



# solar hot water



2 flat-plate panels on a domestic roof; they're thicker than solar electric panels, but only protrude about 10cm from the roof.

## what is it?

Also known as solar thermal, a solar hot water system is one that absorbs the sun's energy and transfers it to the water in a well-insulated storage cylinder, so that you have hot water when you need it. Solar hot water panels (usually called 'collectors') don't produce electricity – water flows through them, which they heat directly.

In temperate regions, it won't be the sole provider of hot water; it will complement a conventional system using gas, oil, electricity or solid fuel – but it will pre-heat water so that bills are drastically reduced. During summer months the system can provide all your hot water, and it should provide more than half the annual hot water needs for an average household.

Collectors are usually installed on a sloping roof, but can also be installed on a flat roof, or even on the ground.

The two main types of collectors are flat-plate and evacuated tube. Flat-plate collectors heat the water directly; evacuated tubes contain a fluid that evaporates at low temperatures, and the resulting gas rises and condenses on a manifold, transferring its heat as it does so.

Insulated pipes deliver the heated water from the collectors to a hot water cylinder.

Most systems are indirect, in that the liquid in the panels doesn't come out of the tap – it transfers its heat to the water in the cylinder via a heat exchanger (a coil of pipe in the cylinder) and then returns to the panels in a continuous loop, to be re-heated. In this kind of system, the heat transfer liquid can contain anti-freeze, and there's no problem with lime-scale build-up.

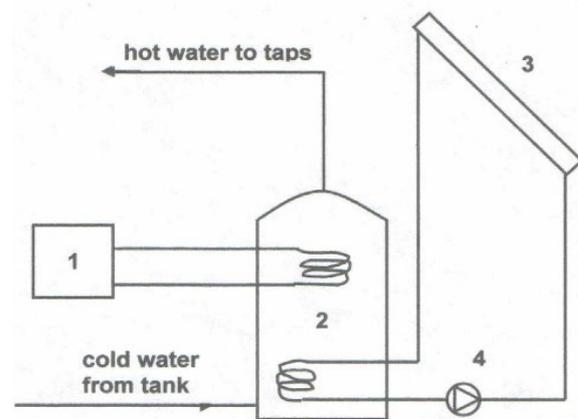
Panels can either transfer heat to a separate pre-heat cylinder, or heat a twin-coil cylinder via the bottom coil. There will be another coil in the cylinder that usually goes to a conventional boiler, but could be used with a wood stove (see below).

## what are the benefits?

Solar thermal, and other renewable energy sources, doesn't involve the burning of fossil fuels, which releases nitric oxides, nitrogen dioxide, sulphur dioxide, carbon monoxide, nitrous oxides, lead, particulates and hydrocarbons, which pollute the atmosphere, and cause damage to plants, ecosystems, and human respiratory health. The burning of fossil fuels adds over 40 billion tonnes of carbon dioxide into the atmosphere each year. CO<sub>2</sub> is an important greenhouse gas. In pre-industrial times there were 290ppm (parts per million) of CO<sub>2</sub> in the atmosphere; it's now well over 400ppm. The last time there was such a concentration of carbon in the atmosphere was 3 million years ago.

The increase in greenhouse gases in the atmosphere is raising the earth's temperature, accelerating biodiversity loss and causing desertification, famine, forest fires, an increase in tropical diseases, and flooding due to the melting of polar ice. In short, burning fossil fuels is a really bad idea, and we should relegate it to history as soon as possible.

Solar thermal reduces energy bills, and is possibly the most cost-effective renewable energy technology that you can install at home, with the shortest payback time. A DTI investigation into solar thermal in the UK from 1970-2000 found that a typical system provides 72% of a household's annual hot water needs (c. 15% in winter, 100% in summer). This is assuming that the roof is south-facing – although if it faces south-east or south-west there will only be a 5% loss of efficiency.



1. conventional boiler
2. twin-coil cylinder
3. solar hot water panels on roof
4. pump

*Indirect solar hot water system: the boiler will kick in if the solar coil in the cylinder doesn't raise the temperature of the water enough.*



### what can I do?

Talk to other system owners, read our book, *Solar How Water: Choosing, Fitting & Using a System*, attend courses, get as much info as you can. Make sure your home is well-insulated, in good repair and dry before thinking about renewables.

A solar hot water system is for delivering hot water to your taps, shower and washing machine / dishwasher. It could be used for supporting space heating, but those types of systems are more expensive and make specific requirements of your house – for example, it needs to be super-insulated and you need more panels.

Make sure your roof is facing the right way (see above), and that your cylinder has an extra coil to add solar, or that one can be fitted – but often, you'll need the space to install a larger, twin-coil cylinder. If you can manage to position your collectors below your cylinder, then because hot liquid rises, you won't even need a pump to deliver the transfer fluid from your panels to your cylinder. You can buy a system installed, self-build and install, or self-build and then have a professional installation. To self-install, you need plumbing experience, and to understand that solar thermal installation has some unique characteristics that can be quite demanding.

There are often government incentives to install renewables. Search online for grants, or see the *Energy Saving Trust* website for the latest news.

You probably won't need planning permission, unless you live in a listed building or a conservation area. Check with your local planners, or your installer can help.

Decide whether you want evacuated tubes or flat-plate collectors. Installed prices for both are typically £3-5000. Flat-plate collectors will have a 'selective surface' – a special coating that maximizes absorption of solar radiation and minimizes re-emission; in temperate climates, selective surface flat-plate collectors are only slightly less efficient than evacuated tubes. But tubes are a bit more efficient, so you'll need a smaller area for the same output – important if you don't have much roof space. Flat-plate systems historically have been more reliable over longer periods of time – there's less to go wrong, and they tend to operate at lower temperatures.

Solar hot water works well in combination with a wood stove with a back boiler. The solar panels will provide all your hot water in summer, and the



Evacuated tubes.

wood stove the same in winter. Then you'll have year-round hot water from renewables. This will involve installing a triple-coil cylinder (or having another coil installed in your twin-coil cylinder) if you intend to keep your existing boiler, or a twin-coil cylinder if you don't.

Modern systems are automated. You don't have to switch them on and off, or re-set clocks after power cuts; and you don't have to change how you use hot water (although if you do, you'll get more benefits – for example, if you change from having a shower in the morning to the evening).

There are (cheaper) special systems for swimming pools, consisting of a large area of black tubing.

NB: if you're thinking of getting solar hot water at some point in the future, then maybe think twice about installing a combination (combi) boiler. It's not impossible, but it's very difficult and expensive to combine solar hot water with a combi. Condensing boilers are fine.

Your installer will leave you with a checklist to make sure everything is working properly every couple of months (if you install yourself, you'll know what these are). It might be good to have a full maintenance check every 5 years or so.

### resources

- see [lowimpact.org/solar-hot-water](http://lowimpact.org/solar-hot-water) for more info, courses, directory, links and books, including:
- Lee Rose, *Solar Hot Water*
- Ramlow & Nusz, *Solar Water Heating*
- Chris Laughton, *Tapping the Sun*
- [energysavingtrust.org.uk](http://energysavingtrust.org.uk) - advice, inc. grants
- [r-e-a.net](http://r-e-a.net) – information, member directory
- [solarenergyuk.org](http://solarenergyuk.org) – trade association for solar

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