Trawsnewid Calon Teifi

SOLAR ELECTRICITY

What is a Solar Photovoltaic (PV) System?

Solar photovoltaic (PV) systems tap into the same abundant and free energy resource as solar thermal technology. PV cells consist of semiconductor materials that convert sunlight into electrical energy through the photovoltaic process,

The panels produce direct current (DC) which is converted to alternating current (AC) by an inverter so it can be used by appliances in the home. These systems can either be connected to a battery or to the national electricity grid **(earning 41.3p for every unit of electricity you produce for 25 years index linked to RPI +3p extra for each unit exported to the grid)**

Despite having a tendency to cost more than other renewable energy technologies, PV offsets the most expensive energy bought and used in the home - electricity

Types of PV Technology

Monocrystalline: made from thin slices cut from a single crystal of silicon. This has a typical efficiency of 15 per cent. This is one usually used for domestic installations.

Polycrystalline: made from thin slices cut from a block of silicon crystals. This has a typical efficiency of around 12 per cent.

Thin Film: made from a very thin layer of semiconductor atoms deposited on a glass or metal base. This has a typical efficiency of 7 per cent. Commonly used for roof tiles instead of crystalline silicon.

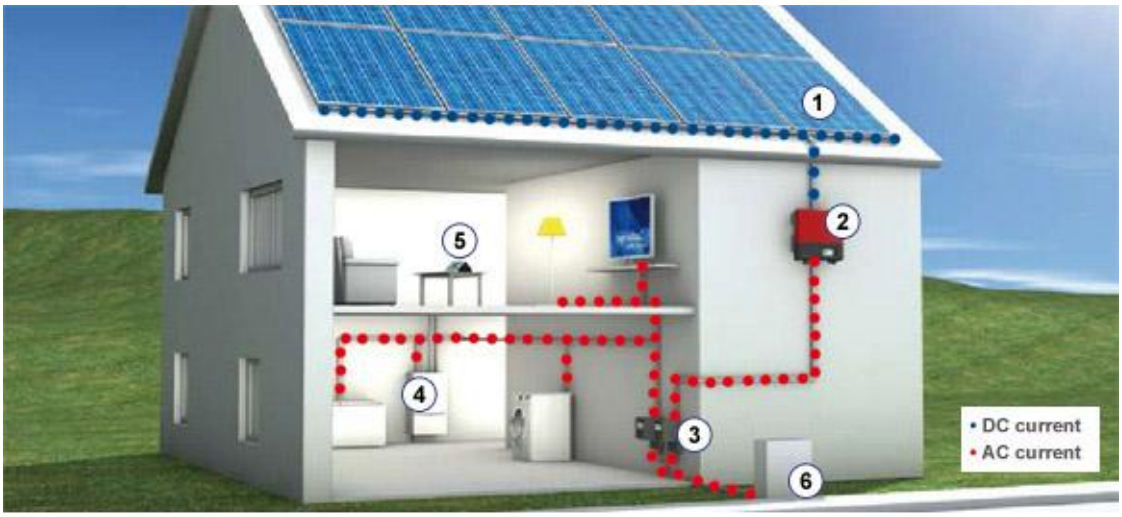
How does a Solar PV System Work?

PV cells convert incident sunlight into electricity; light falling onto a PV cell imparts energy to electrons, freeing them from their ground, or normal state, and leaving them free to move to electrical contacts creating an electrical current. (each cell provides in the region of 0.55Volts and 4.7Amps (=2.59 Watts)). When many cells are connected together to form modules (panels), more practical DC electricity energy can be produced.

PV can be installed into the home in a variety of ways. All that is needed is a site with little or no shading for most of the year and good access to south-eastern to south-western skies. Other options include the use of PV integrated roof tiles. These are designed to appear more like a conventional roof, although the physics of operation is the same.

What components comprise a Solar PV System?

Stand Alone Systems	**Grid connected systems**
1.PV array (modules, slates, tiles, shingles)	1.PV array
2.Power conditioning equipment (converter/inverter, battery charge controller)	2.Inverter (ensuring the AC output of the system is matched to that of the grid.)
3.Battery Bank	3. Feed in meter and Safety switches
4.Load	4.Load (including grid)



Components: 1. PV module, 2. PV inverter, 3. Feed-in meter, 4. Loads, 5. Energy Meter 6. Grid connection

How much energy can I expect a Solar PV System to produce?

This depends strongly on the technology of cells used, array area, location and orientation in addition to whether or not direct shading occurs. A well designed system in a suitable location should produce between 700 and 850 kWh of electricity per year per kWp of installed capacity. A PV system of 1.5 - 2.5 kWp could generate between a third and fifty percent of the electricity requirements of a two or three bedroom household.It should be noted that shading of even a small area of the array may have a disproportionate impact on the performance of the system. Modules containing bypass diodes reduce this effect.

What are the benefits of PV?

- Low maintenance, no moving parts to service so operation is also silent
- If replacing a roof, PV integrated roof tiles/slates form an alternative (but more expensive) to standard tiles
- Reduces the losses with importing electricity to the house; (the most expensive and polluting fossil fuel energy)
- Almost any size or shape of roof can be accommodated by the array allowing creativity in appearance.
- Long operational life-time; well in excess of 20 years.
- PV can be positioned on the roof of a building or near the building on a suitable mounting, e.g. an A-frame

Suitability

For best performance any PV array should face between southeast and southwest, and have an angle of tilt of 30-45 degrees to the horizontal for the UK. Shading should be kept to a minimum as even a small amount of shading on a single module can reduce the overall output. Each kWp requires an area of about 8-15 m2 for mono/polycrystalline modules, but this increases for amorphous silicon roof tiles, etc. due to lower efficiency.

Grid connection and exporting excess energy

Before connecting any electricity generating equipment to the local grid, you should seek advice and approval from your Distribution Network Operator (DNO), Your PV installer should be able to help with this. In the event of grid failure (power cut), your PV system will automatically shut down in order to ensure the safety of any engineers working on the power lines. Excess electrical generation can be sold to the national grid; (**Up to a max of 4kWp will earn 41.3p for every unit of electricity produced for 25 years index linked to RPI +3p extra for each unit exported to the grid)**

Maintenance requirements

Having no moving parts, PV is very low maintenance.

Costs

Main **installation cost** of a PV system is the array and the grid-connect inverter(s), which both can vary substantially. The installed and commissioned cost of a grid connected PV system should be in the region of £4,000 - £9,000 per kilowatt peak of installed capacity, with an average of around £6,000 per kWp. **Running cost** is minimal as no maintenance.

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