

Solar electricity

Power your home with free sunlight

The sun provides an abundant source of clean, renewable energy. This can be converted into electricity using solar photovoltaic panels, usually referred to as 'solar PV'.

Electricity generated by a domestic solar PV system can be used to power your home, leading to savings on your electricity bills.

How does it work?

Solar PV systems turn sunlight into electricity through the 'solar cells' they contain. These cells are made from thin layers of a 'semiconductor' material (traditionally silicon) between layers of glass. Electricity leaves the panel as direct current (DC) and passes through an inverter that converts it to 240V alternating current (AC), so that it can be used in your home. This electricity can then power any appliances that are switched on – washing machine, TV and so on – while the surplus (if there is any) is exported to the electricity grid, or stored in a battery if you have one.

Understanding kWp and kWh

Solar PV systems are rated in kilowatts peak (kWp). This is the maximum rate of electricity generation at peak performance (eg. noon on a sunny day with the panel facing directly south). But a 1kWp panel will rarely (if ever) generate 1kW power, most of the time the output will be lower. The kWp of a solar array depends on the size, type and number of panels – but a 3 or 4 kWp array is typical. Electrical energy generated by solar panels is measured in kilowatt hours (kWh) – the same unit that is shown on your household electricity bill.



Solar panels come in three basic types, which differ in efficiency, appearance and cost:

- 1 Monocrystalline:** made from high purity silicon, these are highly efficient and durable but often expensive.
- 2 Polycrystalline:** made from melting and reforming silicon crystals, these have a lower efficiency and cost than monocrystalline panels.
- 3 Thin-film:** usually the cheapest option, but they degrade much quicker and take up more space. These consist of thin films of photovoltaic material on a backing material - amorphous non-crystalline silicon panels are a popular variety.

Solar panels can generate electricity in winter, too ...



The amount of electricity produced annually is determined by the orientation of the system (i.e. which way the panels face), if there is any shading, how sunny the location is and the size of the system in kWp. You can expect to annually generate between 700 and 900 kWh per kWp installed, but output varies a great deal from season to season. The average household uses around 3,000 kWh a year, but only some of this will be replaced with generated electricity unless you're careful to make the most use of it.

Is solar PV for you?

Before you invest in a solar PV system you should check the following:

- Is your roof roughly south facing? Solar panels need maximum exposure to the sun, achieved by facing panels in a direction between south east & south west.
- Will trees or buildings cast shadows over the solar panels? If even a part of a panel is in shade, the amount of electricity generated will be greatly reduced.
- Is your roof structurally sound? It will need to take the extra weight of the solar panels plus the fixing frames.

To maximise usage of your generated electricity, try running high-usage appliances like washing machines and dishwashers during the day (when the sun is shining), although it's best to stagger their use so they're not all running at once. Doing this can save you around £240 a year on your bills, compared to £100 for households who are out all day.

If you are out during the day then delay-start timers for appliances can be helpful.

Your PV system should include a display that shows how much electricity is currently being generated, so you can judge which appliances could be used for free at that time. Buying energy-efficient appliances which use less electricity also helps reduce your overall household energy demand. Solar PV systems can be combined with battery storage, allowing you to store surplus energy generated by the panels and use it when you need it (eg. in the evening). Although domestic battery storage is currently quite expensive, the technology is developing rapidly, and costs are falling. If you have an electric vehicle excess electricity could also be used to charge it.

Costs

The cost of a solar PV system depends on the size of the array, the type of solar cells used and the ease of installation at a particular site. Typical costs are £1,700 per kWp, so a 3.5kWp array (about 25m²) is likely to cost about £6,000. The inverter may need to be replaced after around 10 years at a cost of about £500-1000. PV systems are particularly economic if you are renovating a roof or building a new home (when scaffolding may already be up), and you can even buy roof tiles with PV cells integrated. Households who are home all day could expect installation costs to be paid back in about 25 years.

Most systems require little or no maintenance and the panels should last for decades, although it is worth checking that they are not too dirty every year, as this can reduce performance.

What's next after the Feed-in Tariff?

The government's Feed-in Tariff scheme, which helped subsidise costs (paying households for generating and exporting electricity to the grid) ended in April 2019. Their new Smart Export Guarantee (SEG) should provide similar benefits. Through the SEG any energy company

with more than 150,000 customers is required to provide at least one export tariff by January 2020, and smaller companies can offer this voluntarily.

The design of export tariffs – the price per kWh for electricity exported and length of contract – is being left to energy companies. It is not a subsidy, so no minimum price has been set by the government (although the few tariffs currently available roughly reflect the final quarter tariff rate for FiT which was 5.38p/kWh).

The system is designed to be flexible, with householders being paid a market rate for the electricity they produce, in a similar manner to small-scale commercial renewable generators. Tariffs are likely to become progressively more dynamic, based on demand at different times of the day. This potentially means only households with a smart meter will be eligible for the SEG because all exports will have to be metered, reporting exports on a half-hourly basis. Even without these payments, PV systems are cheaper, more durable and more efficient than ever before and will deliver long-term carbon and financial savings, especially if the price of electricity continues to rise.

Installation

Obtain 2-3 quotes, requesting a technical survey, not a sales visit.

Choose an installer registered with the Microgeneration Certification Scheme, especially as this will likely be a requirement of the Smart Export Guarantee (www.mcscertified.com).

You should also check that your chosen installer has signed up to the Renewable Energy Consumer Code (www.recc.org.uk).

Solar arrays are classed as permitted developments, meaning they don't need planning permission if they stick out 200mm or less from your building and meet other basic requirements. However, it's still worth checking with your local planning department, especially if you live in a listed building, conservation area, area of outstanding natural beauty or a world heritage site.



St James Court,
St James Parade,
Bristol BS1 3LH

0117 934 1400
www.cse.org.uk
info@cse.org.uk

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Founded: 1979

The Centre for Sustainable Energy is a national charity that helps people change the way they think and act on energy.

Our Home Energy Team offers free advice on domestic energy use to people in Bristol, Somerset, Wiltshire, South Gloucestershire and Dorset.



Contact us:

PHONE 0800 082 2234

EMAIL home.energy@cse.org.uk

WEB www.cse.org.uk/loveyourhome

FACEBOOK EnergySavingAdvice

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