solargreen
energy for life

how does a solar thermal system work?

Solar Thermal or Solar Hot Water systems have been used widely and the simple but efficient process of turning daylight to heat is well tried and tested, the system operates in the following way:

light – The Solar Thermal panel is able to efficiently use both direct and diffuse light. Hot water can be produced even on a cool Autumnal day even when the sky is overcast or cloudy.

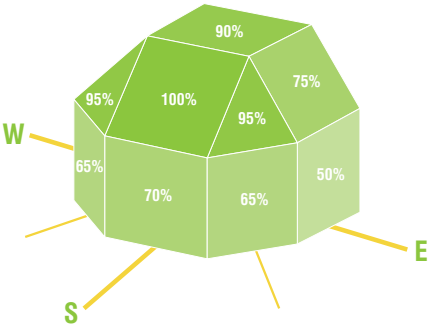
collectors – The Solar Thermal collector is mounted on a roof top and is especially designed to absorb as much heat and light from the sun whilst loosing as little of the captured heat as possible. The collector is constructed with a specially coated absorber plate behind which pipework transfers the heat collected by the plate to heat the hot water cylinder.

controller and pump – To gain as much energy from the collectors as possible the controller measures the heat available at the collector and the heat required for the water in the cylinder. Once the collectors are hot enough the controller activates a circulation pump transferring heat from the collectors to heat the hot water cylinder. Once the cylinder is up to temperature the pump is stopped again.

cylinder – The solar cylinder is slightly larger than a conventional cylinder; it has two coils, one connected to the boiler and one connected to the collectors. The additional capacity of the cylinder provides a means of storing as much of the hot water, heated by solar energy, as possible.

is my building suitable?

The solar collectors come in two forms 1) flat plate collector, which is best mounted on a pitched roof where it will receive plenty of daylight, the collectors can be integrated into a roof space to look like a window light and 2) vacuum tube collector which require approximately 40% less roof area than a flat plate and has the flexibility to be mounted perfectly flat or vertically for instance in a façade or on a West or East facing aspect.



hot water demand – A Solar Hot Water system is most efficient when there is a consistent demand for hot water for example on a residential building or a swimming pool. The system can store heat for short periods of time but the hot water will need to be used to enable the collectors to continue to capture available solar energy.

orientation – The collectors will work best when positioned to face perfectly South and tilted at 35 degrees from the horizontal.
NB Although not ideal the vacuum tube type collector does possess the flexibility to work effectively in a Westerly or Easterly facing direction.

shading – To maximise on efficiency shade cast by trees, chimneys and the like should be avoided or minimised.

space – The Solar Hot Water collectors tend to be relatively compact in relation to the available roof space. For a domestic application a collector area of 3 to 5sqm will generate 50 to 60% of the daily hot water needs for up to 5 people. For other types of building, the space required is dependent on the volume and pattern of hot water usage.

structural strength – The collectors when filled have a maximum dead load of between 30kg per sqm which in general is well within the structural capability of most modern roofs.

steps for designing a system?

1. confirm hot water usage – We start the design process by estimating the hot water usage. To design and install the most effective system it is best to be realistic about the amount of hot water which is likely to be used as over sizing is not only inefficient and uneconomic it can also reduce the life of the system.

2. collector position – The position of the collector should be outside of any shaded area, preferably facing South and with the shortest pipe-run to the cylinder to reduce the amount of energy lost in the pipe-work between the cylinder and the collectors.

3. cylinder – The cylinder size is calculated on the volume of hot water required and is indirectly a factor of the total collector area.

4. performance prediction – We simulate the proposed system with predicted hot water demand to analyse the efficiency of the system and if necessary to make changes to the design.

what will it save me?

In the UK the system when working effectively will produce 300 to 500 kWh / sqm / year but it is dependent on the type of system and the demand for hot water heating. For a residential scheme a saving of up to 70% could be expected for heating hot water down to 20% for a large office scheme with in consistent and small amounts of hot water usage.

The carbon saved by a Solar Hot Water system is dependent on the energy it is replacing. For electrically heated hot water the system will displace about 215kg of CO2/sqm of collector area. For gas heated hot water the system will displace about 16kg of CO2/sqm of collector area.

Solar Green can propose the most appropriate configuration for you to achieve a particular reduction in CO2 or a particular target in onsite renewable energy generation.

what will it cost?

Currently there are grants available through the Low Carbon Building Programme towards the installed cost of a Solar Hot Water system.

community buildings – There is a grant of 50% through the Low Carbon Building Phase II programme. There is also top-up funding available from certain trust funds for community based projects.

residential projects – There is a grant available of £400 through the Low Carbon Building Programme Phase I programme. Solar panels are subject to a reduced rate of VAT as an energy saving device, for existing dwellings this means that VAT is charged at 5% and for new dwellings 0%.

commercial buildings – There is 100% enhanced capital allowance available to businesses against the full cost of the system and for SME there is an interest free loan available to some systems through the Carbon Trust.

The cost of the system, before the grant, will be between £1200 and £2000 per sqm of collector dependent on the scale and specification of the system.

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

how long will it last?

The Solar Hot Water collector has been well tried and tested and we would expect the system components to last 20 years.

Periodically the system's heat transfer medium will need to be checked to ensure that it is in good order, over a period of time the medium will loose it's anti-freeze properties. Manufacturers recommend the medium is checked and if necessary changed every 4-5 years.

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