



GUIDE TO PV POWER

Consumer, Specifier, Installer
and Merchant guide to
Solar 'Photovoltaic' systems



EFFICIENT HEATING SOLUTIONS

The most commonly asked questions about Solar PV Systems

Q. How much power do we use in the home?

A. Everyone consumes energy, but sometimes it is hard to know just how much power is really being used in the home. Domestic electrical usage is measured in kilowatt hours (kWh) and the best way to understand what this means is to look at what a kWh does in everyday life.

A kWh of electricity can provide:

- *1200 electric shaves*
- *Drying your hair 15 times*
- *Listening to 15 CD's*
- *Using a small refrigerator for 24 hours*
- *Microwaving 20 meals*
- *4 evenings of light with 60W incandescent lamps*

An average 3-bedroom house uses between 9-10kWh per day (Source: Energy Savings Trust)

Q. What is a Solar Photovoltaic (PV) system?

A. A Solar Photovoltaic system (or Solar PV as it is commonly known) is a renewable technology which utilises free energy from the sun to generate electricity. The electricity produced by Solar PV can be used to drive anything from an appliance to a light bulb that is usually powered by the mains electrical supply.

Q. How does Solar PV work?

A. Solar PV relies on daylight to generate power through the use of photovoltaic cells within roof mounted panels (modules). These modules are generally fixed to a roof and connected by cables into an inverter. This converts the DC electricity produced by the modules to AC (the same as the electricity that comes from the National Grid) which is either consumed within the property or sold back to the power supplier.



Q. What is the difference between Solar PV and Solar Thermal?

A. As previously mentioned, Solar PV systems use energy from the sun to generate electricity with roof mounted modules. Solar Thermal employs roof mounted collectors to absorb energy from the sun. These collectors are usually connected to the lower coil of a twin-coil cylinder via a sealed circuit containing a special glycol/water solution. The pump in the system circulates the heated fluid from the collector to the cylinder, where the stored water is heated for use in the home.

Q. Where did the idea of PV come from?

A. In 1839, a French scientist named Edmund Becquerel discovered the photovoltaic principle and the first basic solar cell was developed some 40 years later.

However, today's photovoltaic technologies were developed in the 1950s and 1960s for uses including satellites, spacecrafts, electronic watches and calculators. The idea behind the domestic use of PV to provide renewable power for the home, has now been established for over 20 years.

Q. What are the key benefits of Grant Solar PV?

A. The Grant Solar PV system has many unique features. It is available in simple kit form ranging from 0.54kW (three modules) to 2.88kW (16 modules), making ordering straightforward. Bespoke systems of almost any size can also be designed and supplied using the same basic components found in the kits.

The systems utilise 180 Watt monocrystalline Grant Solar PV modules. The module frames are made from corrosion-proof, anodised aluminium and meet the highest requirements in terms of stability and durability.



Q. What is the difference between polycrystalline and monocrystalline modules?

A. The polycrystalline modules use cells made from a multicrystalline silicon material with a blue marbled appearance. The monocrystalline modules have cells of a darker appearance, almost black in colour. These are produced from a pure single crystal silicon, resulting in a cell which is slightly higher in efficiency than the multicrystalline silicon cell. Thus the monocrystalline modules are typically smaller in physical size than a polycrystalline one of the same output.

Q. What mounting options are available for Grant Solar PV?

A. There are several different mounting arrangements available including on-roof, in-roof and flat-roof (by special order), with both landscape and portrait module installations possible.

Q. How 'green' is Grant Solar PV?

A. Grant Solar PV is a renewable energy source that does not require the burning of fossil fuels to generate electricity and does not leave a carbon footprint as it creates no carbon dioxide during operation. For each kWh of electrical energy generated using a fossil fuel, about 1.5lb (0.68kg) of CO₂ is released into the atmosphere and the average person uses around 600-800 kWh of energy every month.

Grant Solar PV makes no noise, emits no pollutants, creates no waste and uses no fuel, meaning it is a VERY green energy supply.

Q. What is the life expectancy of a Grant Solar PV module?

A. Grant Solar PV modules have a life span of over 25 years, but should last much longer since there are no moving parts.



