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Ever-Smarter Ways To Save The Planet

Essential Guide: Solar

Everything you need to know about using the sun to power your home

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Home Club

Save money with the power of solar

Harvest the sun, cut carbon and save money

Here comes the sun! Solar power in homes is going to be an important part of the overall push to decarbonise the UK and help meet the government's Net Zero target to protect the planet.

It's already a popular form of domestic energy.

The Solar Trade Association points out that more than 900,000 homes in the UK already have solar PV (for electricity) installed, and 200,000 with solar thermal (for hot water).

So, what are the benefits of solar PV panels?

Normally, your solar PV panels are mounted on to the roof of your house.

They harvest the energy from the sun and turn it into electricity, which you'd use instead of paying for that supplied through the grid.

So, as you're generating your own electricity, that means lower bills and because solar is a clean energy source, you'll help to reduce planet-harming greenhouse gases

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"Heating your hot water with surplus solar can save you up to £250 a year."

> “Solar PV arrays do not need much in the way of maintenance.”

like carbon dioxide (CO2) Each unit of electricity you generate will save 0.2556 kgs of CO2 per year from being released by gas and coal power stations.

Over its working life, a solar PV installation would produce 30 times less CO2 than coal power on average.

New analysis from Loughborough University shows the importance of mass adoption of solar, battery storage, intelligent controls and other smart energy technologies in the home.

The team at Loughborough, in partnership with the STA and Advance Further Energy, says that households could reduce their carbon emissions by more than 50% and cut energy bills.

Adoption of smart energy technologies in UK homes would not only cut carbon and energy bills, but also minimise spikes in electricity demand that strain the grid, helping to balance the electricity system without costly reinforcements.

So how does solar PV actually work (the techy bit!)

In order to understand how a solar PV system works we need to know a few measurements used when talking about electricity.

Voltage: the unit of electromotive force and is measured in Volts.
It can easily be described as the pushing force of electricity.

Current: the rate of flow of electricity and is measured in Amps.

Power: the amount of electricity used in a given time.
It’s measured in Watts and in its simplest form is Volts multiplied by Amps.

Solar panels work by allowing photons, or particles of light, to knock electrons free from atoms, generating a flow of electricity.

The panels are made of solar cells which are basically a sandwich made up of two slices of semi-conducting material, usually silicon.

During manufacture an electrical field is generated between the two layers of silicon, so that when a photon of sunlight knocks an electron free it’s forced out of the cell and into the wires connecting the cells together.

Solar panels produce Direct Current (DC) electricity similar to that found in the batteries in your TV remote control.
A typical solar panel can produce around 40Volts of DC electricity.

Solar panels are connected

1 **Generating** your own electricity means lower bills.

2 **Solar helps reduce** planet-harming greenhouse gases like CO2.

3 **More than** 900,000 homes in the UK already have solar PV.

together to create "strings".

These strings are connected to an inverter to form a solar array.

The number of panels in each "string" varies according to how many volts and how many amps the inverter needs to operate efficiently.

This is all worked out by your solar design engineer.

The solar inverter is the brain of a solar PV system.

It takes the DC electricity generated by the solar panels and converts it into usable Alternating Current (AC) electricity that can be used in your home to power appliances.

The inverter contains a lot of electronic circuits to make sure that the electricity you generate is of a suitable quality for your home appliances to use without causing damage to them.

The inverter is also there to protect the National Grid.

If the energy you exported to the grid was not of the right quality, it could cause power failures or damage to the network or appliances connected to it.

The inverter monitors the quality of the energy to make sure that it remains within the strict guidelines that our distribution network needs in order to operate efficiently.

How does solar PV work with my current energy supplier?

The energy from your solar array is available to use in your home, or store in a battery to use when you need it.

Every unit of electricity that you don't buy from your electricity supplier will be a saving on your electricity bill, and with cost of electricity in the UK now costing as much as 25p per (kWh) unit, the savings can add up quickly.

Your energy provider continues to supply you with electricity and will charge you for the energy you use from them, just as before you bought your solar panels.

Can I sell unused energy back to the grid?

Since January 2020 you can sell any surplus electricity your solar array generates to the National Grid, getting payments from your energy supplier through the Smart Export Guarantee (SEG).

You can choose an SEG tariff and all supply companies with more than 150,000 customers have to offer these.

The tariff pays households for the excess renewable electricity they generate but don't use.

The SEG tariff will guarantee payment to you for any electricity you export but if you've not signed up to one then any excess energy that goes back from your household to the National Grid won't be paid for.

The energy companies all have

> "A solar battery store can help to make even bigger energy savings."

their own tariff prices, and you should definitely shop around for the best one.

For most of us, it's not too likely that there will be unused electricity from our solar panels going into the grid.

To get an SEG, your solar panel installation must be 5MW capacity or less (50kW for micro-CHP with a smart meter that can make half-hourly readings for electricity export and the project must be Microgeneration Certification Scheme (MCS) certified.

If you have a battery for energy storage, then you'd need to check the SEG tariff rules with your supplier to find out if they'll pay for the electricity you're storing.

Can I get help with the costs of installation?

Homeowners over the age of 60 receiving income/disability benefits, could qualify from a potential 5% tax reduction under the VAT pricing system for energy-saving products.

There are specific eligibility criteria, and the tax reduction can either apply to the whole product or only the installation costs.

Unfortunately, the Renewable Heat Incentive, which provided funding for solar water heating (solar thermal) will end in March 2022 and its replacement, the Boiler Upgrade Scheme (previously known as the Clean Heat Grant) doesn't provide funding for this.

