

Services offered by CEA-INES installations

The STORE facility: STOrage of Renewable Energy

The experimental STORE facility is used to characterise the performance and aging of a range of electricity storage technologies, mainly electrochemical.

It is the largest facility in Europe for the study of renewable energy storage and distributed electricity generation. The facilities provided by STORE may also be used in other energy storage applications such as electric vehicles.

The tests normally involve a sequence of charge-discharge cycles with controlled profiles and temperatures. The protocols used depend on the target application and the conditions under which the energy storage system is to be used (independent or grid connected photovoltaic system, electric vehicle, etc.).

These protocols may be adapted to suit other specific requirements. In the case of aging tests, the accelerator coefficient is estimated from the correlation of post-test physical and chemical analyses, the test profiles, and experience in the field where available. Safety tests may also be carried out.

The tests carried out can be used to characterise the energy storage component in the same way as any other energy resource in terms of, for example, efficiency, instantaneous energy and power availability, and lifetime. Economic parameters such as the cost per kWh can also be assessed.

The STORE facility provides the test resources needed to support innovation, including those needed for modelling studies or for optimising system energy management.

Having been used over a period of 20 years and having gathered data on more than hundred tested batteries, the STORE facility can be used to compare test results with an anonymised database of previous results.

STORE is under constant development and has been enhanced by the addition of new high power test resources in order to meet the requirements of developing applications (grid connected energy storage and electric vehicles) and emerging energy storage technologies. Work is also under way to achieve recognition for STORE at a national and European level.

Equipment

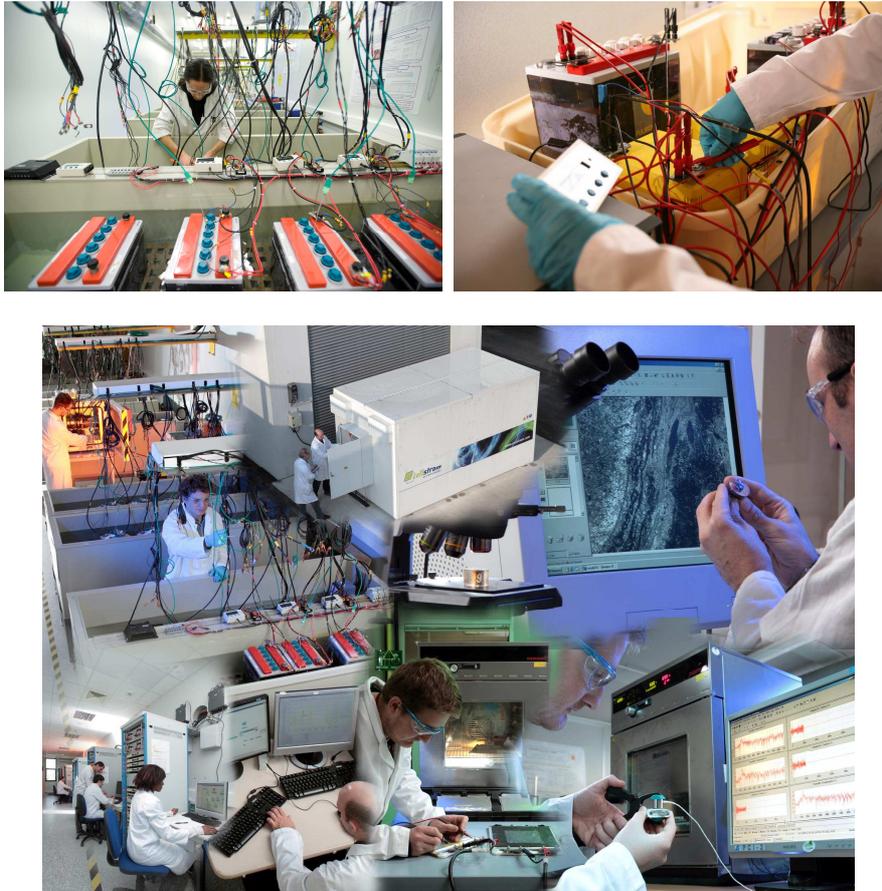
The STORE platform consists mainly of charge-discharge cycling test benches for the study of the performance of a wide range of battery technologies including lead-acid, nickel-cadmium, nickel-metal hydride and lithium-ion.

More than 90 test channels are available at a range of power levels. Additional electrochemical analysis equipment is available for more accurate or smaller scale tests, including potentiostats and impedance meters.

An adiabatic calorimeter (ARC) is used in safety testing (thermal sensitivity, overcharging and short-circuit).

A supporting chemical laboratory provides for the safe analysis of lead-acid batteries, and the physical and chemical characterisation of their constituents such as electrodes and active materials.

Studies of other types of battery are also possible, especially lithium-ion batteries that cannot be allowed to come into contact with the air. A nano-characterisation facility is also available with advanced equipment for electron microscopy, X-ray diffraction and porosity measurements.



The PRISMES platform

The PRISMES research and development facility for optimising photovoltaic electrical systems is used to carry out research into new architectures and new hybrid systems. The optimisation process includes the reduction of costs associated with solar photovoltaic systems, the development of innovative electronic components and, more widely, the definition of new strategies for the management of energy.

The PRISMES facility has a number of specific advantages in this regard:

- A recent installation, among the best in Europe
- A global approach, from the analysis of components to their integration in a building
- A small-scale internal supply network for testing new, mainly solar systems, both independent and grid connected. PRISMES provides interconnections between an 80 kW photovoltaic generation system, a range of test benches, a number of INCA houses (positive energy solar powered), and a solar-powered refuelling station for electric vehicles.

More than twenty channels (single and three-phase AC lines, and DC up to 750 VDC) for the optimisation of electrical systems architectures from production to consumption. The system also incorporates all the technologies currently available on the market with the aim of measuring and comparing system performance.

