

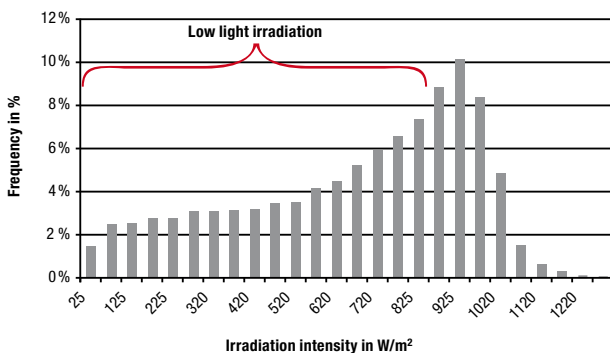


# Strong in low light – Conergy PowerPlus with added performance

- | **Photovoltaic systems operate for roughly two-thirds of the time under low light conditions**
- | **Conergy PowerPlus minimises power loss due to outstanding low light behaviour**
- | **Contrary to forecasts in standard simulation programs, increased yield of up to 3% in practise**
- | **Systems installed in locations with low, high and extremely high levels of irradiation benefit equally**

## The meaning of low light

Blue sky and sunshine, vertical incidence of light on the module and cool temperatures – these are ideal conditions for photovoltaic systems in which their full potential can be realised. During the course of the day and throughout the year the intensity of light naturally fluctuates, e.g. in the twilight, in hazy, cloudy conditions or in the shade and with a non-vertical angle of incidence. Around two-thirds of annual irradiation is low light – even in a sunny location such as Freiburg im Breisgau in Germany. The expression "low light" is used to describe an intensity of irradiation that is significantly less than 1000 W/m<sup>2</sup>. The range of performance a module can achieve under these conditions is referred to collectively as its low light performance.



Annual average distribution of irradiation intensity and proportion of low light based on the example of Freiburg im Breisgau (Southern Germany).

## The rated capacity of a solar module with different levels of irradiation is determined as follows

The nominal output of a solar module is defined according to an industrial standard by means of a standard output measurement with 1000 W/m<sup>2</sup> irradiation and a module temperature of 25° C. The values obtained from measuring the output at irradiation levels of 200 W/m<sup>2</sup> and 800 W/m<sup>2</sup> are also used.

## Influence of low light on the production of solar power

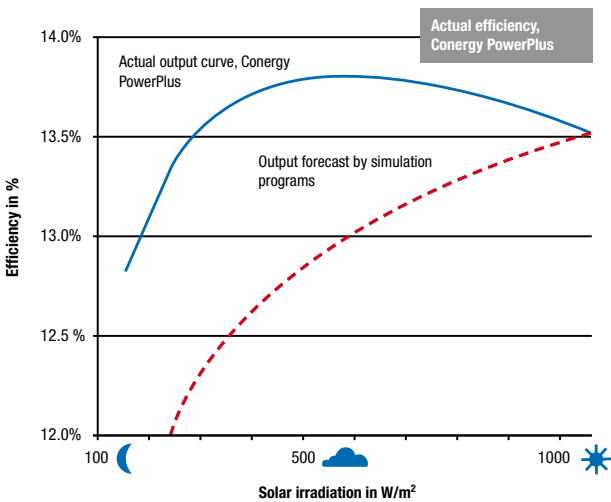
A photovoltaic system also produces electricity even when ideal conditions do not prevail – so long as light continues to fall on it. The power yield of a photovoltaic system falls as light conditions get poorer. The extent of the actual power loss that accompanies the falling incidence of light ultimately depends on the solar module used.

Conergy PowerPlus solar modules are also a convincing proposition with an above average efficiency in the low light range. This means that they are particularly efficient when it comes to converting the energy obtained from low light into electrical power. This provides the system operator with a higher yield and therefore a higher rate of return.



**How the capability of a solar system to utilise leak light irradiation and its performance are taken into account in standard simulation programs when calculating the yield forecasts**

Professional advice and planning of a photovoltaic system also includes a yield forecast and economic viability calculations. In addition to the performance data of the system, it also takes into account the regional irradiation data and the service life of the system, as well as the costs for the system, installation and financing. This means that the likely rate of return for the investor and system operator can be calculated. The standard simulation programs used to plan systems only use standard measured values as the basis for crystalline modules and perform their analysis based on the assumption that the power loss of the system in low light has a linear characteristic. This is normally used as the basis for compiling an economic viability calculation.



Outstanding module efficiency with varying solar irradiation – Conergy PowerPlus 220.

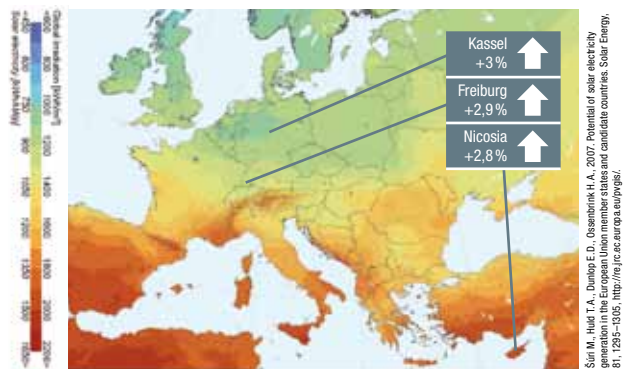
**Low light characteristics under scrutiny – Conergy PowerPlus increases efficiency**

Measurements carried out by TÜV Rheinland (technical inspection authority in Germany) have recently shown that the already high efficiency and therefore the yield of Conergy PowerPlus solar modules increases significantly under standard conditions in what is referred to as the low light range. A significantly lower power loss therefore occurs in Conergy modules in practise in the low light range than forecast by standard simulation programs. This is one of the reasons why solar energy systems containing Conergy PowerPlus modules achieve significantly higher yields.

**Forecast versus practise – 3% increased yield with Conergy PowerPlus**

The outstanding low light performance of Conergy PowerPlus modules ensures an average annual yield that is 3% more than the yield forecast by standard calculation programs\*. This applies for all locations irrespective of whether the incidence of sunlight is low, high or very high. More yield = improved return = faster ROI of system.

\*Your Conergy sales contact partner will be pleased to inform you which simulation programs already work with the data currently used by Conergy PowerPlus.



Systems installed in locations with low, high and extremely high irradiation can benefit more or less equally with Conergy PowerPlus.

**Consistently high quality “made by Conergy”**

Wafers, cells and modules are produced in a fully-automated manufacturing process under one roof at the Conergy module production facility in Frankfurt (Oder). This means that the cell characteristics can be adapted in order to achieve the best possible module characteristics. Moreover, the cells are carefully tested then selected on the basis of specific performance values and processed to maximise the performance characteristics of any given module. Modules in the Conergy PowerPlus series owe their outstanding low light characteristics to the high quality of materials used and also the manufacturing process.

**Even more benefits with the Conergy solar system**

The inverter must also be able to adapt to a range of conditions in order to obtain the best possible yield. Conergy type IPG inverters adapt their optimum operating point to the incoming current automatically within seconds and can therefore react in split seconds to changing conditions such as passing clouds or changing weather conditions and daylight patterns. The performance characteristics of Conergy PowerPlus solar modules and Conergy IPG inverters are harmonised and both achieve optimum efficiency in the same working range. When combined in the same system, they are an ideal way in which to achieve high yields, and therefore also a higher than average return, under different light conditions.