

Solar Hot Water

Summary:

- * Should face south, or between SE and SW
- * Tilted 20-50 degrees, ideally 30-40 degrees
- * Flat plate or evacuated tubes
- * Need room for a storage tank
- * Used for hot water but not space heating
- * Flat plate typical size = 4m²
- * Evacuated tubes typical size = 3m²
- * Meets about 40-60% of hot water demand
- * Needs conventional water heating as back up
- * Costs £2500-£3000 for flat plate
- * Costs £3000-£4500 for evacuated tubes
- * Grants for profession installation

Energy from the sun

Solar water heating systems gather energy radiated by the sun and convert it into useful heat in the form of **hot water**.

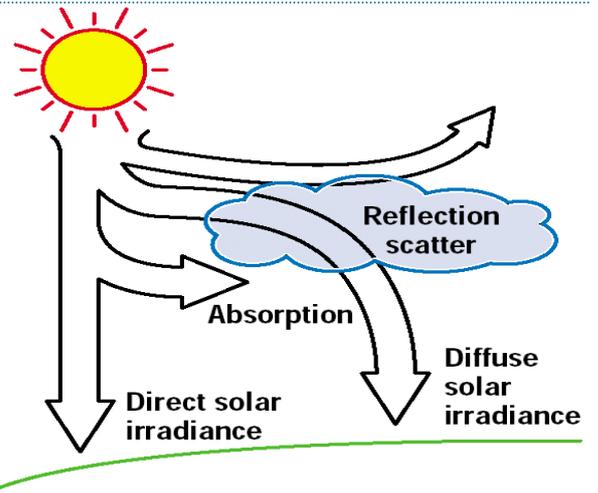
Solar panels have been available since the 1970s and the technology is now well developed with a large choice of equipment.

They represent the most **cost-effective** use of solar energy.

They are the most common domestic renewable energy installation with over 80,000 in the UK.

The hot water produced is used for showers, dish washing, washing cloths and for swimming pools.

Generally Solar panels are not used to provide space heating.



A solar panel does not need direct sunlight to work.

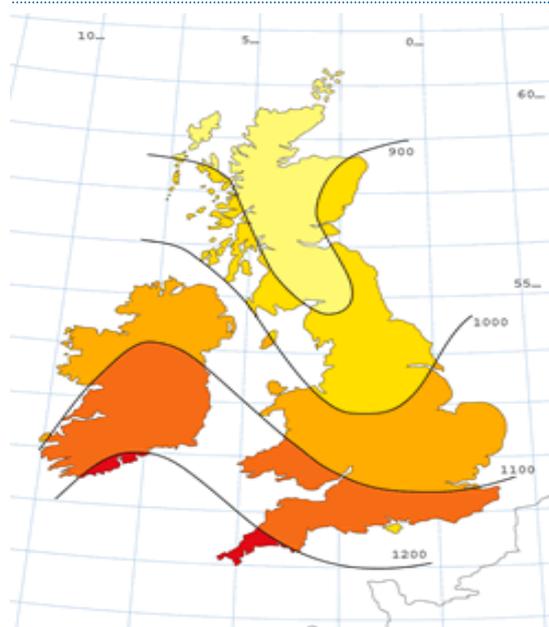
Obviously the intensity of the sun's rays varies from season to season.

However, there is a fairly stable 50/50 proportion of **diffuse and direct** light.

A solar system typical meets **40-60%** of a household's hot water needs over the year and in summer can meet 80-100% of demand.

Solar systems work well in combination with a conventional heating system, which can be switched off during the summer.

Solar energy in the UK



“Archimedes is reported to have boiled water using a concave mirror as early as 214BC”

Northern Ireland gets about 1100 kWh of sunshine on every M². Scotland a bit less 1000 - 900 kWh and the south of England a bit more 1200kWh.

Solar Heating systems will typically **convert 30-50%** of the solar energy falling on the solar collectors into useful heated water.



NOTES

System overview

A solar water heating system is usually integrated with an existing water heating system to ensure year round hot water.

There are three main components:

- Solar panels/collector
- Hot water cylinder
- A plumbing system

Solar panels are usually fitted to the roof and transfer heat from the sun's rays to a fluid.

A **hot water cylinder** stores the hot water heated during the day and supplies it for use later.

Solar cylinders have two **heat exchanger coils**. These transfer heat into the water in the tank.

The first one connects into the **existing boiler**. Water is heated by the boiler and pumped to the hot water tank where the heat is transferred to the water in the tank.

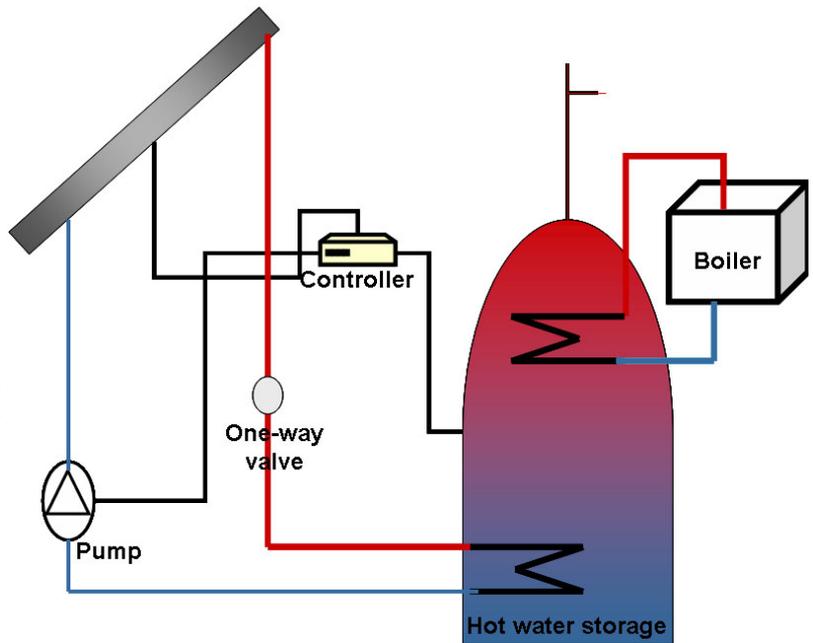
the tank. The water heated in the boiler is in a closed **system** and does not fill up in the tank.

