Solar Water Heating Basics

Severn Wye Energy Agency

Key Points

- Heats or pre-heats water
- Negligible greenhouse gas emissions during operation
- Negligible air pollution created whilst in operation.
- In the UK it will provide around 50% of the annual hot water needs of an average household

Why is it important?

Solar water heating is a simple way to harness energy from the sun to reduce pollution caused by energy used in water heating.

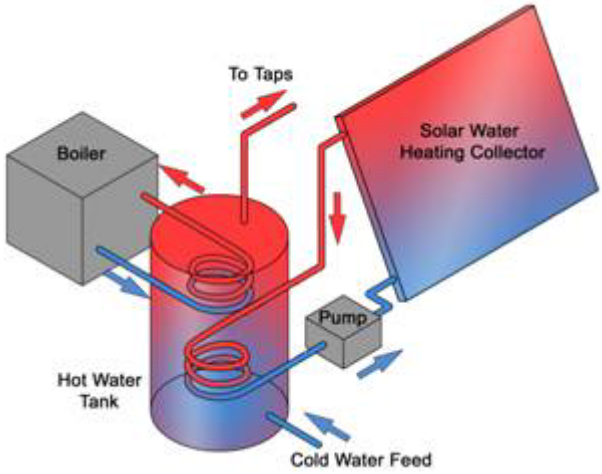
Solar water heating systems heat water whilst releasing only negligible amounts carbon dioxide which contributes to climate change. These negligible emissions are caused by the energy used by the systems circulating pump, these can be avoided by using by using green electricity or if the system can be designed without a pump. The solar panels produce no local pollution during operation and their manufacture causes no significant environmental impacts compared to other industrial processes.

How does it work?

Solar panels are designed to absorb the sun's energy and transfer this to your water heating system. They are a simple idea made more efficient by using modern materials and technology to make sure the panels trap as much of the sun's heat as possible and lose as little of this heat as possible.

Solar panels absorb heat from the sun which heats up a fluid passing through the panel in pipes. The fluid is then piped through a hot water tank to heat the hot water supply.

The way in which solar water heating systems fit into a domestic heating system varies quite widely due to the different types of boilers and heating systems in domestic properties. A common system would use a heat exchanger in the hot water tank (see diagram opposite).



***Solar water heating systems**: Above is one of the most common methods of integrating solar water heating into a hot water system.*

Evacuated tube solar collectors

Flat plate solar collectors

What does it look like?

The panels are generally fitted on to the roof and a typical home system might be 2-4m^2 in size. There are two basic types for domestic water heating, one looks like a simple flat black panel (flat plate collectors) and has a similar appearance to a sky-light. The other system appears as a collection of glass tubes (evacuated tube collectors).

How much energy can it generate?

In the UK, solar water heating systems for the home are designed to work in conjunction with another water heating system, such as a gas, oil or wood boiler.

An average home system might provide almost all your hot water over the summer. Through the rest of the year it will pre-heat the water which will then be brought up to temperature by the conventional hot water system. Over the course of a whole year most solar panels should provide around 50-60% of the total energy used by your hot water system.

Solar Water Heating—Basics

How much does it cost?

A home solar water heating system costs about £2,500-£4,500. By installing the system yourself the cost can be around £1,500-£2,000. Larger systems cost slightly less per unit of energy output.

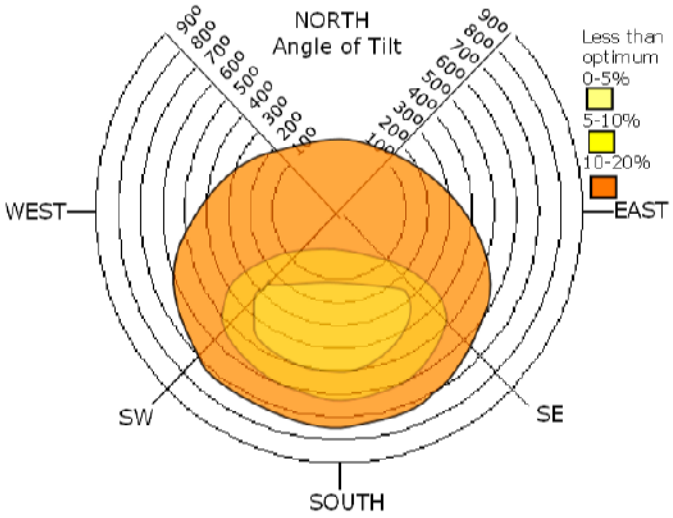
The lifetime of a solar panel is likely to be well over 20 years. Depending on the type of system and the fuel otherwise used for heating your water, most solar water heating systems will pay for themselves in fuel bill savings, over the lifetime of the panel.

Solar panels produce most heat during the day in the summer. This makes them particularly suited to heating outdoor swimming pools which are primarily used in summer. Swimming pools do not need very hot water so the panel itself can also be simpler and cheaper making it particularly cost effective.

A solar collector designed specifically for heating swimming pools, it has a simple construction making it cheaper that a domestic type system[1].

Where can it be sited?

The ideal position is on a south east to south west facing roof (within about 15° of South is best, see diagram below). The panel is best mounted on a slope of about 45° (although between 15-60° is usually acceptable), so panels are usually mounted on a pitched roof as shown in the pictures (on this fact sheet overleaf).



The above diagram shows the orientation and tilt that receives maximum solar radiation.

Although solar energy will work in the shade, it will greatly reduce the energy output. You should ensure that the site will not be overshadowed by trees or other buildings.

When looking at solar water heating systems, it is important to consider your existing heating system and how they can be integrated (installer can help with this). Combi boilers do require some special consideration as they do not have a tank; if the boiler accepts a 'hot water feed', it is usually possible to integrate a solar panel.

In general, planning permission is only likely to be needed if your home is in a conservation area. Check with your local council if you have any doubts.

References

(1) Solar water heating system for a Swimming pool - Filsol Ltd.

Environmental effects?

Solar water heating systems have the following benefits in their operation: -

- Negligible noise
- Minimal visual impact
- Minimal CO_2 and air pollution (negligible amount produced if a pump is powered from non-renewable electricity)

Typical systems require an electric pump to pump the fluid through the solar collector, this can be run by a small Photovoltaic panel. Systems called thermo-siphons do not require a pump due to the layout of the system and the natural circulating effect of the fluid as it is heated.

Further Information

- Solar Trade Association
  www.greenenergy.org.uk/sta
  01908 442290
- Centre for Alternative Technology
  www.cat.org.uk
  Tel: 01654 705981
- National Energy Foundation
  www.greenenergy.org.uk
  Tel: 0800 138 0889

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