



INNOVATION LAB IN CATANIA

Enel will offer the access to the following facilities and equipment. The Lab is accredited according to the ISO IEC 17025 and CEI EN 61215 - 61646 standards for PV modules qualification.

PV Indoor LAB

In the indoor laboratory, accelerated ageing tests are carried out for analyzing PV modules reliability and durability. The equipment generate highly stressing conditions simulating in a short period of time an outdoor exposure equivalent to the lifetime of the module, to allow a quick assessment of the reliability and durability of solar components. Main equipment are climatic chambers controlling temperature and humidity, UV chamber, equipment for mechanical stress test, salt mist corrosion chamber.

PV Outdoor LAB

Innovative solutions for both components and systems are tested on outdoor structures: module cleaning systems, protective coatings and antisoiling, soil coatings designed to improve plant performance. Moreover, the best photovoltaic technologies are compared in a test bench station through tests under real operating conditions. The main equipment are: outdoor fixed structures for mounting and testing experimental PV strings with electronic loads, bi-axial solar tracker with electronic loads, PV modules test bench with inverters, area for future installations.

Solar Simulator

The equipment allows to estimate the performance PV modules and cells. The system measures the power generated by a photovoltaic module with great precision under controlled conditions, at different irradiance levels and it is able also to measure the spectral response of a module. It allows to verify the rated power declared by the manufacturer and to detect and measure the power reduction of modules due to aging processes.

Electrical tests Lab

The equipment measures with high accuracy the electrical resistance between the frame and the cells of a PV module both in dry and wet conditions according to the current standards. Evaluation also of the electrical continuity of the module frame toward ground.

Radiometric station

The main climatic variables and the solar radiation of the site are continuously and accurately monitored in this station. Historical data sequences are generated for the analysis of the

performances of solar devices. Main equipment are: biaxial tracker with high precision with pyreliometer and pyranometers for measuring the components of solar radiation (global, direct, direct normal and diffuse horizontal irradiance), radiometers UV A and UV B, instrumentations for the measure of pressure, humidity, temperature, wind speed and direction.

Electroluminescence LAB

The equipment allows to detect visible and not visible defects in solar modules (such as cell micro breakage, faulty connections, defects of the process, shunt, areas of high resistance to the current). Main equipment are: bench for visual inspection test, Electroluminescence (EL) device, thermography camera. During EL test, constant current source is connected to the module's contacts and a highly sensitive cooled CCD camera is used to record the luminescence emissions from the PV device.

Storage/Microgrid LAB

Different configurations of storage + photovoltaic systems for residential applications are studied, with the aim of finding the most suitable, stable and secure configurations to meet the needs of the end customer. In addition, home automation systems are being studied which will allow the customer to manage energy and load production, making it potentially autonomous from the network. Software platform for aggregation of DER (distributed energy resources) are also studied and tested in a proper scenario (that can be simulated through the Microgrid equipment).

Main equipment are:

- Residential Batteries + related inverters
- Small controllable Electronic loads (1,8kW 1-phase / 5,4 3-phase)
- Working stations for hardware/equipment control
- 1-phase wireless meter + control/monitoring platform
- Microgrid Electric simulator (capable to simulate off-grid/on grid scenario and connect up to 20 different devices to the same network)
- 1 Genset 60kVA
- 1 Controllable 3-phase Electronic load 40kVA
- Dedicated subnet to manage the installed devices/hardware/end-points

Spectrophotometer laboratory

An UV-VIS-NIR spectrophotometer (280 nm-2300 nm) is available in the optical laboratory. The equipment allows the measurement of the spectral optical properties of the material surfaces. Namely, the equipment measures the spectral solar absorptance and transmittance and the solar reflectance at different angle of incidence.

Outdoor test station for Solar concentrating Systems (CPV – CSP)

An outdoor area and facilities, equipped with a meteo radiometric station for the accurate measurement of the electric and thermal performance of concentrating solar systems (HCPV systems - High Concentration PV systems; CSP).

The testing facility is also designed to measure the performance of co-generative systems based on parabolic dish sterling engine or CPV technology able to produce both electric and thermal energy; also little hybrid systems could be installed and tested.

PV Floating

The tests on PV Floating systems can be carried out using:

- The test facilities present in the lab (e.g. solar simulator);
- The water basin present in the area; this is equipped with a floating platform in order to support and make easier the tests execution in the basin

New technologies for Augmented Reality and increased Safety

The Lab is equipped with appropriate spaces to test advanced safety systems, devices based on smart technologies, and innovative systems to improve workplace safety by using wearable smart sensors, apps on smartphones, smartwatches or other smart devices, as well as Augmented Reality systems.