



Centre for
Alternative
Technology

SOLAR WATER HEATING

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For more information sheets, see our web site: www.cat.org.uk/information

Solar water heating or solar electricity?

There are two rather different technologies that use roof-mounted panels to collect solar energy.

This information sheet is about solar water heating (sometimes called solar thermal) technology, a way to directly heat water for domestic use, e.g. in showers.

For information on generating electricity using photovoltaic solar electric panels, see our free information sheet on **Solar Photovoltaics**.

How does solar water heating work?

A solar water heating (SWH) system consists of three major components: one or more solar collectors (tubes or panels, usually mounted on a roof), a pump connected to a controller and a hot water cylinder with two heating coils (twin coil cylinder).

The collector uses the solar energy from

sunlight to heat a thermal fluid (water with antifreeze). If the fluid in the collector is hotter than the water in the cylinder then the controller activates the pump to pump the fluid through the coil in the cylinder, thus heating water in the cylinder for showers and hot water taps. The second heating coil in the cylinder is connected to a back-up boiler (e.g. gas boiler) to provide hot water when there isn't enough sunshine.

Is my home suitable for SWH?

Ideally, solar collectors should be south-facing and free of shade, at an angle of between 20 and 50 degrees, but panels facing south-east or south-west will also operate efficiently. Figure 2 (next page) illustrates how SWH performance varies with tilt and orientation.

Rooftop panels are the most common, but they can also be mounted at ground level.

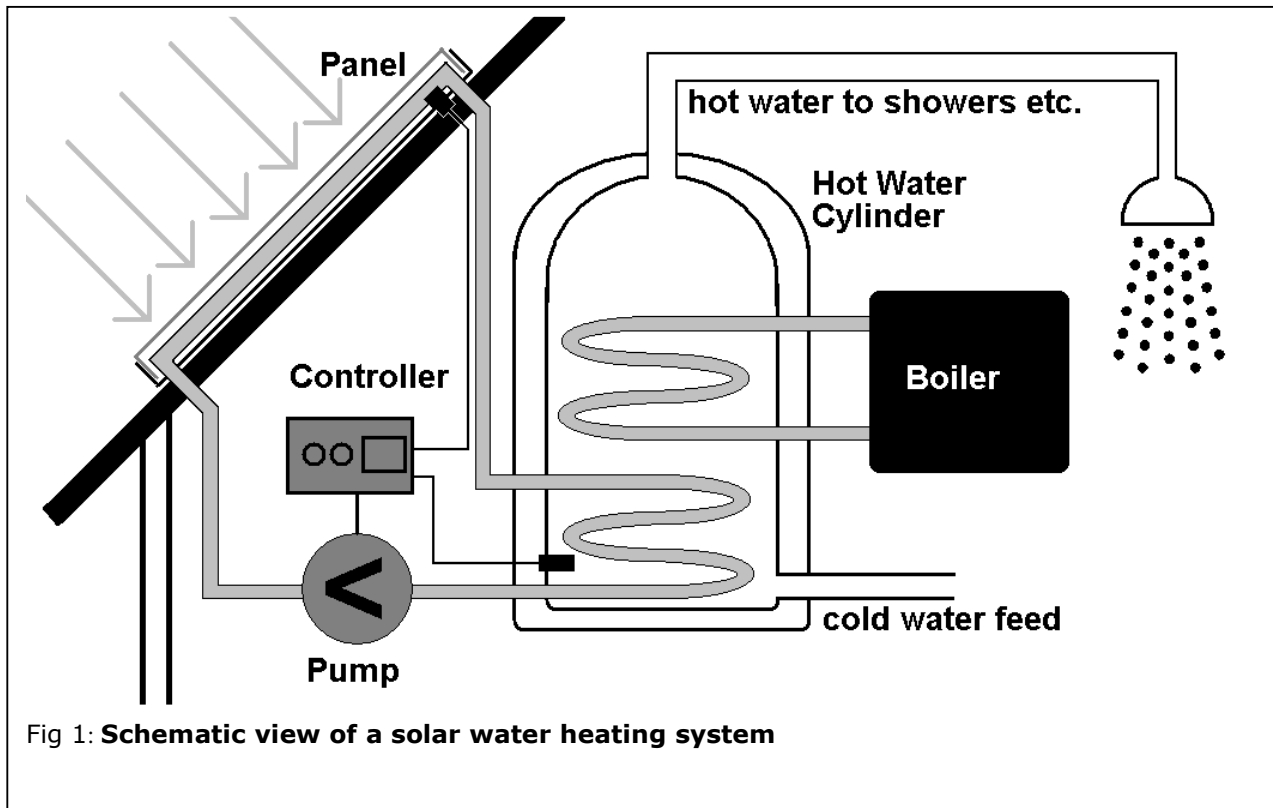
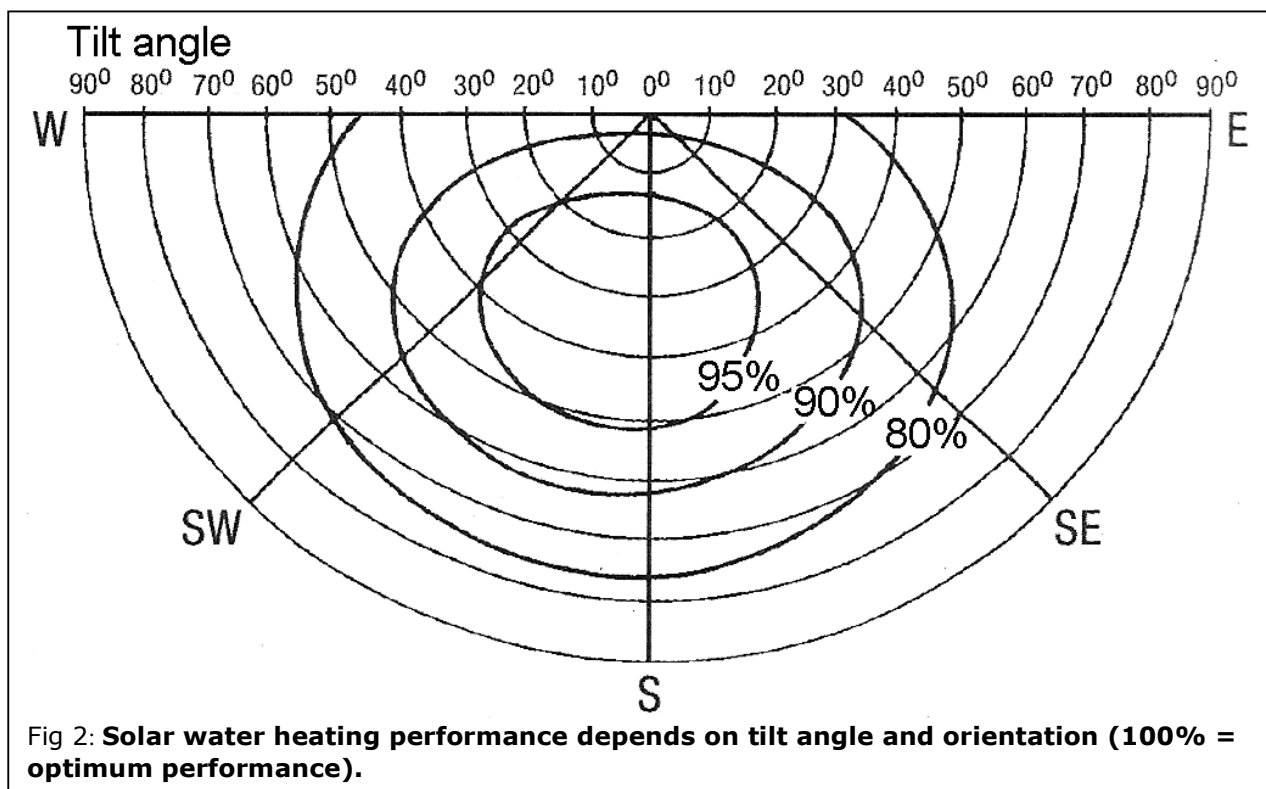


