



Putting Solar Panels to the Test SOLAREC - Photovoltaic Solar Electricity

Photovoltaic (PV) modules convert photons from the sun's rays into electricity, which can either be fed into the electricity grid or stored, for instance using batteries. With the development of new technologies and falling production costs, PV systems are expected to make an increasingly significant contribution to Europe's energy supply in the coming years.

To support this the JRC's research project "SOLAREC" is developing best practices and standards for assessment of all aspects of PV energy, assisting policy-makers, industry, standards organisations and national research agencies. The European Solar Test Installation (ESTI) is part of SOLAREC and forms a focal point for calibration, qualification and R&D work.



EU Policy

The European Council Conclusions of March 2007 set a target for a 20% share of renewable energy by 2020. PV should make a significant contribution to this; indeed the industry has given itself the goal to provide 12% of electric power needs by 2020, based on rapid advances in technology and production methods.

Testing standards must keep pace to provide the basis for a free and transparent market, while policy-makers and investors need reliable performance assessment tools.

European Solar Testing Installation (ESTI):

The ESTI facilities, set up in 1997, are some of the most advanced in Europe. ESTI has a Type "A" Liaison with the International Electrotechnical Commission and is fully accredited under ISO 17025 for calibration of PV devices, making it the first laboratory worldwide to be accredited for the entire traceability chain. The lab has experience with a large variety of PV technologies (mono- and poly-crystalline silicon, amorphous silicon, cadmium telluride cells, CIS and concentrator cells). The measurement capability covers small devices of a few square millimetres up to large modules of several square metres



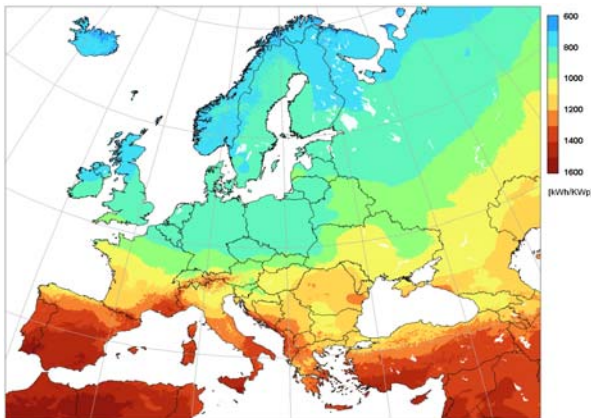
Calibration and Traceability: Prices for photovoltaic devices are commonly quoted per Wp (Watt peak), i.e. the electrical performance under standard test conditions. To have legal value, such measurements should demonstrate an unbroken traceability chain to international primary standards and have a calculation of uncertainty. ESTI has been at the forefront of developing measurement methods for over 20 years. Features of the work include: the ESTI reference cell set); continuous development of methods; international round robin measurement campaigns and calibrations for third parties.

Module Lifetime: this is one of three key factors determining the generation costs of solar electricity. Although long-term performance data (>20 years) is now available for crystalline silicon modules, there is a lack of understanding of the physical mechanisms which may degrade performance. ESTI is developing new evaluation methods for both existing and advanced PV technologies based on accelerated aging tests in climatic chambers and long term monitoring of small systems (<1kWp).

Energy Rating: the estimation of the electrical yield of a PV module is expected to be a more useful predictor of performance than Wp alone, since the return on investment is directly linked to the kWh produced. The ESTI approach combines:

- solar radiation and temperature geospatial data modelled in the geographical information system PVGIS,
- a "performance surface" model for the conversion efficiency of specific PV module types, with the module temperature and incident irradiance as independent variables.

The accuracy of the method has been demonstrated for crystalline silicon modules over periods up to one year. Studies for other module types are in progress.



Photovoltaic Geographical Information System

PVGIS provides a map-based inventory of solar energy resource and assessment of the electricity generation potential of PV systems in Europe, Africa and South-West Asia. By making this information available to the public, PVGIS helps investors, industry and private persons to make investment decisions and supports policy-makers and grid regulators to design intelligent policies for PV deployment.

The existing PVGIS database already addresses many of these objectives. A new database with data at high temporal resolution is currently being developed to provide a platform to integrate traceability, energy rating and life-time assessment in a single system. Supplementary data on temperature will allow the assessment of performance degradation. This opens the way to studying the impact of large-scale deployment on existing European electricity grids.

PV-GIS can be accessed on the web at:

<http://re.jrc.ec.europa.eu/solarec/index.htm>

Transfer and Dissemination

SOLAREC's expertise is used in several ways to benefit the wider community:

- Participation in the International Electrotechnical Commission Technical Committee TC-82 "Solar Photovoltaic Energy Systems and to relevant European Committees for Electrotechnical Standardisation (CENELEC) groups.
- Participation in collaborative European research projects
- Technical Programme Coordinator for the European Photovoltaic Solar Energy Conference, Europe's premiere PV event.
- Collaboration agreements with leading European national laboratories for calibration of reference cells.
- Input to the Commission's Strategic Energy Technology Information System (SETIS), which provides reference data for EU policy makers.
- Scientific-articles

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