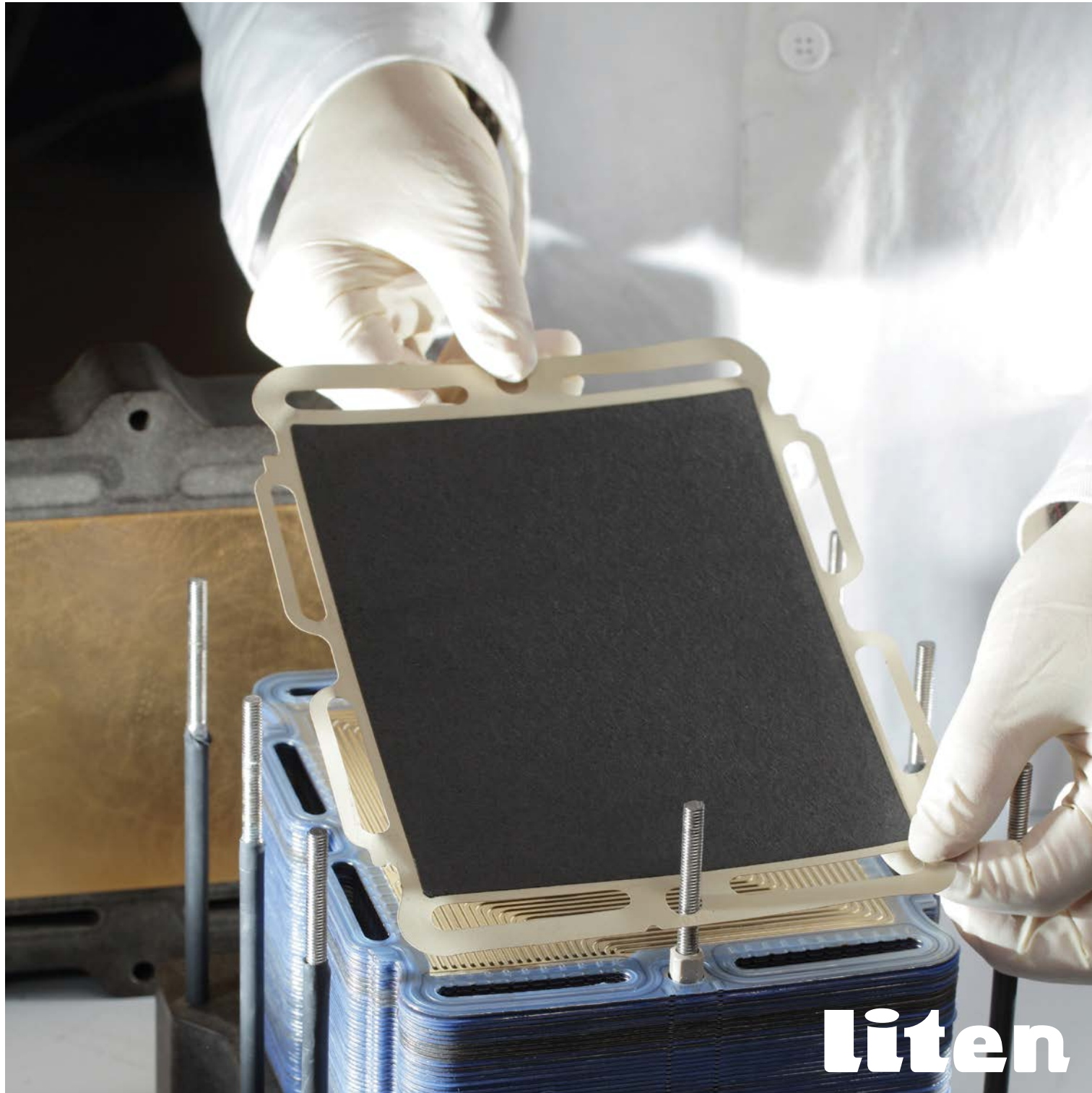
Industrial coating machine, pre-industrial assembly line

KEY FIGURES

- 3,000 sq. m, including 1,000 sq. m of anhydrous chambers
- 200 researchers and technicians
- Investment of €40 million



liten



FUEL-CELL PLATFORM

FUEL CELLS FOR TRANSPORTATION AND STATIONARY APPLICATIONS

With €6 million in equipment and a staff of 40 engineers and technicians, the fuel-cell platform takes a truly unique approach to designing and improving fuel cells. It is the only center in the world to cover materials, membrane-electrode assemblies, stacks, testing, modelling, and characterization.

Around ten manufacturers from around the world—including Symbio FCell and Areva Energy Storage—conduct R&D at the platform. The

platform's missions are to speed the transfer of new fuel-cell technology to transportation and stationary applications and build a strong intellectual property portfolio, adding around 10-20 new patents per year.

The platform builds demonstrators for testing in real-world conditions. For example, the hydrogen-powered Zero CO₂ vessel has been sailing since 2010, and the EPICEA and PROSPAC generators are producing 5 kW of useable electricity. The platform

also has specific equipment like a roll-to-roll electrode manufacturing machine for membrane-electrode assemblies and a stack-assembling machine.