Fig 1: Schematic view of a solar water heating system



SWH works best on a south-facing roof, but even an east or west facing surface can still produce a good amount of hot water. The SWH system heats water in a cylinder, therefore it is difficult to add solar water heating to a heating system that doesn't have a hot water cylinder (e.g. a "combi" gas boiler which heats the water on demand when you turn on a hot water tap).

Roof mounted panels are usually a 'permitted development', so you won't need planning permission. Exceptions include National Parks, Areas of Outstanding Natural Beauty, conservation areas and listed buildings.

How many panels will I need?

As a rule of thumb, you will need about 1m² per person. Of course, this will depend on a number of factors, such as the orientation of your roof, the size of your hot water cylinder – and on how much hot water you use!

Collector panels are usually between 2 m² and 3 m², so a typical house often has either one or two of these panels.

Which collector type should I chose?

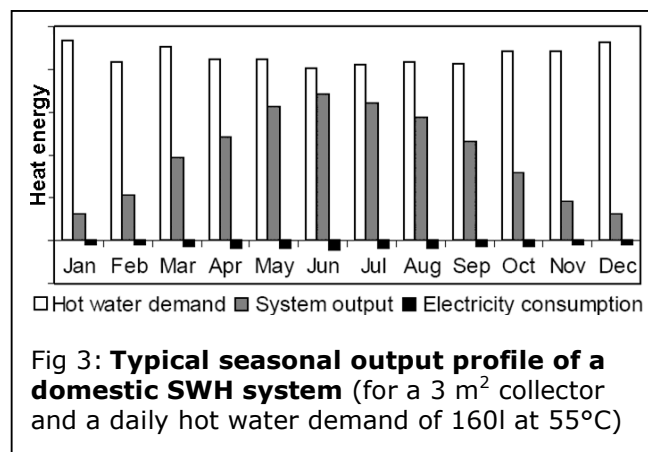
There are two types of SWH collectors typically used in the UK: Flat panel and evacuated tube collectors. Both have their strength and weaknesses – for example, evacuated tubes perform better on cold

sunny days and flat panels protrude less from the roof – but overall they deliver similar value for money.

