GETTING THE MOST FROM YOUR SOLAR PV SYSTEM

National Energy Action is the national charity, helping you with your energy bills. This booklet helps you understand your solar PV system and how to maximise the benefits

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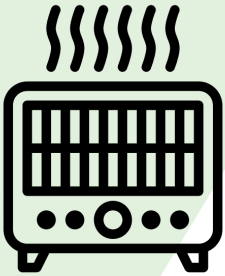
SOLAR PV SYSTEMS

The solar panels on your roof convert sunlight into electricity which can be used in your home for free, saving you money. This booklet explains more about how your solar PV (photovoltaic) system works, when it generates electricity and how to maximise your use of this free electricity.

KILO WHAT?



So what is a kilowatt? The power rating for electrical appliances is measured in **watts (W)** or **kilowatts (kW)**.
A kilowatt is **1000 watts.**
If a **1 kW appliance** (like this fan heater) runs for **1 hour** it will use **1 kWh** (kilowatt hour) of electricity.
Units of electricity are measured in **kWh** and counted through our electricity meters. The price for a unit of electricity is shown in **pence per kWh** and that's what energy suppliers use to bill us.

SMART METERS

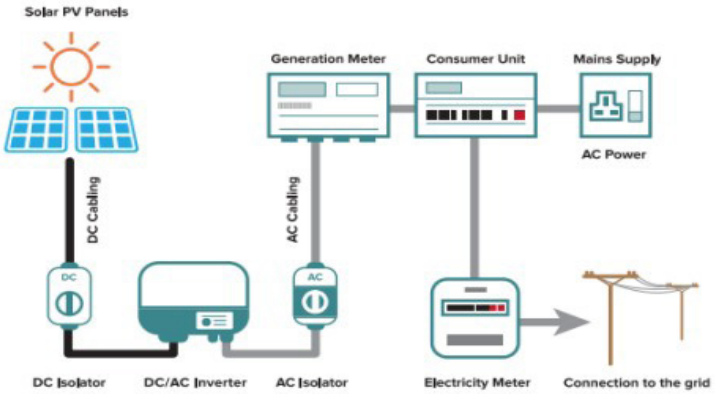
Your solar PV system can work with a smart meter. There is a national roll-out programme. Advantages of smart meters include:

- an end to estimated bills
- no more manual meter readings.

The meter normally comes with an in-home display (IHD). These allow you to monitor the electricity you are importing from the grid and how much it is costing you. At times when your solar PV system is sending electricity to the grid, the in-home display would show that your electricity cost per hour is now £0.00. Some can also show a grid symbol, and the amount of solar generation exported to the grid. When the export is higher, these are good times to use your electrical appliances.
The latest models of smart meters will continue to be smart after switching energy supplier.

YOUR SOLAR PV SYSTEM

The main components of a solar photovoltaic (PV) system are:



1 **Solar PV Panels:** convert sunlight to energy.

2 **Inverter:** this might be fitted in the loft and converts the electricity from the panels into the form of electricity which is used in the home.

3 **Generation meter:** records the amount of electricity generated by the solar PV system. This may automatically send meter readings back to the system owner. Be careful not to provide your PV generation meter reading when you give your electricity supplier your electricity meter reading.

USING YOUR SOLAR PV SYSTEM

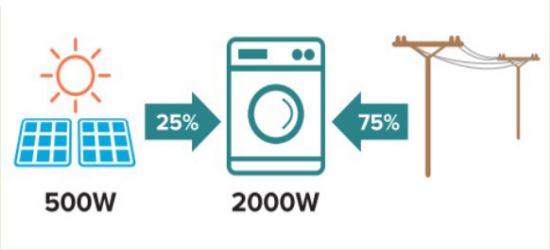
A solar PV system is easy to use and runs automatically. You can use the electricity at the time it is generated for free. If you don't use all the electricity it produces, the remaining amount will be automatically sent on to the electricity grid.

If you consume more electricity than the solar PV system is producing, you'll buy the additional electricity from your electricity supplier.

Solar PV systems cannot store the electricity they produce unless you also have a battery fitted to your home (which most don't). In order to use the electricity produced for free, you must use it at the time it is generated – it can't be saved for later in the evening.

