



Solar Energy

What is... Solar Energy

As the Sun burns an enormous amount of energy radiates to the Earth. This energy is used naturally all of the time to warm objects and our environment and is called passive solar heating. It is also possible to collect this energy using special panels coming under the heading of active solar heating. Solar panels are generally used to heat water or to produce electricity.

Passive Solar Heating

Although you may not be aware of it, passive solar heating has a direct effect on our environment, accounting for about 14% of space heating in British homes, transmitted through walls and windows.

When designing new buildings, consideration of passive solar effects can play a major part in reducing annual fuel bills for heating and cooling internal space.

Active Solar Heating

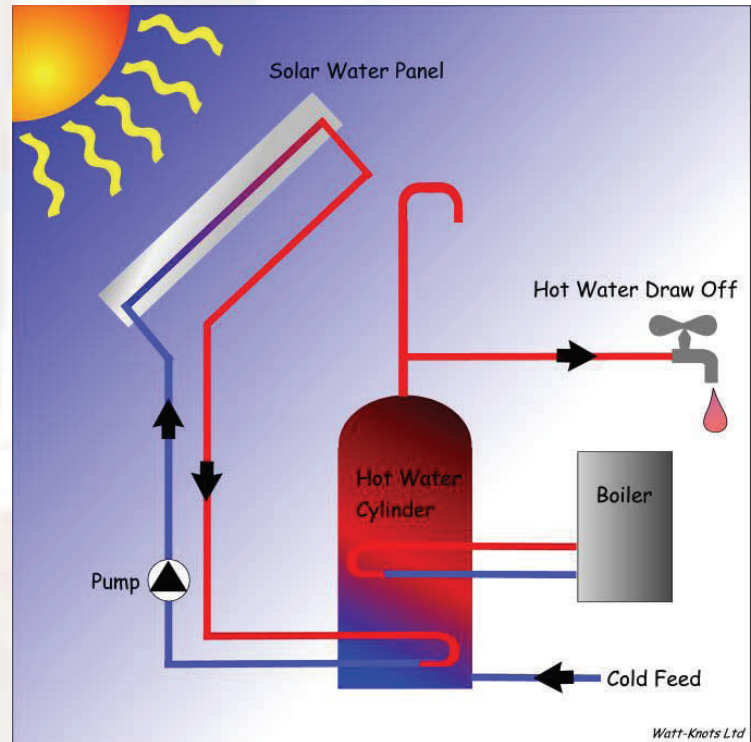
This type of solar heating uses a variety of panels to collect the sun's energy. They are generally used to either heat water or to generate electricity.

Water Heating

Solar water heating systems are currently the most popular form of solar energy used in the UK. This is due to the cost effectiveness and relatively simple installation.

The panels are installed on a south facing roof to maximise the available energy. The panels are connected to a sealed system containing a treated water solution to prevent freezing in winter.

Energy from the sun is absorbed by the fluid in the panels and when the temperature of this fluid is higher than that of water stored in the hot water cylinder, a pump is turned on to allow the heat to be



Simplified Solar Water Heating System

transferred to the stored water. A solar water system can provide over half of the hot water requirement of a domestic property during the year, although production is obviously greater during summer months.

There are three main types of solar panels which can be used in active solar heating systems:

- Evacuated tubes
- Flat plate collectors
- Unglazed plastic collectors

Evacuated Tubes

Panels can comprise a series of vacuumed glass tubes containing a finned pipe in the centre through which the system liquid is pumped, being heated by the sun in the process. The vacuum is very effective in preventing heat loss and ensuring good capture of the solar energy.



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Flat Plate Collectors

Panels can consist of small copper tubes which are attached to a sheet of metal to increase the effective surface area. The metal sheets are coated with a selective surface which allows energy to be more efficiently absorbed and retained.

The metal sheets and tubes are situated in an insulated housing, to prevent heat from escaping and covered with glass to maximise solar gain and prevent damage.

Unglazed Plastic Collectors

This less expensive type of collector is mainly used to heat outdoor swimming pools or other low temperature situations. Heat collection and retention efficiency of the simple plastic tubes is much lower, but so is cost.

Electricity Generation

Electricity can be generated from the sun's rays by using Photovoltaic (PV) panels. Each cell is only capable of producing about half a volt, but connecting many cells together allows greater voltages to be produced.

Typically a number of panels are connected together to form an array, which may be capable of supplying all of the energy needs for a site or simply reducing the amount of mains (grid) supplied electricity required.

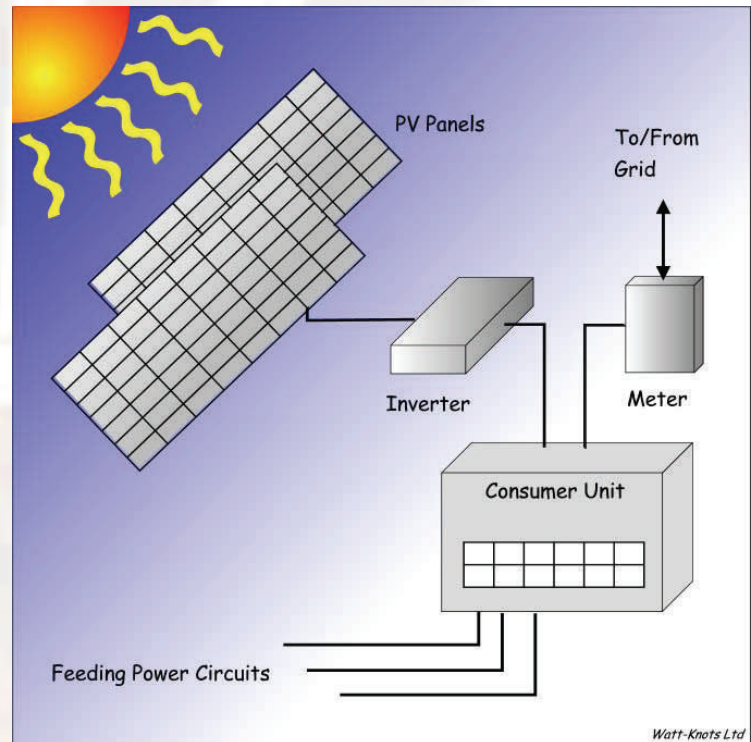
PV array's are typically mounted on a south facing roof, but panels can also be incorporated directly into the building structure.

Grid Connected PV System

In many installations, the amount of energy produced by the PV array is insufficient to meet all of the site energy requirements. During periods of high energy demand and low/no generation, extra power is taken from the grid. Conversely, during periods of low energy demand, additional energy

produced by the array can be fed back into the grid, thus reducing the total energy bill still further.

Grid connected systems require an inverter to change the 12 volt DC supply produced by the panels into a 240 volt AC.



Simplified Grid Connected PV System

Off Grid PV System

PV systems are ideal in remote areas where access to the grid is not possible. In these situations it is necessary to incorporate batteries which are charged by the panels to allow energy use during periods when energy cannot be produced, typically at night.

Solar energy can provide an ideal solution for reducing the amount of energy used from burning fossil fuels. Consideration should, however, be given to all forms of renewable energy to ensure that the most appropriate solution is implemented. Watt-Knots are able to undertake a feasibility study to assess your renewable energy options, allowing you to make the decision that is right for you.