

## YIELD MONITORING

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[www.solar-monitoring.de](http://www.solar-monitoring.de)

1 *This system on the roof of a distribution centre has now fully achieved its yield potential.*

2 *The actual operating performance of an inverter can deviate from its data sheet specs.*

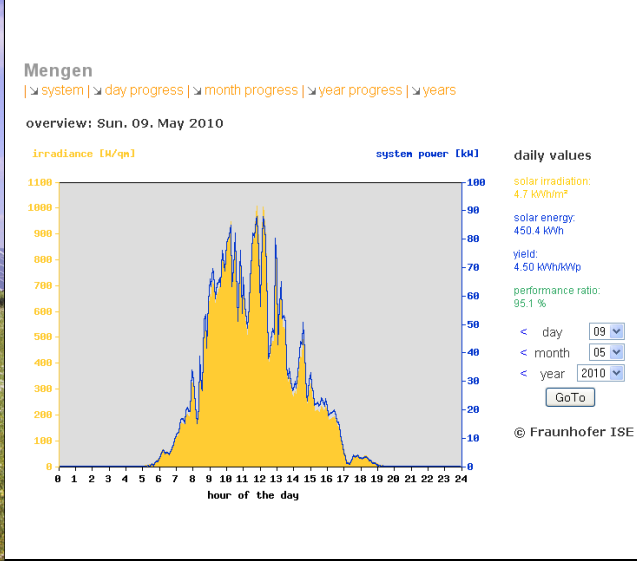
**Component manufacturers and system planners profit from our know-how in joint research projects when we improve and validate their products. Our independence is a guarantee to third parties for reliable references. As an important actor at the forefront of PV development, Fraunhofer ISE combines the current state of the art with practically orientated services.**

Professional yield monitoring, together with good system design and the use of high-quality components, is decisive for optimal operation and thus for the yields of a PV system. With monitoring by Fraunhofer ISE, our clients receive expert-based quality assurance and yield control. Our scientific monitoring system is not only more accurate than systems based on inverter controls, but is also independent of individual PV manufacturers and system components.

With a measurement accuracy of 0.2 to 0.5 % for total yields, our clients obtain high-quality information on the system efficiency. The greatest accuracy in determining the performance ratio is achieved by using special irradiation sensors which are calibrated at regular intervals.

#### Key Advantages:

- high-quality, system-specific monitoring solutions
- high-quality measurement technology to record the operation of the components and their performance
- opportunity to compare the performance of your systems with the results of more than 200 other systems monitored by Fraunhofer ISE
- many years of experience in national and international PV projects
- independent expertise which is valued by many banks and investors



1 This ground-mounted system is performing according to expectations.

2 Essential information at a glance – every day.

3 Special measurement technology enables Fraunhofer ISE to obtain reliable results, e.g. for system comparison.

## Our Monitoring Package

### Measurement Technology

The hardware for our site-specific measurement technology comprises a measurement cabinet designed by our experts, an uninterruptible power supply (UPS), accurate energy meters and high-quality sensors. In addition, our clients receive comprehensive documentation with installation guidelines. Our specialists carry out the subsequent commissioning and calibration of the measurement system.

### Service Package

Our service package, which starts with the commissioning, includes the following points over the entire period of the contract:

- operation and maintenance of measurement systems, data transfer systems, analysis and evaluation software, and web visualization
- daily data transfer and back-up storage of data
- daily data validation
- daily updated web presentation of performance ratio and yields
- prompt notification of system problems
- continuous improvement of the analytical algorithms

### Daily Analyses

All measurement data are transferred daily to Fraunhofer ISE, checked by our highly developed system and analyzed. This ensures that errors are detected early. Our experts identify their possible causes and notify the system operator. Our clients receive qualified and manufacturer-independent error messages if relevant effects occur. Our comprehensive analyses allow characterization of the operating performance of not only the whole system but also the components. Thus, deviations from optimal operation can be recognized.

### Web Portal

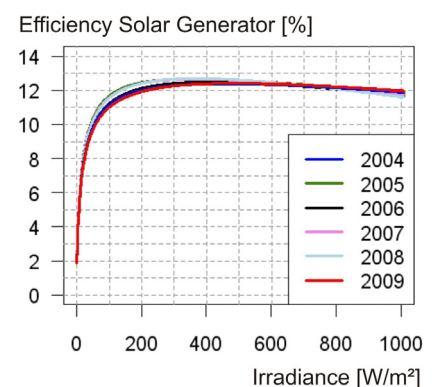
Fraunhofer ISE determines the solar irradiation, the yield and the performance ratio for every system. The data, which are updated daily, are presented on the Internet in the form of daily and monthly analyses. Examples of public web sites include:

[www.solar-frontier.solar-monitoring.de](http://www.solar-frontier.solar-monitoring.de)  
[www.ecovision-gmbh.solar-monitoring.de](http://www.ecovision-gmbh.solar-monitoring.de)

### Analyses and Reports

With our performance controlling, we test whether the predicted system yield or the system performance ratio that was specified by the system supplier is achieved. In addition, we determine whether a change in the system performance can be detected during the initial years of operation. The annual reports include detailed graphical analyses of the operating ranges and efficiency values of the system components, an assessment of the results, and a comparison of the performance ratios.

### ISE Monitoring – PV expertise in the field



More than 6 years of stable generator efficiency for a PV system in Freiburg.