CASE STUDY

The Way to Energy Gain

Aidlingen, GERMANY

OVERVIEW

Highlighted Features:
Chimney shading

Installer: SL Solarlösungen GmbH

Installation Date: December 2010

Location: Aidlingen, Germany

Installed capacity: 6.75 KWp

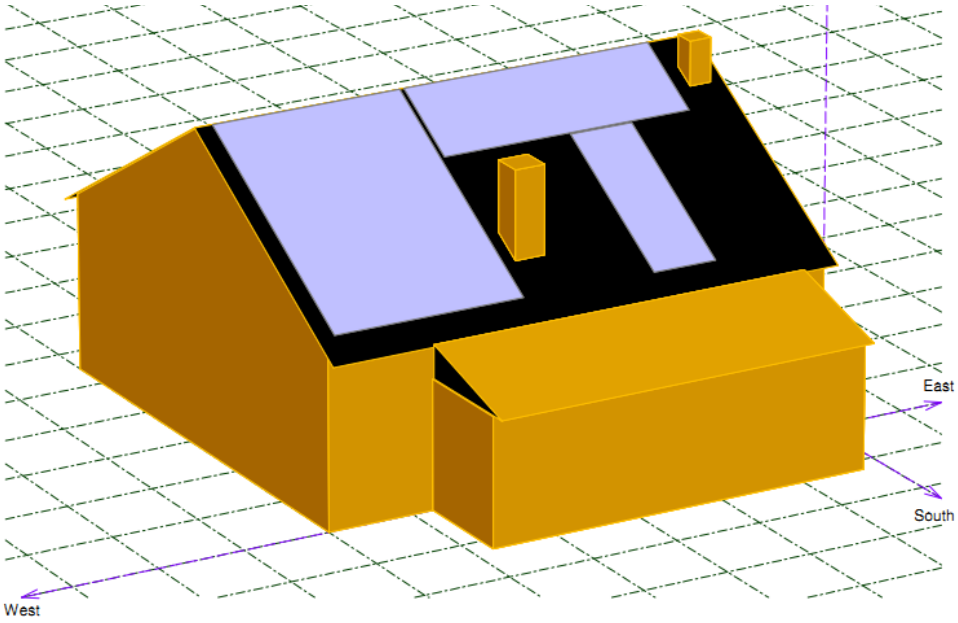
Average Irradiance:
1,180 kWh/m^2/year

Modules: Solaria S6P 225

String Layout: 2 inverters, 1 string per inverter with 15 modules

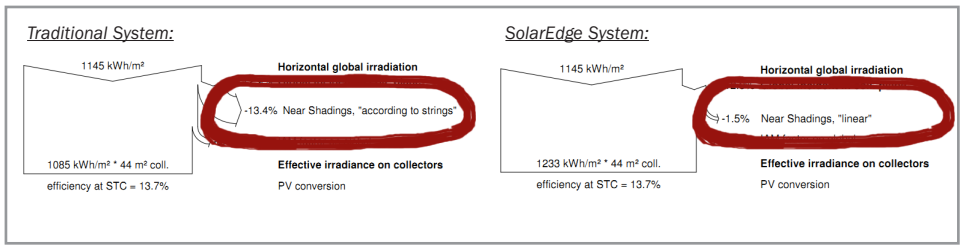
The photo shows how the SolarEdge system allowed Mr. Schneider to install modules close to the chimney without risking disproportional energy losses.

How much energy really gets lost from partial shading?
Installer Bernhard Schneider was called to install a PV system on the roof of a family home in Aidlingen. Besides a small chimney in the middle, the roof was generally suitable for a 6.75kW installation. *"The chimney was a major reason why I recommended that Mr. and Mrs. Gerstner use SolarEdge power optimizers. The chimney could cast a shadow on some of the modules. A small shadow is enough to cause energy losses which are much greater than the actual shaded area would imply"*, says Mr. Schneider.

