	Module Performance	**ENEL IIN S.p.a.** **Outdoor Test Lab for PV Flat Modules**
Location of the infrastructure :	Catania, Italy	http://www.enel.it
Contact person :	Antonluca Loteta	Phone : +39 0952877066 E-mail : antonluca.loteta@enel.com

Objectives :

- Outdoor I-V curves measurement, power and long term energy rating of PV modules, characterization tests according to IEC 61215- 61646

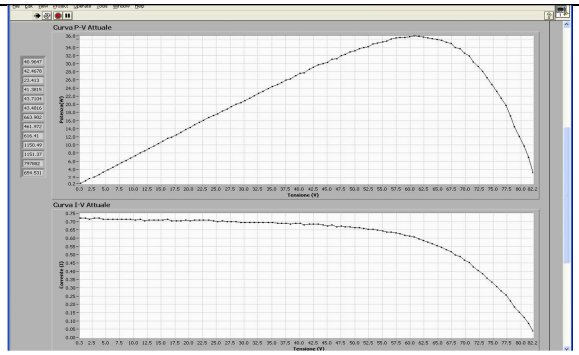
Main features :

1. Outdoor Test Station

Due to the optimal irradiation conditions of the site, DNI equal to 1803 kWh/m2 per year, the Outdoor test station is one of the main infrastructure of ENEL Advanced Solar Laboratory for testing on different kind of PV flat modules. It permits the analysis in parallel of up to 24 flat modules, positioned in benches opportunely oriented toward the south direction depending on the month of the year.
The test station permits to take I-V curves of flat PV modules and to determine long time energy yield according to the standards IEC EN 60904-1 and IEC 61853 (this latter still in progress). The test station includes the meteo-radiometric instrumentation (pyranometers, termo-hygrometer, taco-gonio anemometers) and reference cells of different materials (a-SI, Si-mono, Si-poly) and the relevant temperature sensors (surface transducer PT100).. Data acquisition and control systems are placed in an suited box. The outdoor I-V curves are taken by means of different sized electronics loads or using multimodules I-V tracers. The testing facility permits to measure Pmax and long term energy yield.

Namely, the equipment consists of:

- tilted benchs,
- electronic loads ranging from 10 V to 660 V, 100 W to 3kW for continuous acquisition of module IV curves
- Data acquisition system (SW Labview 8.x professional)
- Sw for electric parameters and meteo-radiometric conditions processing to evaluate perfomance indexes
- one Infrared thermal imaging camera for the detection of thermal distribution and hot spots phenomena on PV devices in real outdoor conditions



Limitations or constraints :	The access will be allowed with technical and scientific assistance from ENEL.
Typical services or results :	These test benches can be used for: • Peak power measurement under real outdoor operation conditions, • Outdoor data acquisition for modelling the energy output of PV modules.
Examples of research projects :	• Pre-conditionning procedures before peak power measurement • Harmonisation of IV tracing methods and relevant data format • Data management procedures to sort out relevant parameters • Round-Robin tests performed all over Europe for Peak Power measurements and Prediction of the energy yield of PV modules.