



Power-Check 2011

PV systems with components from
Solar-Fabrik

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1 Preface

As a part of their quality control measures, Solar-Fabrik carries out „Power-Check“. Owners of photovoltaic systems with modules from Solar-Fabrik were asked to provide the energy production of their systems in the years 2005 to 2010. Invoices concerning the calculation of energy production were requested from the local electricity supplier in order to establish a sound data base. Fraunhofer ISE was contracted for the evaluation of this data. The following analysis is based on 220 PV systems which were built between 1999 and 2010.

To evaluate the quality of a PV system the Performance Ratio (PR) is used. The Performance Ratio is the ratio of the energy which has been produced compared to the energy which would have been produced by the solar modules at 25°C in an optimal system free of losses. To calculate the Performance Ratio the locations of the systems were divided into five areas. The irradiation data of a reference location provided by the Deutscher Wetterdienst (DWD) was used for each area.

2 Results

System yield

The average yield of the observed PV systems amounts to almost 1000 kWh per kWp. In the table below the annual mean values are listed. The very high yields are caused by the high irradiation levels in recent years and also by improved system performance.

year	systems	average yield [kWh/kWp]	Average Performance Ratio [%]
2005	48	986	74,9
2006	58	999	74,5
2007	124	1020	75,7
2008	149	1013	77,4
2009	106	1007	75,7
2010	152	933	75,3

The bar graph in Figure 1 shows an accumulation of yield values from 900 up to 1050 kWh/kWp. Two thirds of the systems reached more than 900 kWh/kWp. The best systems surpassed the 1100 kWh/kWp mark in all six years.

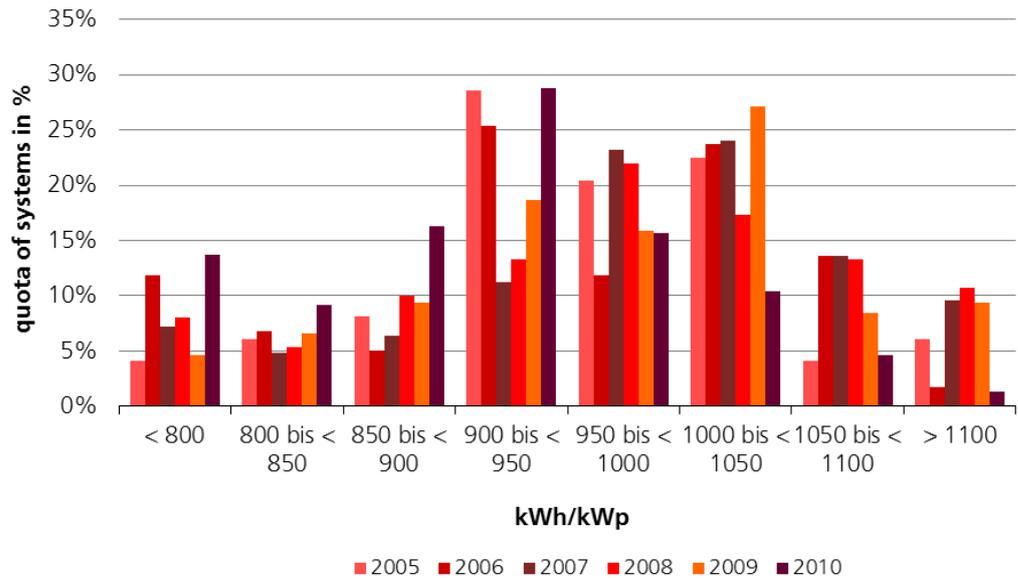


Figure 1: yield distribution of all systems for the years 2005 to 2010

Performance Ratio

The average Performance Ratio of the investigated PV systems was around 76%. The distribution in Figure 2 shows the Performance Ratio of all six years. Because of the newer systems in the examined years, the distribution of the data from more recent years shifts to higher Performance Ratio values. Only a few systems registered values lower than 70 %. The best systems recorded values which exceed 85 %, thus making them comparable to large solar power stations for investors.

Figure 3 compares the PV systems from Power-Check to PV systems being monitored by Fraunhofer ISE. The PV systems with components from the Solar-Fabrik are well represented in the entire range of systems.