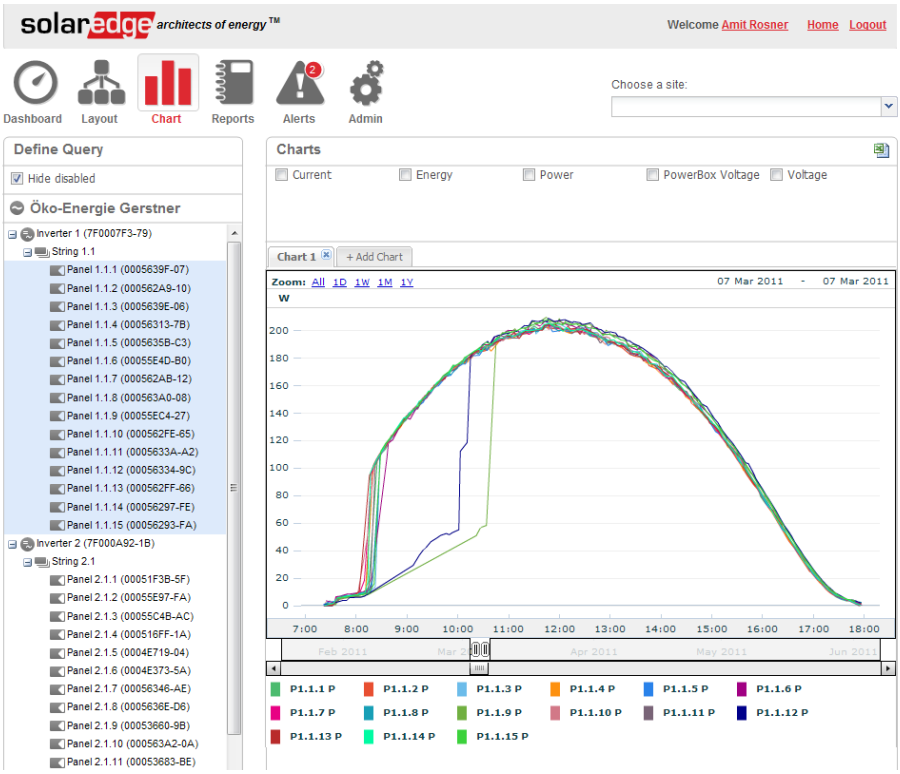


The picture shows the PVsyst model of the house with 6.75kWp and 30 x 225W modules and the chimney in the middle.

It is a well-known fact that modules interfere negatively with each other in a serial connection; while the modules' peak operating points are diverse, traditional inverters use a 'one-size-fits-all' approach to harvest their energy. Partial shading, or uneven exposure to sunlight, diversifies the modules even further as some can produce more than others now. All modules obviously produce less energy

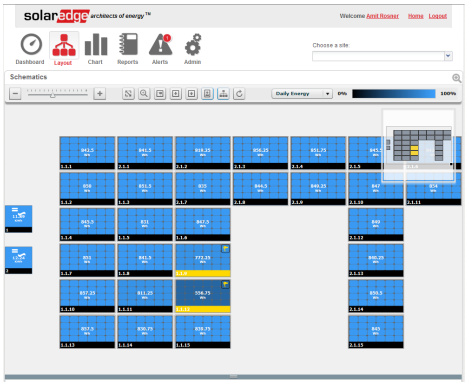


The result summary of the PVsyst simulation shows the improved ability of the SolarEdge system to mitigate losses caused by partial shading (only 1.5% loss) compared to 13.4% loss by the traditional system.



This screenshot from the SolarEdge monitoring portal shows the performance of each module in a chart. The chart proves that modules 9 and 12 are shaded in the morning between 8-10 o'clock.

when they are shaded, but in a serial connection shaded modules bring down the output of all other modules connected to them in a string. Hence, the question is: how great is the energy loss really?



This screenshot from the monitoring portal of the installation shows two modules in an alerted state as they are being partially shaded by the chimney.

In order to examine the impact of partially shaded modules on the overall energy production, we use this 6.75kW installation as an example. The SolarEdge monitoring portal, which offers insight into each module's performance, reveals the following: module 9 and module 12 in string 1 (marked in the server as 1.1.9 and 1.1.12, respectively) are shaded in the morning hours between 8:00 - 10:00.

In order to quantify the impact of shaded modules 9 and 12 on the energy production of the system, we employed PVsyst (a simulation software developed for installers by the University of Geneva) to create a model of our 6.75kW installation. We then simulated its energy output, once using a traditional 'one size-fits-all'-inverter and once using SolarEdge power optimizers with individual maximum power point trackers for each module.

With maximum power point tracking per module, the shading losses calculated by PVsyst are proportional to the shaded area and constitute 1.5% of the potential output. The overall system perfomance ratio is 80.7%. The traditional inverter however, loses 13.4% of the potential output because of the two shaded modules. The overall system perfomance ratio is 71.8%. The power optimizers managed to harvest 12.4% more energy in the first year of operation alone. This percentage is likely to grow over the 20 year typical lifetime of an installation as the disparity between the modules grows with their exposure to changing weather conditions.

Quick fact:
Aidlingen is situated in the state Baden-Württemberg. The town is famous for its surrounding nature and for being the home of Germany's first female fighter jet pilot, Ulrike Flender.

Summary: This case shows that a small chimney which casts a shadow on two modules in the morning, combined with normal module mismatch, unnecessarily causes the home owners to lose 13.4% of their potential energy while the real loss caused by the shaded area is merely 1.5%. The truth is that few installations in residential neighborhoods are completely free from shading elements. Therefore, next time when planning a PV installation, keep this study in mind.

"We are very happy with Mr. Schneider's recommendation to use power optimizers. Our chimney proved no obstacle for the SolarEdge system and the results simply speak for themselves."

Mr. and Mrs Gerstner
System Owners