



# Solar PV (Electric) Panels

Solar panels are great because:

- The electricity has a low carbon footprint compared to fossil fuels
- You can use the electricity they generate for free, and the extra is exported to the national grid
- You can **earn money** with the Feed-in-tariffs
- They need almost no maintenance

## What is solar PV?

Solar photovoltaic (PV) panels generate electricity from sunlight (unlike solar thermal panels which absorb heat from sunlight and warm up your water). The electricity they generate is fed into your existing supply. What you don't use is exported to the grid.

You should consider solar hot water panels as well as PV. However, there is only so much hot water you can use and most households will only need 2-4 m<sup>2</sup> of solar hot water panels whereas you can have as much solar PV as you have space for.

The PV panels generate DC (direct current) electricity and we use AC (alternating current) so the wires from the panels have to be fed through an inverter which



does the necessary conversion,

## How much electricity will I generate?

Solar panels are rated as so many kWp (kilo-watts-peak). This says how much power (kW) they can produce under optimum conditions. But conditions are rarely optimal! In Cambridge, you can reckon on about 850-900 on average over the year from a 1kWp installed system, *with no shading* at optimum orientation and tilt, see below. A typical size installation is 3 kWp which would give you about 11 kWh/day in July, but only about 2.4 kWh/day in January. A typical household uses 9-10 kWh/day.

There are useful websites with solar calculators: google for *PVGIS* or *PVWATTS*.

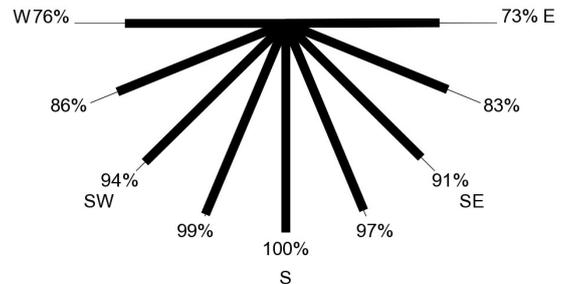
A 1 kWp system will need 6-7m<sup>2</sup> space depending on the efficiency of the panels. High efficiency panels are more expensive.

The efficiency of the panels will slowly degrade. You will typically have a guarantee that they will generate at least 80% of rated power after 20 years.

## What about shading?

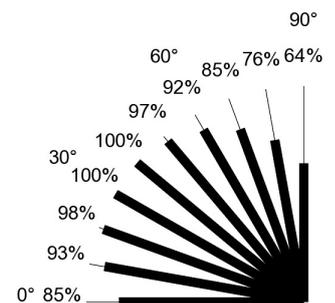
The effect of shading can be greater than you might expect. However the effect can be minimised by per-panel optimisers so that shading on one panel does not affect the others. Also, be aware that trees grow – you may need to prune so as to avoid shading where there was none before.

## What about the aspect of my roof?



Rooftop installations are fixed tilt and orientation for low maintenance. The ideal is to face directly south. However, if your roof faces SE or SW you will still get more than 90% of the ideal.

Also ideally the panels should be tilted between 30° and 40° to the horizontal. If you have a flat roof then you can fix your panels onto tilted frames. A horizontal panel will capture around 85% of the ideal.



# What will I earn?

The Feed-in-tariff (FIT) rates reduce over time as panels get cheaper. April-June 2017 the rates are

- 4.14 p/kWh for everything you generate
- 5.03 p/kWh for what you export to the grid.

This is tax free and index linked and lasts 20 years!

NB. Mostly you won't actually measure how much you export to the grid and it is deemed you use half.

When you use the electricity yourself you save more by not having to buy it:

- typically 14p-15 p/kWh but it depends on your supplier

Suppose you have a 3 kWp system in an ideal location and you use 50% the power from it in your house (bear in mind that if the house is normally empty during the day and your usage is mainly early mornings and evenings, then you will be seriously out of step). Suppose you normally pay 14p/kWh

1 kWp generates 880 kWh on average; 3 kWp gives you 3400 kWh.

Generator tariff	2640*4.14	£109
Export tariff	2640/2*5.03p	£66
Electricity bill savings	2640*0.5*14p	£185
Annual Total		£360

The lowest quotes we have seen for a 3kWp system were about £5,000 including 5% VAT. So your annual return is about **7% (tax free)**, varying somewhat with the weather of course, and provided there are no other costs. There are also a number of firms offering you installations for low or zero cost, in return for the FIT. You save at least the avoided cost of buying electricity.

On our website there is a simple spreadsheet which you can download and use to calculate your returns,

For more information about the FIT go to [www.decc.gov.uk](http://www.decc.gov.uk) and look for 'feed in tariff'.

NB. To qualify for the FIT the installation must be performed by a certified supply under the Microgeneration Certification Scheme and you need an energy performance certificate for your house at level D or above..

## What is the energy payback time?

The energy payback time is the time taken to generate the energy which was used to manufacture and install the solar cells. Most studies on this estimate a

For more information go to <http://www.transitioncambridge.org/faqs>

payback time of less than 3 years, even in the North of England. The lifetime of the system will be typically at least 25 years, so even the worst estimates give an overall positive payback.

## Do I need planning permission?

You don't need planning permission to put solar panels on the roof of your house unless it is a listed building. Even if you are in a conservation area, you are allowed to put panels on the roof. If you aren't in a conservation area, you have more freedom to put PV panels in various places.

[https://www.planningportal.co.uk/info/200130/comm\\_on\\_projects/51/solar\\_panels/](https://www.planningportal.co.uk/info/200130/comm_on_projects/51/solar_panels/)

## Will this affect my insurance premiums?

We have never heard of this happening but you should always check with your insurance provider.

## Does it need maintenance?

Generally speaking, no. Not even cleaning provided it rains occasionally!

The likeliest bit to go wrong is the inverter and they are usually guaranteed for only 5 years although you will be able to buy an extension. The inverter is not on the roof, so it is relatively easy to get at.

If anything does go wrong it is likely that the system will stop generating altogether. It is a good idea to check your generation meter occasionally to make sure you are getting at least something.

## Will it make any noise?

The inverters do make humming noise so it is best to put them somewhere this will not be a nuisance.

## Will my solar PV system protect me from power cuts?

With a standard grid connected system, you can't use it in a power cut because if you did the voltage would feed back into the grid and you could electrocute any poor maintenance man from the electric company trying to fix the problems.

You can install a battery system with a change over switch, and keep the batteries charged with a solar array. If you really want to run your entire house from it in the event of a power cut, this will be expensive however because you will need a lot of battery storage but you should be able to run important equipment like your refrigerator and freezer from this.