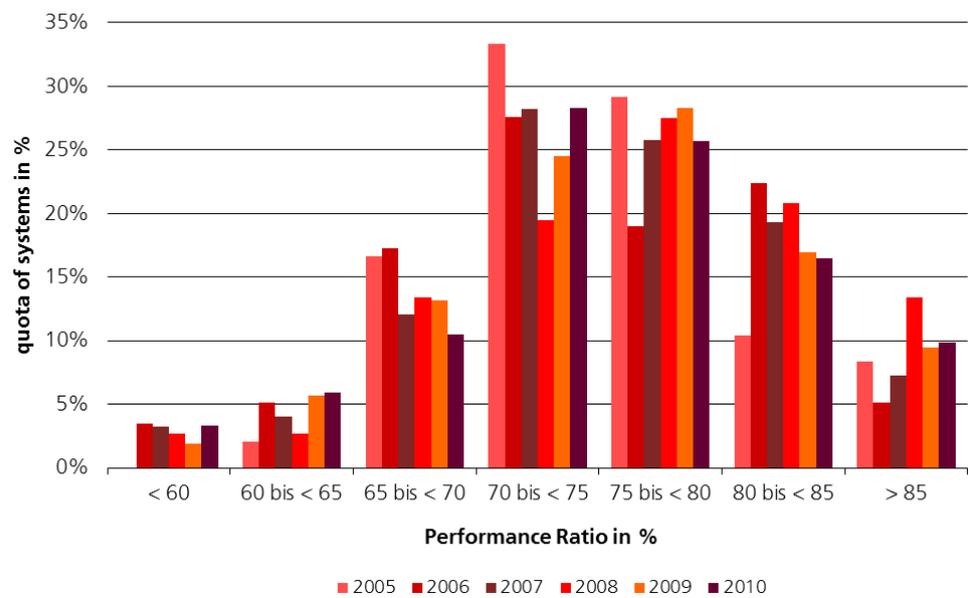


Figure 2: Distribution of the Performance Ratio for the years 2005-2008

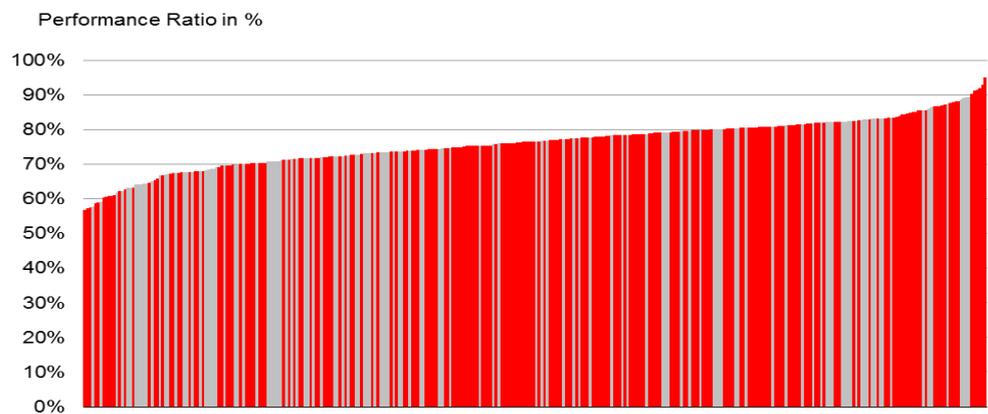


Figure 3: 183 PV-systems in South-Germany from Fraunhofer ISE Monitoring (grey) compared to the PV-systems from Power-Check (red) .

3 Assessment

The Power-Check 2011 again shows that PV systems with components from the Solar-Fabrik are state of the art and achieve very good results. Such results are only possible with modules and inverters of high quality. Also, an appropriate system design and a professional installation is required for virtually error-free operation. This research for the Solar-Fabrik is undertaken for quality control purposes and for giving feedback from practical experience.

4 Glossary

Yield:

The electrical energy, measured in kilo watt hours (kWh), which is fed into the grid, is measured by gauged counters from the local electric supplier. If the yearly production is divided by the nominal power (maximum power of the generator in kWp) of the system, the result is the yield in kWh/kWp. This value strongly depends on precise power labelling of the modules by the manufacturer.

Performance Ratio (PR):

$PR = \text{yearly energy production} / (\text{yearly irradiation on the module surface} \cdot \text{efficiency of the module under „Standard Test Conditions“})$. The Performance Ratio is a degree of system quality largely independent of the system location. Only very good systems reach values higher than 80%.