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 6.75 kW 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.

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

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.
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 performance ratio is 80.7%. The traditional inverter however, loses 13.4% of the potential output because of the two shaded modules. The overall system performance 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.

**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