The hot fluid coming from the solar panel heats water in the storage tank.

This fluid can contain an **anti-freeze** to help protect the system in winter.

The fluid in the coil then cools down and is pumped back, through another pipe, to the collector.

The system forms a continuous loop that brings heat to the cylinder and returns cold fluid to the collector for re-heating by the sun.



The fluid is circulated through the closed loop system by means of a **pump**. A pipe carries the hot fluid to the domestic hot water cylinder, where the heat exchanger coil gives up the heat to the water in the tank.

The **controller** compares the temperature of the water in the tank with that produced in the panel and turns on the pump when the water produced by the panel is warmer than the water in the tank.

Hot water cylinder



For most people their need for hot water does not coincide with daylight hours.

Hence the cylinder's function is two-fold:

Firstly, it must effectively transfer heat from the solar collector to the stored water.

Secondly, it needs to have a large enough capacity to smooth the light energy fluctuations not just

throughout the day but from day to night and from bright through dull days.

It is an often under-rated component of the solar system but should be big enough to exceed the daily hot water demand by a **factor of 1.5 to 2**.



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Types of collector



Flat plate panels typically look like a Velux window.

They can be set flush with the roof or on a frame on top of the roof.

They have an **efficiency of around 30%**. Which means that they can convert 30% of the 1200kWh of sun energy falling on each m².

Evacuated tube collectors are set on the roof rather than integrated into it.

Systems will often have 20 or 30 tubes that connect into a manifold.

The vacuum is beneficial because it reduces convection heat losses due to air movements. This makes the evacuated tubes more efficient.

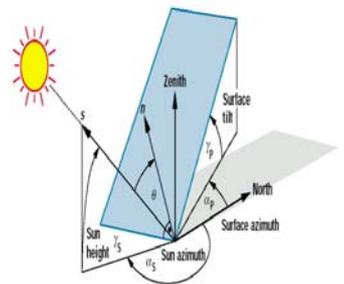
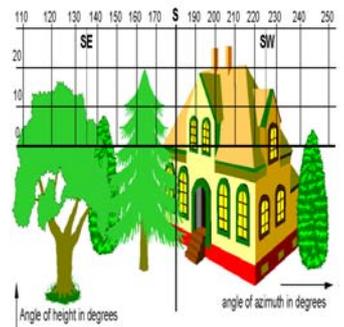
Evacuated tube systems **occupy a smaller area** and have an efficiency of approximately **40-60%** but are generally **more expensive** to install.

If you have a limited amount of space on your south-facing roof then an evacuated tube system may be best.



Is my home suitable?

- Roof orientation - the roof should be south facing to maximise the solar energy it receives but will be suitable providing it faces between SE and SW.
- Size of roof - 3m² for evacuated tubes and 4m² for flat plates.
- Angle of roof - between 20-50 degrees and ideally between 30-40 degrees.
- Weight loading of roof - a structurally sound roof to take the 40-50kg of additional weight.
- Shading - can cause losses of performance. Assess shading on an area at different times of the day and year.
- Type of heating system/water storage - vented, unvented or combination boilers. If you have a combi, can it take hot water on the inlet?
- Space for a large hot-water storage tank - recommended storage for a family with 4-6 people is 300–500 litres.
- Economics – the fuel replaced will determine savings.



Maintenance

Solar hot water systems generally come with a 5–10 year warranty and require very **little maintenance**.

A yearly check by the householder and a more detailed check by a professional installer every 3-5 years should be sufficient (you should consult your

system supplier for exact maintenance requirements).

Losses of 2–10% can result if the panel is never cleaned.

However, rain and snow can clean a tilted surface more easily.

The systems are given a **lifetime of 25–30 years**.



NOTES

Permissions

Building control approval will be required.

Planning permission is not usually required for solar hot water panels unless:

- The panel projects more than 150mm above the plane of the roof in Northern Ireland or 200mm in England.

- The building is in a conservation area.
- The building is in a World Heritage site.
- The building is listed.

What does it cost?

Cost start from £2500 installed.

However, it depends on the size of the collector and the system to be installed.

Flat plate: £2500-3000 installed for 4m² system.

Evacuated tubes: £3500-4500 for 3m² system.

Information in grants is constantly changing but a good starting point is the Energy Saving Trust.
Tel: 0800 512 012

The average domestic system reduces carbon dioxide emissions by around 400–600kg per year, depending on the fuel being replaced.



More information

Energy Saving Trust advice centre
Tel: 0800 512 012
www.energysavingtrust.org.uk

The Low Carbon Buildings Programme
www.lowcarbonbuildings.org.uk

Action Renewables
www.actionrenewables.org

Scottish Community and Household Renewables Initiative
www.energysavingtrust.org.uk/schri/

www.nie-yourenergy.co.uk/renewablegrants.php

www.solartradeassociation.org.uk

www.cat.org.uk

www.dti.gov.uk

www.greenenergy.org

www.lowimpact.org

www.solarenergy.ch