



Morri Consult Ltd

Solar Photovoltaic Technology (Electricity)





Solar Photovoltaic System (PV)

As with almost everyone in the country we at Morri Consult are aware of the increasing fuel costs that have resulted in higher gas, electricity and oil bills for consumers and businesses alike. This together with the increasing effect on the environment of the burning of fossil fuels has led us to focus on renewable energy sources and in particular the introduction and use of solar photovoltaic (PV) systems.

Dispelling The Myths

- All solar systems work best with direct rays of light from the sun but also work effectively with diffuse light.
- Solar systems are able to work every day of the year in the UK to differing levels of efficiency.
- Solar energy is free and is the most abundant energy source on the planet.
- Against this background of new technology plus rising fuel prices and focus on renewable energy sources Morri Consult have become solar photovoltaic (PV) specialists.

The Truth About Renewable Energy Sources

The amount of energy that is contained in a litre of oil or a kilogram of coal is phenomenal. However, that energy has been concentrated in a process which has taken thousands if not millions of years. When we need energy, we can release it and generate in an instant, the product of that slow concentration. This is ideal for the way we live our lives because when we want energy, we want lots of it and we want it immediately so that we can heat a room, boil a kettle or drive a car.

Renewable energy sources are not like that, the energy is acquired relatively slowly so that we need to go through the same process of concentration until we have sufficient energy to be of use.

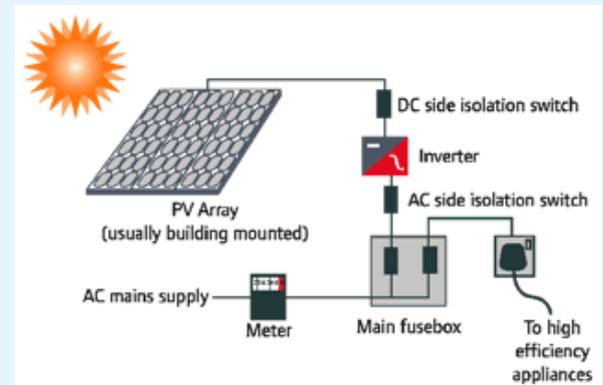
How It Works

Photovoltaic means electricity from light. Photovoltaic systems use daylight to power ordinary electrical equipment, for example, household appliances, computers and lighting. The photovoltaic (PV) process converts light directly into electricity.

A PV cell consists of two or more thin layers of semi-conducting material, most commonly silicon. When the silicon is exposed to light, electrical charges are generated and this can be conducted away by metal contacts as direct current (DC). The electrical output from a single cell is fairly small so multiple cells are connected together and encapsulated (usually behind glass) to form a module (sometimes referred to as a "panel"). The PV module is the principle building block of a PV system and any number of modules can be connected together to give the desired electrical output.

PV systems can either generate electricity that is stored on your property (in batteries) and runs on a separate circuit (known as a standalone system), or can be a Grid Connect system. The latter type of PV system is illustrated in the diagram below and involves using an inverter to change the low voltage DC generated to the higher voltage AC necessary for household electrical supply.

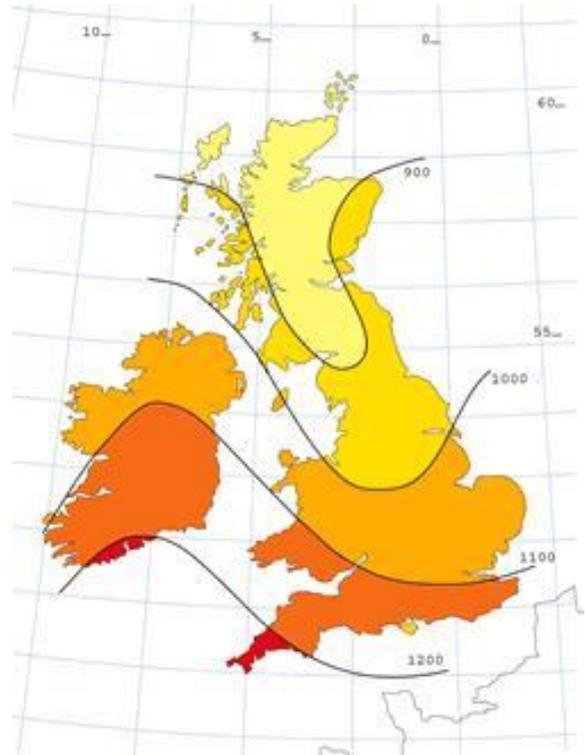
Basic Schematic





UK Average Solar Radiation

The map opposite shows the total UK solar irradiation in Kilo Watt hours per square metre. So, dependent on location every square metre of your house or garden receives between 800 and 1200 kW hours per year of solar energy. This energy is completely free! And in the UK we actually receive around two-thirds of the solar irradiation experienced at the equator. Whilst no-one can claim that the UK can benefit from solar energy to the same extent as say, Kenya, there are still significant amounts of free energy that a modern system can exploit with a high degree of efficiency. New technologies mean that solar energy can be harnessed more effectively now than ever before. Morri Consult has an enviable track record in maximising the potential that solar energy has to offer.



Typical Domestic System Size

Typical PV panels have a rated power output of around 185 - 255 Watts peak (Wp) each. A typical domestic system of 2 - 4 kWp may therefore comprise some 12 - 16 panels covering an area of between 12 - 40 m², depending on the technology used and the orientation of the array with respect to the sun.