GENERATING AND USING POWER

This example shows 500W of power is generated from the solar panels and a washing machine is using 2,000W. More power is being used by the appliance than is being generated by the solar panels so an extra 1,500W is being purchased from your electricity supplier. On a sunny day in summer, a 3kW solar PV system may generate 2,000 to 3,000W in the middle of the day – about the power of a normal kettle. The power output would be less on a cloudy day, early in the morning, in the evening or in winter.



HOW MUCH ELECTRICITY WILL MY ITEMS USE?

To know what appliances can be powered by your solar panels, it helps to know how much power different appliances consume. The electricity used by domestic appliances will vary between makes and models, but typical values are shown below. Most appliances should have a label showing their consumption in watts (W) or kilowatts (kW) - 1 kW is 1000W. Consumption may be lower than the rated power if the appliance has temperature control or runs in a cycle.

Appliance	Rating (watts)*
Mobile phone on charge	2 to 20
Broadband router	5 to 20
LCD TV	25 to 175
Fridge freezer	80 to 250
Microwave	700 to 1400
Iron	1000 to 3000
Hob (per ring)	1000 to 2000
Grill/oven	1800 to 3500
Washing machine	1000 to 2300
Tumble dryer	600 to 2800
Immersion heater	3000
Electric shower	7000 to 10,500

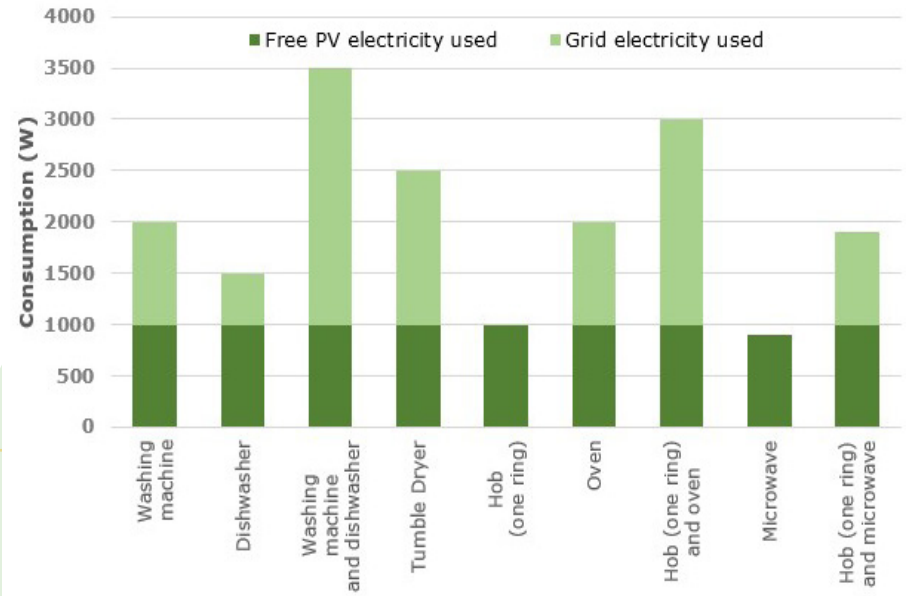
HOW MUCH ENERGY IS PRODUCED?

If your solar panels are generating over 1,200W at a particular time, you would be able to power a 100W fridge-freezer, an 1,000W microwave and a number of small appliances like your broadband router and LED bulbs.

If you have a smart meter, it is possible to see how much electricity your home is purchasing from the electricity grid using the smart meter in-home display (IHD).

When your solar PV system is generating more electricity than you are consuming, the IHD should show you are not importing electricity.

There is more information about smart meters on page 3.

