

# SolarSets Case Study

## LEAN SOLAR GMBH

### Residential Rooftop Ennepetal



Ennepetal, Germany



Three Solar Frontier SolarSets being installed on the roof of a semi-detached house in Ennepetal. (Image: lean solar GmbH)

#### Site Overview

Location	Ennepetal, Germany
Coordinates	51.3° N, 7.36° E
Average global irradiance	987 kWh/m <sup>2</sup>
Average temperature	10.4 °C, 50.7 °F
Average precipitation	860 mm/yr, 33.9 in/yr

#### Technical Overview

Date onstream	July 2013
SolarSet	2 x SolarSet 6.9, 1 x SolarSet 3.0
System capacity	16.8 kWp
Panel type	SF165-S (165 W)
Number of installed panels	102
Tilt angle, orientation	20°, -85° E/ 95° W
Expected output	14,600 kWh/yr
CO <sub>2</sub> reduction	12,000 kg/yr, 26,456 lbs/yr
Inverter	5 x SF-WR-3000

#### Financing Bank

Private Investment

*"I have been a big fan of Solar Frontier modules for many years as they have the best performance in my opinion. Thanks to the new SolarSets from Solar Frontier I save at least 90 minutes in the planning per installation because I no longer need to do the layout of the inverters and cabling by myself. In addition I save considerable time in the purchase and installation phases. I am really impressed by the perfectly matched components."*

Hartmut Bauer,  
Managing Director lean solar GmbH

lean solar GmbH is a system provider in solar and renewable energy concepts. They offer custom-made energy consulting and individual solutions for environmental energy generation and cost reduction. As a "one-stop" provider they can pass significant benefits and costs transparently to their customers. From planning to commissioning, lean solar GmbH remains the sole contact for customers.

On both sides of a roof of a semi-detached house in Ennepetal, North Rhine-Westphalia, three Solar Frontier SolarSets in total were installed. The east-facing roof provides space for two 6.9 kWp SolarSet of 42 modules each and on the small west-facing roofside a 3 kWp SolarSet of 18 modules. The plant of 16.8 kWp total capacity is expected to produce 14,600 kWh of electricity annually and thus offset about 12,000 kg of CO<sub>2</sub> emissions per year.

Thanks to the precisely matched components of the SolarSets, consisting of inverters, modules, connecting cables, DC-Cables, plugs and sockets – the installation of SolarSets was very easy. Each SolarSet can be installed in many different ways including in places where nearby objects partially shadow the panels. The challenge of this roof was in the east-west orientation. Thanks to good low-light behavior, the CIS thin-film modules also work in the early morning and the late evening hours, leading to a higher output generation compared to other modules.

#### About Solar Frontier

Solar Frontier is committed to creating the world's most ecological, economical solar energy solutions. Our proprietary CIS technology (denoting key ingredients copper, indium, and selenium) has the best overall potential to set the world's most enduring standard for solar energy. For more information visit [www.solar-frontier.com](http://www.solar-frontier.com) and [www.solar-frontier.eu](http://www.solar-frontier.eu)