To the end user (consumer) these include:

- Reduction of CO² emissions.
- Use of a free energy source (the sun) reduces use of fossil fuels – coal, gas, oil.
- Consumers enjoy more independence from utility companies.
- Advantages over other renewable energy technologies – well suited to the urban environment and silent.

Domestic systems can be roof or ground mounted and either of a fixed or tracking design.



Grid Connections

Note that some inverters allow power to be fed back into the UK mains supply, therefore allowing consumers to reduce their electricity bills through “net metering”. During the day, the electricity generated by the PV system can either be used immediately (which is normal for systems installed on offices and other commercial buildings), or can be sold to one of the electricity supply companies (which is more common for domestic systems where the occupier may be out during the day). In the evening, when the solar system is unable to provide the electricity required, power can be bought back from the network. In effect, the grid is acting as an energy storage system, which means the PV system does not need to include battery storage.

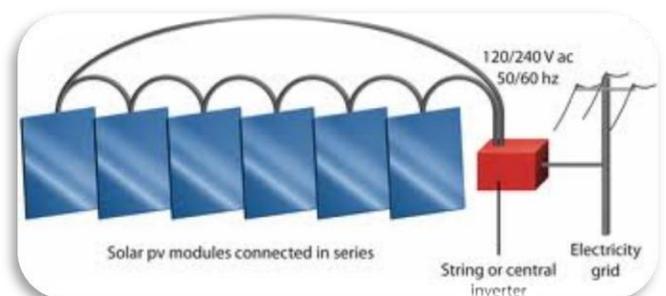
Solar PV Typical Costs

Installation cost is approximately £6,500 for a 4kW peak. A 1kW peak installation will generate approximately 800KWh per annum. The actual energy produced by a system will depend on the orientation of the panels, the angle of the roof and whether there is likely to be any shading on the panels. The Government’s Feed in Tariff will pay the system owner for every kWh produced by the system for 20 years. The pence paid per kWh depends on the size of system installed. The table below shows current Government Feed in Tariff rates. For more information about the Feed in Tariff visit <http://www.ofgem.gov.uk/Sustainability/Environment/fits/Pages/fits.aspx>.

Solar PV System Size	Tariff from 01/02/2013	Tariff Lifetime:
0kWp - 4kWp	15.44p per kWh	20 years
4kWp - 10kWp	13.99 per kWh	20 years
10kWp - 50kWp	13.03p per kWh	20 years
50kWp - 100kWp	11.5p per kWh	20 years
100kWp - 150kWp	11.5p per kWh	20 years
150kWp - 250kWp	11.0p per kWh	20 years
250kWp - 5MWp	7.1p per kWh	20 years

Inverters

All Solar photovoltaic installations require either one or multiple Inverters depending on the size and configuration of the array. The Inverter converts the variable direct current (DC) output of a photovoltaic (PV) solar panel into a utility frequency alternating current (AC) that can be fed into a domestic or commercial electrical grid or used by a local, off-grid electrical network



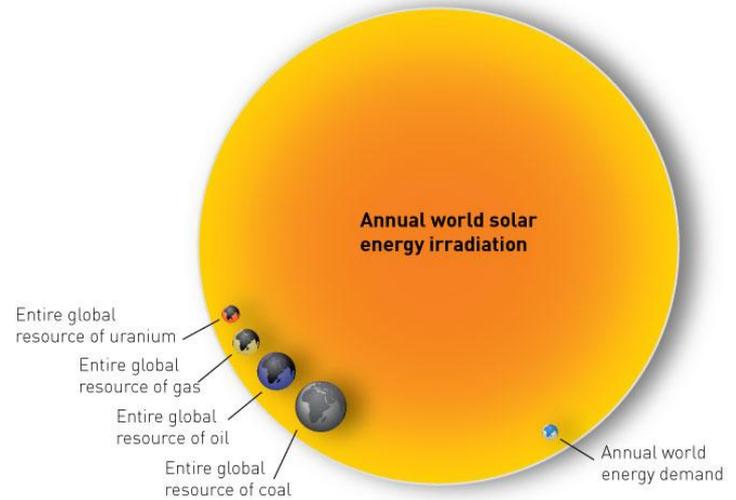


Facts about Solar PV Technology

1. Solar photovoltaic technologies use the sun's radiation to generate electricity.
2. The earth receives a continuous power input from the sun of 200 quadrillion Watts - that's 200 followed by 15 zeros! An unimaginably huge amount of energy which completely dwarfs the capabilities of fossil fuels or nuclear fission; and it is clean and free.
3. Solar PV generated power could, in theory, provide 10,000 times more energy than the world currently uses.
4. If we were to cover just 3 percent of the Sahara desert with PV panels we could generate all the worlds electricity requirements.
5. Solar PV collectors can be mounted on the roof of a building or in another location that has exposure to the sun i.e. a garden or field.
6. Solar energy provides "power security", enabling you to continue getting power even when utility power is disrupted.
7. Using solar energy is free and it is an environmentally friendly source of power.
8. The inclusion of PV panels on homes and businesses has been shown to increase property values.
9. Excess electricity can be sold back to the grid via your electricity provider.
10. PV systems can 'future proof' homes and businesses against rising costs associated with fossil fuels.

Our Policy

At Morri Consult we are happy to discuss all forms of alternative energy sources with you, to allow you to make the right decision. We won't try to sell you anything that is not economically right for you. We believe in giving it straight, in terms of the facts and figures, and what you can expect from an alternative energy source. We do not supply equipment from a single supplier; we will advise and help you select the product that best meets your needs. Above all we are always around to answer your questions and deal with any issues that may arise. We are professionally qualified engineers and passionate about renewable energy technology.



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