



# Solar Water Heating

Information Service, Centre for Alternative Technology, Machynlleth, Powys, SY20 9AZ.

Tel: 0845 3308373 or 01654 705989; e-mail: info@cat.org.uk

<http://info.cat.org.uk/solar-water-heating>

## Solar water heating or solar electricity?

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

This information sheet is about solar water heating (sometimes called solar thermal) technology, an efficient way to heat water needed for showers, baths and hot taps.

For information on using photovoltaic (PV) solar electric panels to generate electricity to run domestic appliances, see instead our free sheet on **Solar Photovoltaics**.

## How does solar water heating work?

A solar water heating (SWH) system consists of three major components:

1. One or more solar collectors (tubes or panels, usually mounted on a roof),
2. A pump connected to a controller
3. A hot water cylinder with two heating coils (called a twin-coil cylinder).

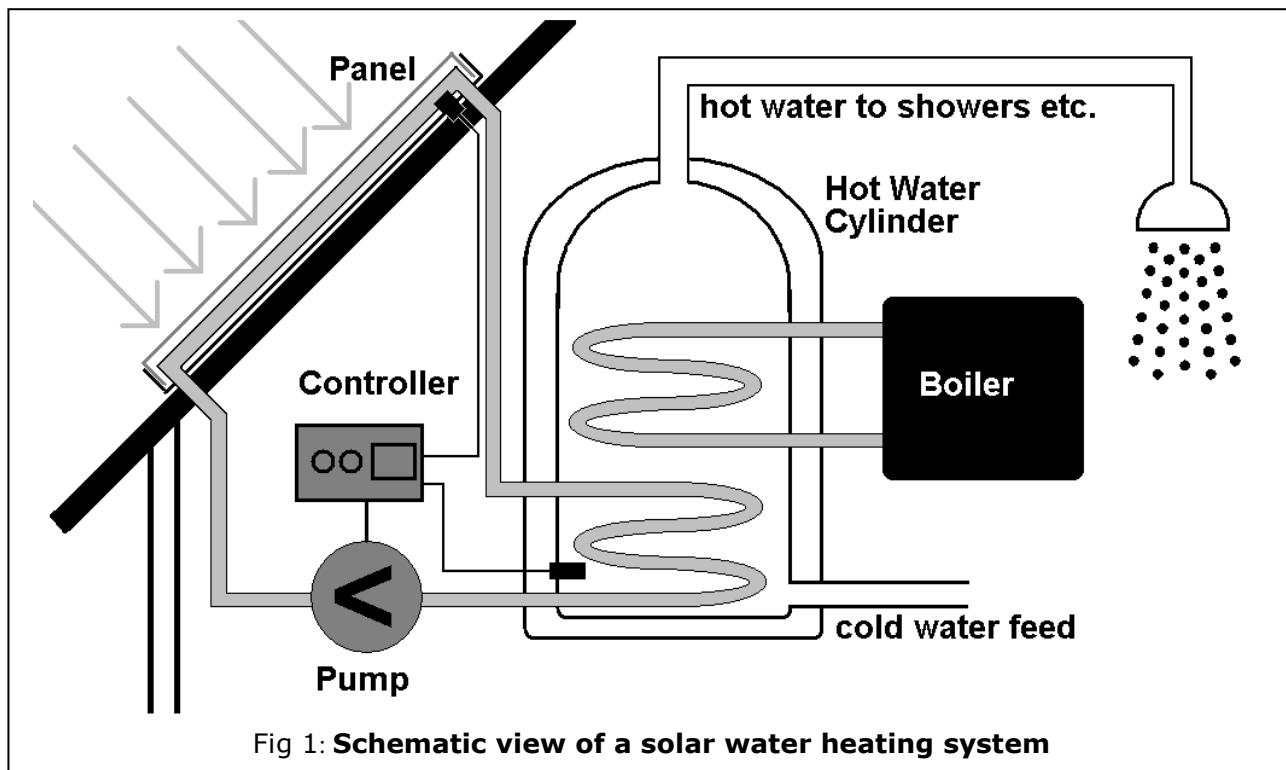
The collector uses the energy in sunlight to heat a thermal fluid (water with antifreeze). If the fluid in the collector is hotter than the water in the cylinder, the controller turns on the pump to circulate fluid to the coil in the cylinder, and heat the water there.

