CASE STUDY

SevernWye
ENERGY AGENCY

SWEA Solar Photovoltaics

Use the photons, Luke!

Key Points

- Sanyo hybrid panels use monocrystalline and amorphous silicon layers for the highest performance
- Dual arrays facing SE and SW, to capture the sun's energy throughout the day from dawn to dusk
- Integrated weather station to correlate output against temperature, solar radiation, and wind speed
- Yield of over 950 kWh/kWp achieved in the first full year

Background

When SWEA moved to its new leased premises in early 2009, there was a strong desire for the company to install its own renewable energy system on or near the building. A quick assessment showed wind and solar PV to be the most relevant technologies. The former was ruled out due to potential planning and land ownership complications. Local installers were engaged to design the most appropriate type of solar PV system for the building.

The completed system on a sunny spring day

The System

The front of SWEA's building has a variety of roofs facing south-east and south-west, all within 45° of due south, which is generally deemed the viable range. A split system, comprising equal-sized frame-mounted PV arrays on both of the upper roofs, was predicted to give excellent all-round performance. This is maximised by the choice of Sanyo HIT panels, which comprise monocrystalline cells sandwiched between amorphous silicon layers. The hybrid system improves solar capture under low-light conditions, and also raises output at higher ambient temperatures, where, ironically, PV performance is normally impaired.

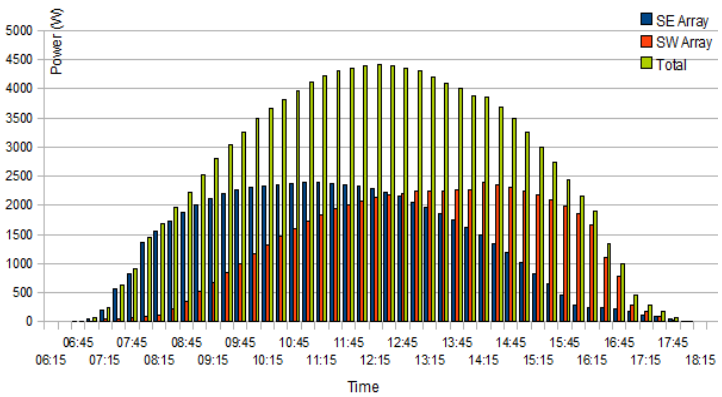
Kierson Wise and Alastair Stevens, two of SWEA's renewables experts, inspect the new PV panels close-up

Because the dual arrays will have different output profiles through each solar day, they each feed separate Fronius IG30 inverters, although both are connected to the same supply phase. The inverters convert DC electricity to grid-synchronised AC electricity, and use maximum power point (MPP) trackers to continually optimise the DC voltage of the arrays for best efficiency.

Output

Each array comprises 14 panels, and is rated at 2.94 kW peak output, giving a total system capacity of around 5.9 kWp. The system managed to generate a total of 5,587 kWh of carbon-free electricity in its first year, resulting in an impressive specific annual yield of 950 kWh/kWp.

Over 70% of total PV generation occurs during the six months from April—September inclusive. The green power is fed directly into the building's electrical distribution unit,



Generation profile on a cloudless day: the effect of array orientation can clearly be seen by the different output peaks

This small sensor, located next to one of the PV panels, records solar radiation intensity in W/m²

and for much of the time, will be directly offsetting the power consumption of SWEA's office lighting and computers—meeting around 20% of our annual consumption. At times such as summer weekends, clean electricity will be spilled to the local grid. Around 25% of the PV system's output is reckoned to be exported in this way.

The PV system also benefits from a roof-mounted weather station, which records sunlight hours, solar radiation intensity, ambient temperature, panel temperature and wind speed. All of this information is fed into a datalogger, along with inverter output data, and can be analysed to assess the impact of different weather conditions on performance.

The dual inverters, switchgear and generation meter

Funding & Agreements

The cost of the fully-installed system was around £38k, and was funded predominantly by grants from the government's Low Carbon Buildings Programme (no longer available) and the ScottishPower Green Energy Trust. PV prices per kWp have already fallen by over 50% since this installation was originally conceived and specified.

This project encountered few barriers. Planning permission was required, but gaining this was straightforward. SWEA leases its premises, so we needed to secure permission from our landlord for the required building modifications. These included minor roof strengthening (completed within a single day—many buildings will not require this), tile removal and the addition of wiring conduits. A clause in our lease allows the landlord to request removal of the panels should SWEA vacate the premises.

Note that for new renewable microgenerators, feed-in tariff (FIT) revenue can be assigned to either the landlord or the tenant, in both domestic and business situations, so this can be negotiated individually. Meanwhile, solar PV costs continue to fall, and even at UK latitudes, PV plays an important role as a distributed energy technology for retro-fitting in dense urban areas.

The unistrut frame systems that support the PV arrays only required the removal of a few roof tiles, and were installed in just two working days

SWEA would like to thank ScottishPower for making this installation possible, through their Green Energy Trust.

Further Information

Microgeneration Certification Scheme
Find approved PV products and installers
www.microgenerationcertification.org

ScottishPower Green Energy Trust
www.scottishpowergreentrust.co.uk

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