Q. How long is a Grant Solar PV System guaranteed for?

A. All Grant Solar PV Systems are covered by a unique five-year manufacturer's guarantee, subject to the system and its components e.g. inverter, modules, etc. being supplied by Grant as a kit. Please note that Grant do not warranty mixed systems i.e. those which include an inverter or modules that have not been supplied by Grant. For further information, please contact the Grant Customer Service Department.

Grant Solar PV modules also carry up to a 25-year performance guarantee as follows:

Performance guarantee to 90% output minimum after 12 years

Performance guarantee to 80% output minimum after 25 years

Q. How many Grant Solar PV modules are needed to produce a kW of electricity?

A. Grant Solar PV modules will produce a maximum output of 180 watts each in bright sunlight (warranted under standard test conditions 'STC'). This is written as 180Wp (watts peak). For example, if six modules are connected together they will produce $6 \times 180 = 1080$ Wp or 1.08kWp (kilowatts peak).

Q. What size Grant Solar PV System do I need?

A. Electricity requirements vary depending on the size of your house and how energy-efficient the building and appliances are. A standard three-bedroom house consumes approximately 3300 kWh of electricity per annum, excluding heating and cooking (Source: Energy Savings Trust).

To put this into perspective, a 2.88kW Grant Solar PV System (approximately 16 panels) should produce around 3,285kWh of electricity per annum.

For a more accurate calculation of your household electricity consumption, either check with your energy supplier or refer to previous electricity bills.

Q. How is the electricity produced by a Solar PV system connected to the electrical system in my house?

A. The DC power produced by the solar PV modules is converted to AC by an inverter and this is connected to the electrical system of the property, usually via a 16A circuit breaker in the consumer unit.

Q. I have heard a system can be installed as an 'off-grid' arrangement. What does this mean?

A. If you live in a situation where there is no electricity or connecting to the Grid is not possible, an 'off-grid' solar PV system (commonly referred to as an 'island system') could be installed. This system incorporates a number of batteries charged from the DC output of the PV modules, so that any excess power is stored for times of no solar gain. An inverter is then used to convert the DC power from the batteries into AC, to supply the electrical system/appliances.

Q. Do I always need to store the electricity generated in batteries?

A. Batteries are not used if the system is 'grid connected', that is to say it is connected to the electrical supply network, via the electrical system in the property.

Q. What happens to the electricity produced by solar modules that is not used in my house?

A. With a 'Grid-connected' system, any excess power generated is fed back into the electrical supply Grid. If you have an island system, the excess power would be stored in the batteries for later use.

Q. How can the amount of electricity generated by a Solar PV system be checked?

A. An 'export' meter installed between the inverter and consumer unit, will record the power supplied by the Solar PV installation.



Q. Can I sell the electricity I generate back to the power supplier?

A. Most electricity suppliers will pay for power fed into the Grid (feed-in) from domestic Solar PV systems. The easiest way to do this is by signing up to a 'Buy Back' or 'Feed-in Tariff' scheme with your power supplier. There are two main types of tariff available:

Generation: You are paid for all of the electricity that your solar PV system generates even if you consume it in your home.
Export: You are paid for just the electricity that is exported back to the Grid and not for any electricity you have consumed.

Q. What are Feed-in Tariffs (FiT)?

A. On 1st February 2010, the Government announced new standard generation Feed-in Tariffs (FiT) rates due to start on 1st April 2010, which are guaranteed for 25 years. This new payback scheme, results in a shorter payback for Solar PV systems, making them an extremely attractive green option for any home.

PV systems registering with the scheme between 1st April 2010 and 31st March 2011 will benefit from the following:

Any system less than 4kW on a new build	=	36.1p per kW pay-back
Any system less than 4kW on a retrofit	=	41.3p per kW pay-back
Any system 4-10kW new build or retrofit	=	36.1p per kW pay-back
Any system 10-100kW new build or retrofit	=	31.4p per kW pay-back

This means that if you normally pay 12p per kWh for your electricity, you would effectively get both the power consumed for free and the FiT. So on a retrofit system below 4kW this would mean $12p + 41.3p = 53.3p$ per kWh saving!

Any Solar PV system installed after the 15th July 2009 is eligible for this Feed-in Tariff at the above rate, provided the system uses MCS approved equipment and has been fitted by an MCS accredited installer.