The fuel-cells produced by the platform are at the international state of the art in terms of performance, lifespan, and form factor, all benefits that should open the door to niche-market applications in the near future.

R&D

A comprehensive approach from materials to systems integration

LOCATION

Grenoble,
CEA research institute Liten

NOTABLE EQUIPMENT

Around 20 test benches for fuel cells from 10 W to 50 kW

KEY FIGURES

- 500 sq. m
- €6 million in investment
- 40 engineers and technicians
- 10-20 patents filed each year

ELECTRIC MOBILITY PLATFORM

ON THE ROAD TO MORE SUSTAINABLE MOBILITY

Electric and hybrid-electric vehicles are about more than just batteries (or fuel cells). The battery or fuel cell must be integrated into the powertrain and tested in real-world conditions. The test results must then be analyzed so that further improvements can be made. The electric mobility platform does all of these things, developing solutions for

automotive applications as well as for all other types of land, air, and sea vehicles and vessels.

The platform possesses a complete set of equipment that includes a motor bench, solar charging stations, and instrumentation capabilities. The platform can perform one-off testing (up to 60,000 km for an electric

vehicle) and continuous monitoring of fleets of up to 30 vehicles. For the platform's industrial partners, these testing capabilities provide valuable feedback so that they can improve product quality and reliability and even launch totally new products on a still-emerging market.

R&D

Integrates batteries and fuel cells developed by the CEA into vehicles, performs testing, monitoring, and powertrain optimization

PARTNERS

Around ten industrial partners, including Courb (electric vehicles) and Zodiac Aerospace (fuel cells)

NOTABLE EQUIPMENT

300 kW electric motor bench, solar charging stations for electric vehicles, fast charging station for electric buses

LOCATIONS

Grenoble and Chambéry, CEA research institute Liten

KEY FIGURES

- 1,500 sq. m
- €4 million in investment
- 20 engineers and technicians





leti
liten

MICRO-ENERGY-SOURCE PLATFORM

BATTERIES, FUEL CELLS, AND ENERGY-RECOVERY SYSTEMS

The micro-energy-source platform brings together R&D for the full range of independent power solutions for smart cards, sensors, laptop computers, and other mobile devices. The platform occupies 1,000 sq. m of clean rooms and boasts around 30 pieces of pre-industrial equipment used to develop micro-batteries, micro-fuel-cells, and energy-recovery systems (for temperature gradient and vibration energy, for instance).

R&D at the platform focuses heavily on optimizing materials using techniques like thin-layer deposition for batteries, methods to enhance the performance and durability of fuel-cell catalyst and collector materials, and nanostructured thermoelectric materials to improve merit factor.

The platform possesses advanced equipment—a flash sintering furnace to make ultra-pure materials and a

cluster of five PVD chambers for fine-layer deposition—and can develop processes up to the pre-industrial phase.

The platform's main industrial partners are STMicroelectronics for micro-batteries just a hundred microns thick and Bic for fuel-cell chargers for mobile electronics. HotBlock OnBoard, a start-up spun off from the CEA, also works with the platform.

R&D

Micro-batteries, micro-fuel-cells, and energy-recovery systems

NOTABLE EQUIPMENT

Around 30 pieces of equipment, including PVD and CVD capabilities

KEY FIGURES

- 1,000 sq. m of clean rooms
- €20 million in investment
- 50 engineers and technicians
- 30 patents filed per year

LOCATION

Grenoble,
CEA research institutes Leti and Liten

THERMAL TECHNOLOGY PLATFORM

PRODUCING, STORING, AND USING THERMAL ENERGY

The thermal technology platform is unique in Europe, in terms of both its size and the scope of its R&D activities, which span technologies to produce thermal energy (concentrated solar power), store it for later use, and use it efficiently for industrial applications like heat pumps, boilers, and thermal exchangers.

The R&D carried out at the platform

involves around 50 industrial partners, including major corporations like GDF Suez, Saint Gobain, Total, and Renault. These partners hope to improve the energy performance of their industrial processes by optimizing heat transfer and by introducing thermal storage systems.

The platform possesses an extraordinary range of equipment:

two concentrated solar power plants of more than 1,000 sq. m, around 20 instrumented test loops, and thermal storage demonstrators (phase-change-material on a high-pressure steam circuit, oil on rock bed, and stacked ceramic on a high-temperature—up to 1,200°C—air circuit).

R&D

Concentrated solar power (CSP), thermal storage, and thermal systems for industry

LOCATIONS

Grenoble and Chambéry, CEA research institute Liten

NOTABLE EQUIPMENT

The Cadarache CSP plant with 1,300 sq. m of mirrors, a 450°C steam turbine, and three-stage thermal storage

KEY FIGURES

- 1,500 sq. m
- €15 million in investment
- 75 engineers and technicians
- A portfolio of 60 patents; 15 new patents filed per year





liten

POUDR'INNOV POWDER METALLURGY PLATFORM

HIGH-ADDED-VALUE MAGNETS AND COMPONENTS

The Poudr'Innov powder metallurgy platform develops high-added-value magnets and components from metal, ceramic, and magnetic powders with applications on the connector, lighting, electronics, healthcare, fine chemicals, and energy markets.