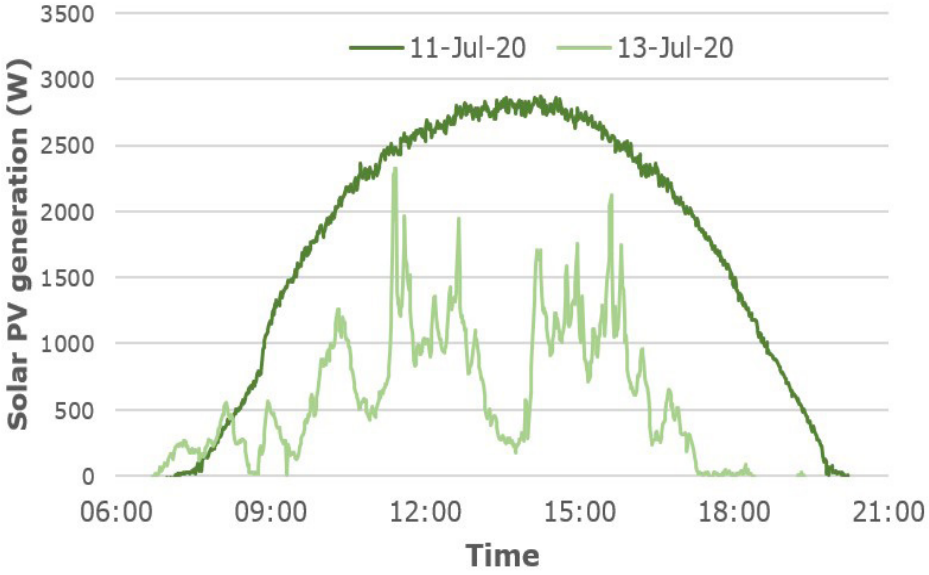


This graph shows the typical electricity consumption for various appliances and the amount of the electricity consumed that could be provided from the free solar PV compared to that purchased from the electricity grid. This is for a small 1kW solar PV system generating its maximum power at midday in summer.

With a larger PV system more of the power could be provided by the solar PV system.

WHEN DO SOLAR PANELS PRODUCE ELECTRICTY?

Solar panels generate electricity during the day. They generate more electricity when the sun shines directly on the solar panels. The graph below shows how much energy in watts is generated by a typical 2.8kW solar PV system on 12 July 2020, when it was sunny and on 13 July when there was a mixture of sun and cloud.

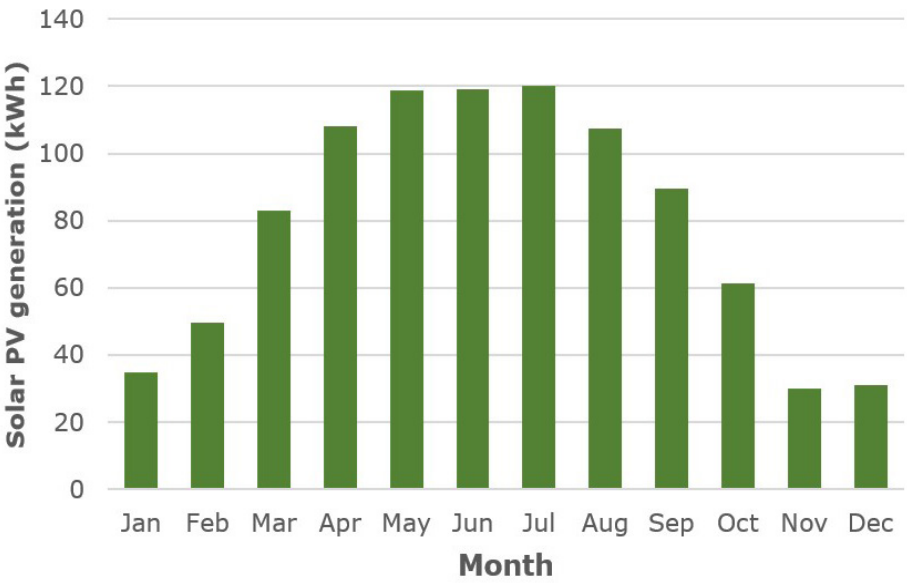


SOUTH VS EAST FACING

A south-facing solar PV system will tend to generate more around noon. The sun rises in the east and so east-facing PV panels will have maximum generation partway through the morning.
A west-facing array will tend to generate most electricity partway through the afternoon.

SUMMER VS WINTER

Solar PV generation is higher in the summer than the winter due to longer days and the sun being higher in the sky. The graph bottom left shows the typical monthly values of solar PV generation for a 1kW PV system in Birmingham.
From year to year there is variation in the generation for any particular month. But there is less variation from year to year as weather patterns over the year can average out.



SHADING

The performance of a solar PV system is affected by shading of the solar panels. This could be from trees or bushes, dirt or leaves on the solar panels, or shadows from chimneys or other buildings.
If you are a tenant and have shading of your solar panels from trees or bushes, you should contact your landlord to discuss this rather than attempting to cut them back yourself.

USING YOUR SOLAR PV SYSTEM TO SAVE MONEY

Top tips for maximising savings from your solar PV system

If possible, use an appliance during the day when the solar PV is generating power, not in the evening or overnight.