Q. Does the power company and/or the local network operator need to be consulted before installing a Solar PV system?

A. Yes, it is recommended that you contact your energy supplier before you purchase and install a Solar PV system, as they may wish to fit an additional meter. You should also enquire about green export/feed-in tariffs. There are several now available through different suppliers, so it is advised that you speak to several power companies about their particular schemes. **The local network operator must be notified of the installation of a Grid-connected Solar PV system.**

Q. Will Solar PV protect my house from power cuts?

A. Not if it is a 'Grid-connected' system. As a safety requirement the inverter constantly monitors the supply Grid and must shut down immediately if the power supply fails. It will automatically restart when the power supply is reinstated on the Grid. The inverter needs a 230V electrical supply to convert the DC from the Solar modules to AC.

Q. What happens when there is little or no sunlight, e.g. during winter months?

A. Grant Solar PV modules do produce more electricity on brighter days, however sunlight is not a necessity. Even in the winter months when the sun is lower or the skies are overcast, Grant Solar PV modules can still produce some electricity. The output will just be lower.

Q. What is the minimum number of Solar PV modules that can be installed?

A. The minimum number of Grant Solar PV modules that can be installed is 'one'.

Q. What is the maximum number of Solar PV modules that can be installed?

A. There is no maximum number of Grant Solar PV modules that can be installed in a system, however, in very large installations, modules will be split into groups (known as 'strings'). Each of these strings will then be connected to its own inverter. The more strings made, the more inverters needed. The number of modules in a string will vary depending on the type of inverter used.

Q. How long does a Solar PV system take to install?

A. This varies depending on the size of system. A standard domestic grid-connected 2.88kWp Grant Solar PV system should only take a few days to install.



Q. Can I increase the size of my Solar PV system in the future by adding additional solar modules?

A. Yes, it is possible to do this, providing there is sufficient roof space with the correct orientation and the maximum input to the inverter is not exceeded if more modules are connected to it.

Your installer can contact Grant UK for technical advice if required.

Q. Do the Solar PV modules have to be installed at an angle? Can they be laid flat on a flat roof?

A. Grant Solar PV modules should ideally be installed at an angle between 30° and 45° to ensure they receive the maximum amount of light available throughout the year. Any module installed at an angle outside of this specification will see a reduction in module output, which would affect the overall system performance.

Q. Can Solar PV modules be fitted on a roof facing in any direction?

A. Ideally Solar PV modules should face South to achieve the maximum power output. Modules facing South East or South West will produce a slightly reduced amount of power.

Q. Will planning permission be required to install Solar PV modules on the roof of my house?

A. In some circumstances, you may need planning permission to install Solar PV modules. This may be if you live in a listed building or conservation area. You should always check with your Local Authority before purchasing and installing a solar PV system. A flat roof installation will always require planning and a structural engineers report, due to the effects of wind pressure, etc.

Q. How much will a Grant Solar PV System cost?

A. For a Grid-connected Solar PV system, Grant has a range of standard on-roof kits starting from the smallest 0.54kWp pack up to 2.88kWp. Larger bespoke on-roof, in-roof and flat roof kits are available by special order and prices will vary depending on components.

Typically, a 0.54kWp system would cost around £3000 to purchase, including three modules, an on-roof mounting system to suit, inverter, DC isolator, 32A AC isolator, cables and connectors.

Q. What maintenance is required for a Grant Solar PV system?

A. If the Grant Solar PV system is Grid-connected, it will need very little maintenance. An annual visual inspection should be carried out which usually includes checks such as ensuring the modules are not in shade (by any surrounding growing trees) and in a clean condition (no routine cleaning is required as normal dirt build up is removed by rain).

It is however, still recommended that a qualified electrician checks the wiring and system components within a 10 year period, in accordance with the current IE Wiring Regulations, 17th Edition.

Grant UK can recommend a qualified electrical engineer to carry out this annual check, if required.



Q. Can Grant help with the design of a Solar PV system for my property?

A. Yes, Grant offer a free of charge custom design service for all Grant Solar PV systems, for any household, or business on mainland UK. Using the latest dynamic simulation software for the design and calculation of solar systems, Grant can not only size a system, but give very accurate estimates of the achievable solar gain, CO₂ reduction and fuel savings.





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