What types of homes can have solar panels and are there any restrictions?

Installation of mounted solar panels In England and Wales is likely to be considered "permitted development", so there is no need to apply to the council for planning permission but there are conditions to be met:

- Solar panels must not be installed above the highest part of the roof (excluding the chimney.)
- Panels should protrude no more than 20cm from the surface on which they're installed (roof slope/ wall face.)
- Panels should be installed, so far as is practicable, to minimise the aesthetic impact upon the building's exterior.
- Panels must not be installed on a property located within the grounds of a listed building.

If your home is listed or in a conservation area, it's advised to check with your local planning office.

How much disruption will this cause to my home?

Although ideally, solar PV systems would be installed facing due South, useful amounts of energy can be generated from systems facing East and West as well, which your solar designer will advise on.

A good solar team would survey your home and carefully check the external and internal conditions, to make sure the property is suitable for panel installation.

They should also check your consumer unit to test how the solar PV system will transfer the energy it captures into your home.

Typically, a domestic solar PV system can be completely installed in 1 day, although more complex designs may take a little longer.

Costs and paybacks

The average solar PV system

1 **A domestic** solar PV system can be installed in 1 day.

2 **You don't** need to apply for any planning permission.

3 **You can sell** surplus electricity to the National Grid.

> "The cost of installing solar panels has fallen by around 70% since 2010."

in the UK consists of around 12 solar panels on the roof and will be capable of generating around 3,150 units of electricity every year.

That could save over 805 kgs of CO2 being release into the atmosphere every year just from your home.

For a typical domestic property (a 3-bed semi-detached) expect to pay between £4,000 – £6,000.

This will depend on any particular requirements you might have or extras that you choose to install such as a solar water heating diverter.

The cost of installing solar panels has fallen by around 70% since 2010 when they really started to become popular.

You can expect to see your electricity bills reduce by around 50% and maybe even more with a solar battery added to your system.

What if something breaks/goes wrong: are these easily fixed?

Solar PV panels are designed to last for at least 25 years, and many are backed up by manufacturer's warranties to give you peace of mind.

Solar inverters are likely to need replacing once during this time.

A typical 3kW domestic solar inverter will likely be provided with a 10-year manufacturer warranty and will cost in the region of £500 to £700 to replace depending on the type of inverter and difficulty of access.

Solar PV arrays don't need much in the way of maintenance.

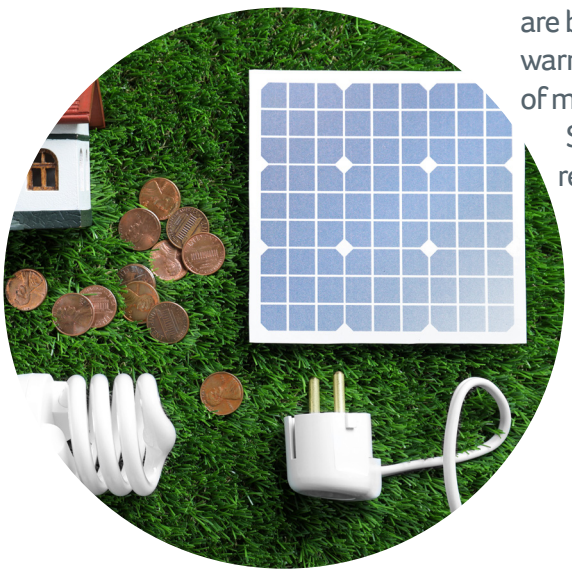
Ensuring that the solar panels are clean and free from shade is key to maintaining good performance.

Many local window cleaners are able to clean solar panels and have the right equipment for doing this properly.

In the countryside where panels can get dusty around harvest time, it might be necessary to have your system cleaned once per year.

The solar inverter should be checked annually to make sure that it's free from damage, isn't showing signs of over-heating or strain and that there are no error codes recorded.

This can often be done using the inverter manufacturer's monitoring



software, which will connect to the internet through your home Wi-Fi.

Heating your water with solar thermal

Solar water heater diverters are a cost effective first step to energy storage.

Solar water heaters save 50% to 80% in energy costs compared to gas and electric tank water heaters.

The cheapest form of energy storage is your hot water.

If you have a hot water cylinder in your airing cupboard, you may be able to fit a solar diverter.

This handy little device watches the performance of your solar array and if you are exporting surplus power, it will turn on your immersion heater and heat your hot water for free.

You can buy a solar hot water diverter for between £300 and £400 and they can be fitted by a local electrician.

Heating your hot water with your surplus solar can save you up to £250 per year from your energy bill.

Storing your electricity with battery storage

A solar battery store will store surplus energy and release it when you need it.

With the right solar battery, you also could power essential household appliances like the family TV or mobile phone chargers if there's a power cut.

If you fit a home battery, you'll be able to store and use more of the electricity you've generated, helping you save even more on your electricity bill.

However, if you have an SEG tariff its worth checking whether the supplier will pay for electricity stored in a battery, especially if some of it could be 'brown' electricity from the grid.

Check what your chosen SEG company's rules are.

If they'll pay for stored electricity, then you could earn more with a flexible tariff by storing electricity to export at times when rates are higher.

But you'll also need to take into account the initial cost of the battery.

If you fit a home battery, you'll be able to store and use more of the electricity you've generated, helping you save more on your electricity bill.

You could make some good savings on your electricity bills: a 9.6 kWh solar battery storage system (with 12 x 315W panels) might allow you to utilise up to 30% more of the energy generated by your solar panels and save up to £600 on your annual energy bills.

If we've not covered the array of questions you've got about solar PV, drop you Carbon Mentor a message.