

# The ESTI Outdoor test field

## Photovoltaic performance in real conditions

### ESTI

The European Solar Test Installation (ESTI) is a European reference laboratory for the verification of the power and energy generation of photovoltaic devices.

ESTI is located at the JRC's Ispra site in Italy. It has been at the forefront of developing standards for electrical performance of PV products since its launch in the late 1970's

Outdoor testing at ESTI focusses on:

- energy rating under different intensity, spectral and temperature conditions,
- long term exposure of PV modules, with periodic performance checks.

ESTI's work supports the EU's renewable energy goals (Directive 2009/28/EC) and the European Strategic Energy Technology Plan (SET-Plan).

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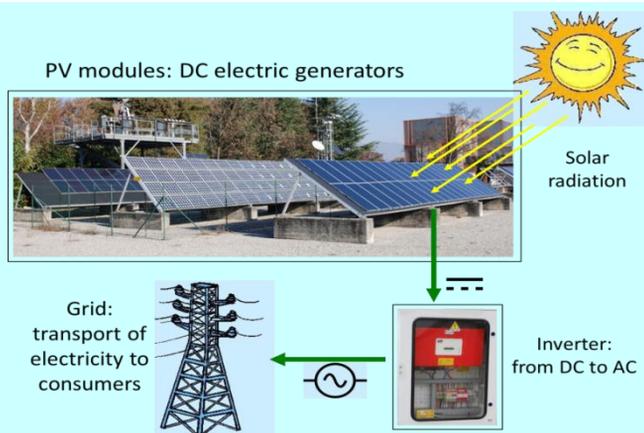
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### PV Electricity Generation

The photovoltaic effect converts sunlight into direct current electricity. Modules are the basic commercial product that combine a series "cells" of active material in a sealed package. Individual modules are connected together in strings and then to an inverter, which outputs alternating current at a standard voltage and frequency. The electricity can be consumed directly or feed into the grid.



## Energy Rating

PV installations are typically ranked in terms of peak power (kWp). However, the electrical energy yield is often more useful to investors since the return on investment is directly linked to the kWh produced.

ESTI's energy rating model uses a "performance surface" to represent the conversion efficiency of different PV technologies, with the module temperature and incident irradiance as independent variables. This model is implemented in the on-line PVGIS tool:

<http://re.jrc.ec.europa.eu/pvgis/>

## Lifetime and Ageing Studies

Module lifetime is critical to the cost of solar electricity. Long-term outdoor exposure of PV modules provides valuable information on the degradation processes that determine their useful economic life.

Currently, the outdoor test field includes:

- Crystalline silicon PV modules dating from the 1980s, with over 25 years operation. These have already helped demonstrate that the useful lifetime of such modules is not limited to 20 years as commonly assumed.
- Thin film and high-efficiency silicon modules installed more recently.

## Large-Scale Façade

The large amorphous silicon façade was installed on the ELSA building in 1994. At the time it was the largest of its kind in the world, with a nominal power of 21kWp. The JRC is incorporating PV into new buildings and parking areas on the Ispra site, aiming for a total installed capacity of 10 MW by 2020.

## Metrological Data

The ESTI meteo tower measures and records the following parameters:

- solar irradiation on the horizontal, vertical 45° and 60° planes;
- diffuse solar irradiation;
- temperature, relative humidity and atmospheric pressure;
- wind speed and direction, rain fall.

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///schematic of the modules currently installed///