How much hot water can SWH produce?

A typical solar water heating system in the UK will produce between 40% and 60% of the hot water a household uses over the course of a year for showers etc. As Fig. 3 illustrates, most of this hot water will be produced in summer.

Because the solar radiation is much weaker in winter, SWH will not produce enough heat for your hot water in winter, and it will not help with your space heating (radiators).



What's the likely cost?

A typical SWH system mounted on a house in the UK will cost between £2,500 and £5,000.

A big part of this cost is for plumbing and scaffolding, so you can sometimes save money by installing SWH while carrying out repair work – or by integrating SWH in the construction of a new building.

Does SWH make financial sense?

Yes! The combination of fuel savings and a new government support scheme, the **Renewable Heat Incentive** (RHI) now means that a typical SWH system in the UK can, over its lifetime, pay back twice its initial cost.

See Box 1 below for an example calculation.

How do I find an installer?

To qualify for Renewable Heat Incentive payments you'll need to use installers and equipment accredited under the Microgeneration Certification Scheme (MCS). A list of MCS installers can be found at www.microgenerationcertification.org

You could also check if the installer belongs to a professional body that promotes high standards, and you should always get a few quotes to compare.

Contacts

Microgeneration Certification Scheme

Tel: 020 7090 1082

Web: www.microgenerationcertification.org

Lists installers accredited for the Renewable Heat Incentive.

Energy Saving Trust

Freephone: 0800 512 012;

Web: www.est.org.uk

Advice on energy efficiency measures and details of any other grants or support.

Trade Associations:

Solar Trade Association

Tel: 01908 442 290;

Web: www.solar-trade.org.uk

Trade body who promote high standards of service in the solar water heating industry.

The Institute of Domestic Heating & Environmental Engineers (IDHEE)

Tel: 02380 66 89 00; www.idhee.org.uk

Association of Plumbing & Heating Contractors

Tel: 024 7647 0626; Web: www.aphc.co.uk

Chartered Institute of Plumbing & Heating Engineering

Tel: 01708 472791; www.ciphe.org.uk

Box 1: The economics of solar water heating

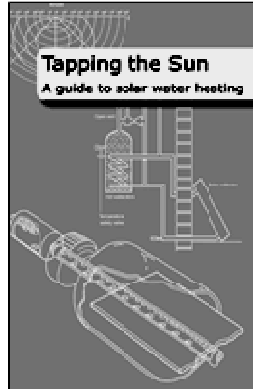
A typical UK household uses around 2,500 kWh of energy per year to heat water for showers and hot taps. A solar water heating system that produces 60% of the total hot water thus saves around 1,500 kWh in energy bills.

Annual payments and savings		
Renewable Heat Incentive payments	1,500 kWh x £0.18 / kWh	£270
Energy bill savings if using <i>gas</i>	1,500 kWh x £0.03 / kWh	£45
Energy bill savings if using <i>electricity</i>	1,500 kWh x £0.12 / kWh	£180
	Total annual income + savings	£315 - £450

With a system cost of £2,500 - £5,000, the total income over a system's lifetime of 20 years can be twice as high as the upfront system cost.



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Tapping the sun

Fully revised and updated by experienced solar water heating installer Chris Laughton of The Solar Design Company, *Tapping the Sun* is the introduction you need if you want to upgrade your home hot water system to solar. A complete step-by-step guide, *Tapping the Sun* covers all the elements of adapting a conventional domestic water heating system - from likely costs and equipment to basic mechanical principles and legal issues, it cuts right through the technical jargon and shows just how the changes can be made.

56 pages, £7.99

CAT Short Courses 2010

www.cat.org.uk/shortcourses/ ☎ 01654 704952

- 24-28 May ***Solar Domestic Water Heating for Installers/Specifiers***
Professional qualification course for qualified installers/specifiers. BPEC certification.
- 23-25 July ***Solar Water Heating Systems***
This course is ideal for those who want to understand both the theory and practice of solar water heating systems. Sessions will cover types of collector, energy storage, plumbing and controls. There will be hands-on practicals for constructing a simple collector and a working solar system
- 31 July ***Is it for me? Solar Water Heating Taster Day***
Is Solar Water heating suitable for you? This one day course will help you find out.
- 29 Nov - ***Renewable Heating Systems***
- 3 Dec Various renewable technologies for domestic heating will be examined in this course, including solar water heating, biomass, heat pumps, domestic CHP and gas condensing boilers.

CAT Consultancy

www.cat.org.uk/consultancy/ ☎ 01654 705991

For in-depth advice on renewable energy you may find our consultancy service useful. Our experts can give detailed technical advice, either in person or over the phone.

CAT Charity

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www.cat.org.uk/fundraising/ ☎ 01654 704953

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