

Free software to predict the energy production of photovoltaic systems

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Photovoltaic system connected to the network and installed on the roof of IES-UPM./ Credit: IES-UPM

Researchers at UPM make available for the general public programmes to simulate the functioning and predict the energy production of photovoltaic systems.

A team of researchers of the Solar Energy Institute (IES) at the

Universidad Politécnica de Madrid (UPM) has developed a [model](#) that predicts the [energy production](#) of [photovoltaic systems](#) starting from minimum meteorological information. This model has been integrated in a simulation programme of photovoltaic systems and has proven useful for research and educational purposes and for professionals. Recently, the researchers have made this model available to the general public with a version for the internet called SÍSIFO, which simulates systems connected to the network.

Today, the most important application of photovoltaics is the production of [energy](#) through photovoltaic systems connected to an electric network, whose power can vary from a few kilowatts—for small systems installed in houses or buildings—to hundreds of megawatts of large photovoltaic plants.

The prediction of the energy produced by the systems is made at the beginning of the projects in order to optimize design, maximize production and assess economic viability. For these purposes, the photovoltaic engineers use simulation programmes that require time series of solar radiation and [ambient temperature](#) from various sources as input data (for example state meteorological agencies or satellite databases). However, these time series are not always available for the site of a project and it is needed to turn to the usage of synthetic series (artificial) that are produced from a reduced set of meteorological data.

The model makes predictions with only two out of 12 monthly values for solar radiation: the Linke turbidity (a parameter that indicates how transparent the atmosphere is) and the ambient temperature. The model has been compared with time series from over 200 weather stations and the differences found are less than 2 percent.

This model includes the simulation programme of IESPRO photovoltaic systems developed by the Photovoltaic Systems Group of IES-UPM for

the last 10 years. This programme, written in MatLab programming language, is used not only for research purposes but also for professionals usage and education.

IESPRO simulates using data series from any time resolution (between seconds and hours) and any length. Thus the programme can be used to predict the instantaneous power generated by the photovoltaic system in real time or its energy performance in the medium and long term.

So far SISIFO only simulates systems connected to the network, but the researchers say, "In the future, users will be able to simulate other [photovoltaic applications](#) that are now available on IESPRO, such as water pumping systems, photovoltaic-diesel hybrid systems, ventilation and air conditioning systems, or autonomous systems for the electrical supply in isolated places of the network."

Provided by Universidad Politécnica de Madrid

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