Make greater savings by using high-power electric appliances when the solar panels are generating most. Typically, in the middle of the day when it's sunny.

Use larger appliances one at a time to minimise the electricity coming from the grid.

Run washing machine and dishwasher cycles at a lower temperature.

If it is safe, use timers on appliances which can run while you're out.

Consider getting a smart meter and use its in-home display to monitor the electricity you purchase from the grid.

Consider cooking your evening meal during the day using a slow cooker on low power rather than by using the hob or oven in the evening.

More energy and money saving tips

Use energy efficient, ideally A-rated appliances.

Microwaves and air fryers use less power than an electric oven.

Only fill a kettle with the amount of water you need.

Cook with lids on pans so you can turn down the power.

Wash your clothes on a sunny day and dry them outside on the clothes-line, avoiding use of the tumble dryer.

Don't leave appliances on standby. Turn them off at the wall.

Switch energy supplier – the solar PV system does not restrict your ability to switch energy supplier to get a better tariff rate.

MINIMISING YOUR IMPACT ON THE ENVIRONMENT

There is a need to reduce carbon emissions due to climate change. Your solar PV system will generate electricity without producing further carbon emissions. Electricity from the grid can be produced by burning fossil fuels which release carbon dioxide which contributes to climate change. The less we rely on energy produced from fossil fuels, the better it is for the environment. A solar PV system works well with other electric technologies such as solar immersion controllers, heat pumps and electric vehicles.

CHECKING YOUR SOLAR PV PERFORMANACE

You can check the performance of a solar PV system by taking readings from the generation meter if it is accessible. It is helpful to see how much power the solar PV system is generating, as a guide to how many appliances can be run from the solar PV system – for free.

The inverter is likely to have a display which shows the power output, but this may be inaccessible in the loft.

Monitoring devices can be fitted to the solar PV system to allow households to view the power output. The most common devices are 'dongles' which are plugged into the inverter. These typically connect to the internet via home broadband (Wi-Fi) or mobile signal (4G). Households can view the information on an app on their phone or tablet computer. You may need support from the manufacturer or your landlord to reconnect the dongle to the internet if you change broadband router.

MAINTAINING YOUR SOLAR PV SYSTEM

- Social landlords or the system owner typically monitor performance of the solar PV system via readings from the generation meter.

What do I do if there is a problem with my system?

If there is a problem, either you or the landlord will need to arrange a visit by an electrician. Having a working system will save you money on your electricity, so it's best to allow access.

- **Do I need a contract?**

Residents do not need to agree maintenance contracts or fees with any company.

Solar PV systems have no moving parts and generally require little maintenance.

How many years should my solar PV system last?

The lifespan of the solar panels is about 25 years, but the inverter may need replacing after seven to 10 years. Solar panels are typically guaranteed to provide 90% power output after 10 years.

HOW DO I KNOW IF MY SOLAR PV SYSTEM IS WORKING CORRECTLY?

Social landlords or the system owner typically monitor performance of the solar PV system. The generation meter has a red light, and this will flash when the solar PV system is generating electricity. It might be fitted in the loft, and we do not advise going in the loft if this is the case.

The faster the red light flashes, the more electricity is being produced. Overnight, when the panels are not generating, the red light will stay on constantly. The generation meter reading increases during the day as the solar PV system generates electricity from sunlight.

On very dull days in winter, the light may rarely flash, and the meter reading may not increase for a few days if the amount of electricity generated is too small to register.

If there is no change in the meter reading over a week, then the system may not be working, and you may need to report this to your landlord or the system owner.

WHAT HAPPENS IN A POWER CUT?

For safety reasons, most solar PV systems will not run in the event of a power cut and the inverter will automatically switch off.

This safety feature protects engineers working on the fault, as they could be put at risk if electricity were being supplied to the grid during a power cut.

The solar panels should automatically switch back on when safe to do so.

Some more expensive battery systems can disconnect the home from the grid during a power cut. This can allow the solar PV system and battery to provide power to the home during the power outage.

IF YOU NEED HELP CALL NATIONAL ENERGY ACTION'S ENERGY ADVICE AND SUPPORT SERVICE ON 0800 304 7159 OR GO TO WWW.NEA.ORG.UK/GET-HELP.

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