

SOCRATE and SOLSTICE: High performances in solar concentrating systems

The equipment of excellence (Equipex) SOCRATE and the laboratory of excellence (Labex) SOLSTICE, funded by the French “Investments for the Future”, are complementary projects that aim at developing the new generation of concentrating solar energy conversion systems from the concept to the industrial pilot scale.



The 1 MW CNRS solar furnace in Odeillo-Font Romeu



The 5 MW Themis solar tower



The 150 kW (thermal) small scale trough power plant

Concentrated solar energy technologies (also named CSP) produce medium and high temperature heat (150 - 2000°C), power and fuels such as hydrogen or syngas. Solar thermal electricity production is clean and firm and can be adapted to the demand thanks to thermal energy storage and hybridization with other primary energy resources (natural gas and biomass for example).

The equipment of excellence SOCRATE (Concentrated solar energy: advanced researches and energy technologies) links together the main French large scale concentrating solar facilities in order to improve the performances of these systems and to increase the technology capacity of the National and European industry. It includes particularly the 1 MW CNRS solar furnace in Odeillo-Font Romeu (66) and the 5 MW “Themis” central receiver tower in Targassonne (66).

SOCRATE equipments are open to access to public research laboratories and to R&D industry departments for developing collaborative research projects and tests in the fields of high temperature materials properties, heat transfer fluids for solar thermal

THE FRENCH
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power plants, innovative solar receivers, thermal storage, component integration and solar concentrating system simulation tools.

The laboratory of excellence SOLSTICE (Solar energy: sciences, technologies and innovations for energy conversion) links together the scientific and technical skills of about 200 persons for developing new solar energy conversion and storage systems, improving the conversion efficiency of solar energy to energy carriers (heat, electricity, chemicals, fuels) and training engineers in solar energy.

Examples of equipments and achievements:

- A unique set of solar concentrating systems consisting of: ten small scale solar furnaces (1-2 kW), one 6 kW solar furnace, a 50kW parabolic dish, a 1 MW solar furnace (Photo 1)

and a 5 MW solar tower (Photo 2);

- A small scale 150 kW (thermal) and 15 kW (power) solar thermal power plant based on trough collectors with two-hour thermochemical thermal storage (Photo 3);
- A solar energy materials characterization platform (optical and thermal properties);
- A new generation of multi-junction high efficiency solar cells based on antimony alloys;
- Biogas production by pyro-gasification of biomass and carbonaceous by-products;
- New catalyst development for solar photocatalytic waste water treatment;
- Pilot facilities for thermal energy storage at medium and high temperature.

SOCRATE and SOLSTICE are managed by PROMES (CNRS-UPVD) laboratory.

SOLSTICE joins the research teams of three laboratories: PROMES (Odeillo-Font Romeu and Perpignan), RAPSODEE (EMAC, Albi) and IES (UM, Montpellier).



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► Thermal and chemical storage of solar energy.

The built-in thermal storage capabilities of CSP plants are a decisive asset that distinguishes these plants from other highly variable renewable electricity production technologies (PV & wind). Synergy of SOCRATE equipments and SOLSTICE researches aims at developing innovation to decrease cost of storage technologies.