R&D at the platform focuses on powder preparation processes designed to optimize the end components' properties—and create new properties that would be impossible if

the materials were used in solid form. These include tiny components with complex shapes, lightweight hollow structures, dielectric components with high thermal conductivity, high-performance magnets, and multi-material assemblies. The components are molded and do not require additional machining, resulting in reduced cost.

The platform is the only R&D center in Europe to possess a complete range of semi-industrial and industrial

equipment and is capable of completing the entire component production process under one roof, from formulating and blending powders to injection molding, debinding and sintering, and characterization by μ -tomography. The platform leverages several decades of powder metallurgy research conducted by the CEA and files around ten patent applications each year. R&D at the platform is currently at the international state of the art.

R&D

Major technologies: feedstock, powder injection molding

PARTNERS

Several dozen industrial partners of all sizes from around the globe

KEY FIGURES

- 500 sq. m
- €5 million in investment
- 20 researchers and technicians

LOCATION

Grenoble,
CEA research institute Liten

NANOCHARACTERIZATION PLATFORM

WORLD-LEADING MICROSCOPY CAPABILITIES

The nanocharacterization platform houses around 40 pieces of heavy research equipment operated by a staff of experienced researchers and technicians. The platform studies samples for CEA research programs and conducts research on characterization techniques and protocols to prepare appropriate responses to tomorrow's characterization needs.

The platform possesses certain equipment that exists at just

a handful of other locations worldwide—this is the case for the platform's Titan Ultimate transmission electron microscope, which offers resolutions of 50 picometers.

Researchers at the platform can characterize a material's morphological, physico-chemical, and electrical properties, depending on partners' needs, providing 2D and, increasingly, 3D images of the materials studied. These tests provide valuable insight into nanomaterials

and nanocomponents. The platform also works with large research instruments ESRF and ILL, leveraging their synchrotron and neutron capabilities to obtain even higher-resolution images.

The platform is used by scientific equipment manufacturers that wish to improve their products, as well as by other manufacturers from start-ups to corporations like IBM and STMicroelectronics.

R&D

Nanocharacterization for micro- and nanotechnology, nanomaterials, materials for energy applications, and more

LOCATION

Grenoble,
CEA research institutes Leti, Liten, and Inac
Cooperation with large European instruments

40 PIECES OF HEAVY EQUIPMENT

Ion-beam and X-ray beam, surface analysis, near-field electron microscopy, optical characterization, magnetic resonance, and sample preparation

KEY FIGURES

- 3,000 sq. m
- 80 researchers and technicians
- €30 million in investment



**leti
liten
Inac**
INSTITUT NANOSCIENCES
ET CRYOGÉNIE



NANOSAFETY PLATFORM

HANDLING AND USING NANOMATERIALS SAFELY

The nanosafety platform focuses on protection, health, and safety issues related to the handling and use of nanomaterials. Housed in a brand-new, 5,000 sq. m building and staffed by a team of 150, the platform has two main activities:

R&D, with five major focus areas: toxicology, ecotoxicology, the

integration of nanomaterials into industrial processes and nanomaterials lifecycle analysis; industrial health and safety, and characterization and methods.

BtoB services: training of prevention and emergency response personnel, consulting, workstation auditing and design,

occupational health consulting, and 24-7 incident-response services. The platform's partners come from all industries (inks, paints, cosmetics, food), and also include prevention and testing organizations like INERIS, INRS, Institut Pasteur de Lille, and the French National Testing Laboratory.

NOTABLE EQUIPMENT

FFF-ICP-MS (for nanoparticle analysis), cryogenic transmission electron microscope, and a full range of equipment for the measurement of nanoparticles in aerosols and colloids

KEY FIGURES

- 5,000 sq. m, including 2,000 sq. m of laboratory space
- €10 million in equipment
- 150 researchers, engineers, technicians, doctors, and biologists
- A portfolio of 4 patents

LOCATION

Grenoble, CEA research institute Liten

The CEA Tech technology platforms in Grenoble, Chambéry, and Paris-Saclay were set up

WITH THE FINANCIAL SUPPORT OF: *



ON THE FOLLOWING CAMPUSES:



IN PARTNERSHIP WITH:



* funding for infrastructure and major research equipment; R&D project funding not included

PHOTO CREDITS: P. AVAVIAN, I. CHATAING, D. GUILLAUDIN, P. JAYET, D. MOREL, P. STROPPA

INTEGRATED CIRCUIT AND
NANO-ELECTRONICS AND M
PICTIC: LARGE-SURFACE
MANUFACTURING NANOB
BIOMASS PHOTOVOLTAIC S
HYDROGEN PRODUCTION
FUEL CELLS ELECTRIC MOBIL
THERMAL TECHNOLOGIES
METALLURGY NANOCHARA
NANOBIOTECHNOLOGY IN
EMBEDDED SYSTEM DESIGN
MICRO- AND NANOSYSTEM
PRINTING ADVANCED M

CEA Tech

17 rue des Martyrs | 38054 Grenoble Cedex 9 | France

Tel.: +33 4 38 78 44 00