



1 Satellite data enable a real-time, high-resolution mapping of solar irradiance and PV electricity generation.

Photo satellite © Meteosat Second Generation (EUMETSAT).

2 The inhouse-developed monitoring station with pyranometer and south-oriented silicon reference cell sends measured values every minute.

3 Sky camera images with cloud motion vectors provide the basis for shortest-term forecasting.

## PV POWER FORECASTING FOR A STABLE POWER GRID

The generation of PV electricity depends on the sun's position and the weather. In energy meteorology, Fraunhofer ISE develops algorithms to predict PV power for forecast horizons from a few minutes to several days. In order to support a reliable and cost-effective power supply, PV power prediction is becoming increasingly important for

- solar energy trading,
- management of grid stability,
- reduction of grid integration cost for PV power.

### Present PV Performance and Prediction

A reliable prediction starts with the assessment of the current PV power generation. To access irradiance data in real-time, Fraunhofer ISE has developed a ground measurement station, sending data every minute. This helps plant operators to monitor the performance of PV power plants and serves grid operators to maintain grid stability. Forecasts up to 30 minutes ahead, which resolve fluctuations on a minute scale, are derived from sky images

by analyzing clouds and cloud motion. For horizons of several hours ahead, forecasts based on the analysis of clouds in satellite images are most appropriate.

### Smart Power Balancing in Electrical Grids

To support grid operators in providing a stable and efficient energy grid, Fraunhofer ISE develops algorithms to merge ground measurement data, satellite derived forecasts, and numerical weather predictions. By weighting in dependence of the forecast horizon, we create optimized forecasts from 15 minutes to several days ahead.

### Our Services

- real-time monitoring of PV clusters
- forecasting with sky-imagers (up to 30 minutes ahead)
- forecasting based on meteorological satellite data (4 hours ahead)
- probabilistic forecasting from a few minutes to several days ahead

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