



**ines**

INSTITUT NATIONAL  
DE L'ENERGIE SOLAIRE





INES is the reference center in France, and one of the first in Europe, dedicated to research, innovation and training on solar energy. Set up with the support of the Savoie Departmental Council and Rhône-Alpes Regional Council, it hosts teams from the CEA and the University of Savoie Mont Blanc. INES currently employs 400 staff on a 22,000-m<sup>2</sup> site equipped with state-of-the-art facilities.

## INES, LEADING SOLAR-ENERGY RESE



### Two complementary activities:

#### Research & Innovation ▶

Steered by the CEA, these laboratories and facilities also welcome research teams of the University of Savoie Mont Blanc, linked to the needs of industry. Its research works are: innovation in solar technologies, electricity storage, solar mobility and energy efficient buildings. This department is at the heart of a French and international network.

#### Training & Evaluation ▶

The Training & Evaluation Unit operates in tandem with the Research & Innovation Unit, supporting the development of new technologies for solar energy and energy-efficient buildings. The Training & Evaluation Unit also contributes to the solar energy industry by providing businesses with four types of services:

- Continuing professional development (CPD)
- An observatory that monitors and assesses the installed solar base
- Support for innovation-driven development projects
- A digital resource library

#### KEY FIGURES

**22,000-m<sup>2</sup>** of laboratories, offices and training rooms

**800** professionals trained each year

**400** researchers and technicians

**200** industrial partners

**85** patents pending per year

**15** laboratories



# RESEARCH WITH TECHNOLOGIES FOR BUILDINGS

## Research & Innovation

### Solar components and systems

From materials to applications, **INES scientists aim to meet a double challenge:** reduce production costs while improving the efficiency and lifespan of technologies and systems.

#### MAIN RESEARCH AREAS

##### In the photovoltaic field:

- Silicon purification and crystallization processes
- Innovative cells based on silicon, thin films and organic materials
- New techniques for PV module encapsulation
- Safety, diagnosis and management systems for solar power plants

##### In the solar thermal field:

- Innovative components and systems for hot water production, heating, ventilation and air conditioning
- Hybrid systems combining solar with other renewable energies
- Concentrated solar power plants

### Grid management and solar mobility

Renewable energies are intermittent but predictable. In order to optimize their use, INES is developing:

- **Intelligent management** of energy production and demand in order to smooth flows through electricity grids
- **Storage technologies**, either stationary or mobile, in the form of batteries (lead-acid, lithium-ion, sulphur sodium, redox flow, etc.)

INES is making a specific contribution to **solar mobility** by developing both onboard energy storage systems and local photovoltaic production systems to facilitate battery charging.

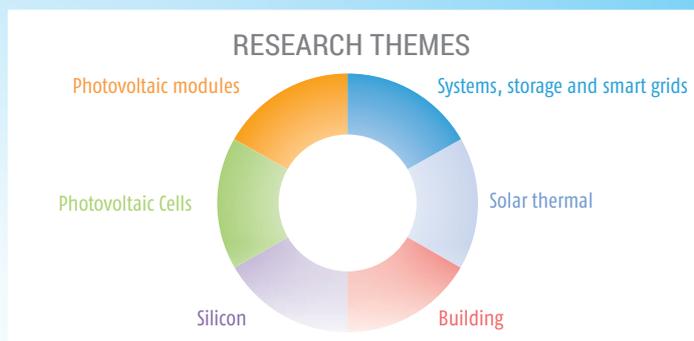
### Building energy systems

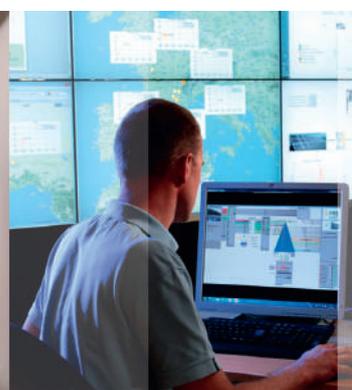
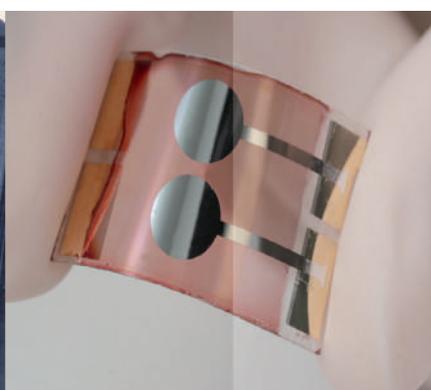
The labs at INES are working to promote the widespread adoption of **energy-positive buildings**, by developing tools and methods to:

- **Improve energy-positive building design for more efficient operation**
- **Forecast and assess building energy performance**

INES offers a range of **building testing equipment:**

- **Component testing equipment** suitable for building envelope materials like windows, doors, and shutters, passive and active solar components, building-integrated solar modules
- A group of **life-sized, fully-operational instrumented homes** used to compare construction techniques and energy systems and to validate dynamic simulation models





# INGS, MOBILITY, STORAGE AND GRIDS

## Training & Evaluation

### Continuing professional development

The Training & Evaluation Unit operates in tandem with the Research & Innovation Unit, offering a full range of solar-related training courses covering thermal, photovoltaic, and building energy systems. With a wide variety of courses to choose from, there's something for solar-industry professionals across the entire value chain. Each year nearly 800 participants benefit from the Unit's:

- Experienced in-house teaching staff backed by a network of recognized industry experts
- Catalogue of more than 60 programs and courses
- Custom training courses (on request)
- Four workshops where trainees can practice new technical skills
- E-learning catalogue of 100 courses, all with the support of a tutor

### The observatory: monitoring and evaluate the installed equipment and systems

- The observatory was set up to support the growth of the solar-energy industry by monitoring and evaluating the thermal and photovoltaic installed equipments and systems and solar-powered buildings. The goal is to provide insights into the actual performance of the installed equipment and systems and generate accurate statistics for the industry
- The observatory's flagship program is a web-based platform used to monitor nearly 450 individual and collective thermal solar installations in the Rhône-Alpes region for private individuals or professional building owners and operators

### Digital resource library

Solar-industry professionals can use the digital resource library's:

- Calculation and dimensioning tools (CALSOL, CASSC, VESTH, ECHARP), which were developed by INES
- An e-learning platform used for blended-learning-type courses combining online classes with support from a tutor. The platform boasts more than 400 videos on INES's three focus areas. The videos can be combined to create courses to meet specific learning objectives and prerequisites.

### Support for innovation driven projects

The support team includes experts in solar energy and building energy systems and provides auditing, consulting and inspection services to support businesses, manufacturers, and government agencies in their innovative projects.

# INES CAMPUS

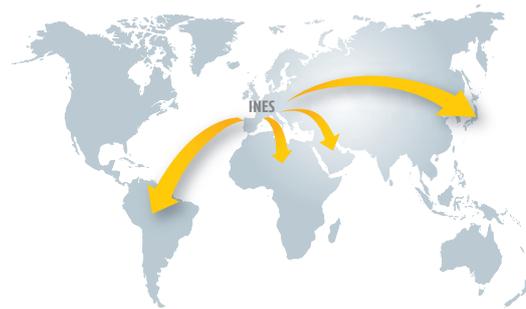
- 1 / Helios** - Administration, Training & Evaluation, organic photovoltaic and building energy systems
- 2 / Building experimental center**
- 3 / Lynx 4** - Photovoltaic modules
- 4 / Lynx 2** - Energy storage
- 5 / Lynx 3** - R&D management, solar mobility and electrical systems

- 6 / Puma 3** - Thermal systems and Certisolis (certification company)
- 7 / Puma 2** - Homojunction cells
- 8 / Alouette 3** - Silicon wafers
- 9 / Gazelle** - Silicon cristallization
- 10 / Puma 1** - Silicon characterization
- 11 / Écureuil** - Pilot line for heterojunction cells
- 12 / La Base** - Solar business incubator



## INES, PART OF AN INTERNATIONAL NETWORK

Germany - HELMHOLTZ, JÜLICH,  
 FRAUNHOFER, ZSW  
 Austria - AIT  
 Belgium - IMEC  
 Denmark - DTU  
 United states - NREL  
 Spain - TECNALIA, UPM, CIEMAT  
 Finland - VTT  
 Great Britain - CREST  
 Italy - ENEA, ENEL, JRC, RSE  
 Netherlands - ECN  
 Morocco - IRESEN, MASEN  
 Swiss - EPFL, CSEM  
 Norway - SINTEF



### INES NETWORK

**EXTERNAL NETWORK**  
 CEA - Cadarache  
 INSEME - Corse

**ASSOCIATED RESEARCH CENTERS**  
 IPVF - Saclay  
 THEMISOL - Perpignan  
 LCPO - Bordeaux  
 ICube - Strasbourg  
 IM2NP - Marseille



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