

## how does a solar photovoltaic system work?

There are very few components in a Solar Photovoltaic system which means it is very simple and inherently robust, the principle behind the operation of the Solar Photovoltaic system is as follows:



**light** – A Solar Photovoltaic module will generate electricity in direct or diffuse light. This enables the Photovoltaic system to generate even when the sky appears to be dull or overcast.

**solar photovoltaic cells / modules** – Work by converting sunlight directly into electricity, the amount of electricity produced being directly proportional to the amount of light falling on the cells.

**the inverter** – Converts the power generated by the array of modules mounted on the roof, which varies with daylight, into a constant 240V 50Hz power supply which the building can use.

**connection** – The inverter is connected into the building electricity supply, any power immediately required by the building is provided by the Solar Photovoltaic system any additional power required comes from the grid. Any surplus electricity is exported back to the grid.

**power storage** – There are no batteries in this type of system, it is the grid that becomes your storage mechanism. A sell and buyback agreement with your supplier will allow you to export and import electricity to and from the grid.

## is my building suitable?

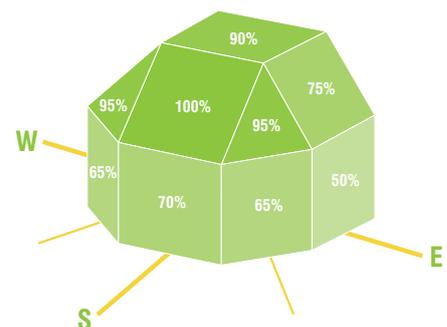
The solar modules are best mounted on a roof top as this area of the building will probably receive most daylight, it is also an opportunity to turn an under utilised area of the building into a renewable energy generator. When mounting modules on a building the following should be considered:

**orientation** – The area to be equipped with the solar modules should ideally be orientated in a Southerly direction and in the UK the optimum tilt angle is 35degrees from the horizontal in order to maximise electrical output. Installing a Photovoltaic array outside of these orientations simply reduces the efficiency of the electrical generation.

**shading** – It is almost inevitable that when installing a Photovoltaic system on a building that a degree of the Photovoltaic array will be subject to shading at sometime of the year. The designer will examine options to; first position the array away from likely sources of shade such as a vent pipe, tree or lamppost and second configure the connection of the array to minimise losses of power due to shading.

**space** – To install a reasonable size system for a home a minimum of 16sqm is required, each solar modules typically measure 1.6m x 0.8m and can be arranged in a number of patterns and layouts, it does not necessarily have to be a regular shape.

**structural strength** – In the majority of cases most roofs can withstand the minimal additional load of the solar modules, of 20kg/sqm, without any additional strengthening or structural modification.



## steps for designing a system?



**1. confirm dimensions** – The first step is to confirm the available space on the south facing area of the building, therefore the power that can be generated.

**2. array position** – It is important that the solar modules are installed in an area which remains virtually shade free.

**3. inverter size** – From a cost and performance point it is crucial that the appropriate size of inverter is selected.

**4. performance prediction** – A computer model is used to predict the amount of electricity which will be generated over the year.

## what will it save me?

**Typically in the UK 100kWh of electricity will be produced over a year from every 1sqm of space, and for every kWh produced from your solar panels approximately 0.5kg of carbon dioxide will not be emitted into the atmosphere.**

There is a wide variation in the cost of electricity dependent on; your supplier, your chosen tariff and method of payment, currently costs of electricity vary between £0.06 and £0.12 per kWh and rising. Therefore for every kWh you generate and use directly will be saved from your electricity bill.

There are also buy-back and sell agreements available which will enable you to sell any surplus electricity back to your supplier. Again prices vary widely but one supplier is offering homeowners and SMEs £0.18 per kWh for electricity exported.

In addition to the electricity cost saved by generating your own or by selling back to your supplier you can currently also receive a credit from Ofgem through a scheme known as ROCs, for every 1000kWh generated by a Solar PV system you can claim 2 ROCs which are currently worth £47 each.

As an accredited Microgeneration installer Solar Green is able to provide advice and information on accessing the most appropriate funding for your project.

## what will it cost?

**Currently there are grants available of up to 50% towards the installed cost of the Solar PV system through the Low Carbon Building Programme.**

For **community buildings** there are also funds available from various trusts which we can advise upon. For **residential projects** Solar Photovoltaic panels are considered to be an energy saving device by the Inland Revenue and therefore the VAT for the supply and installation of Solar Photovoltaic systems on such buildings is charged at 5% for existing buildings and 0% for new buildings.

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In terms of capital cost for a small scale system, before the grant, will be between £500/sqm (£4000/kW) and £800/sqm (£6400/kW) dependent on the scale and type of system.

## how long will it last?

**The Solar Photovoltaic module was originally developed for powering remote applications, such as; telecommunication masts and navigation aids for shipping, where a reliable low maintenance means of power supply was required, therefore as a power generator it is one of the most robust sources of electricity available.**

This is reflected in the warranties offered by the solar module manufacturers of up to 25 years, a warranty duration which is rarely offered on any other product. The system is expected to operate trouble-free for over 35 years.