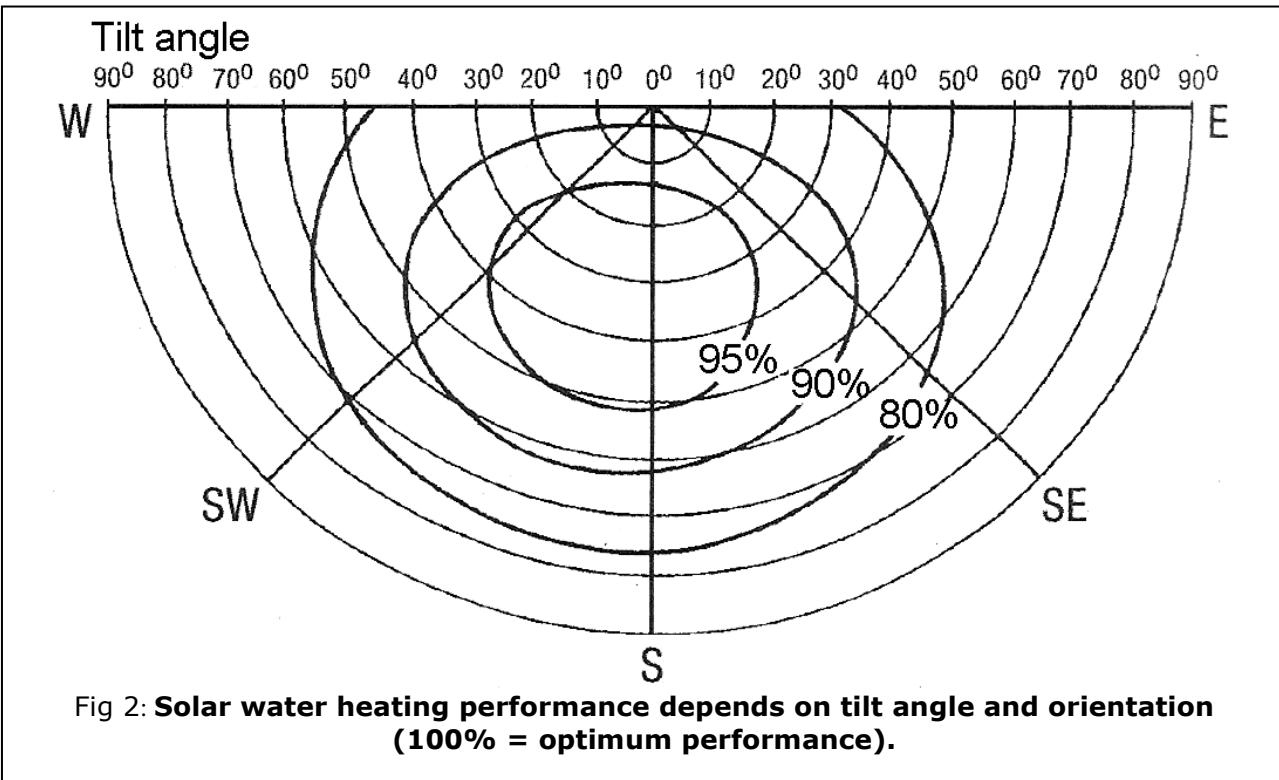
The upper heating coil in the cylinder is connected to the main central heating boiler (for example a gas boiler), and this will finish heating up the hot water when there isn't enough sunshine (as in winter).

## Is my home suitable for SWH?

Solar collectors facing anywhere between south-east & south-west, at an angle of between 20 and 50 degrees, will give the best performance. However, even an east or west facing panel can still be worthwhile – it just needs to be about 20-25% bigger. 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.





Because SWH gradually heats the water in the cylinder, it's difficult to add it to a heating system using a 'combi' boiler – one that heats water on demand and so doesn't have a cylinder. Only a few combis accept pre-heated water, so you'd need to check with the manufacturer and installer to see if your combi system could be adapted.

Roof mounted panels are usually a 'permitted development', so you won't need to apply for planning permission. However, for National Parks, Areas of Outstanding Natural Beauty, conservation areas and listed buildings, restrictions may apply.

#### How many panels will I need?

As a rule of thumb, you'll need about 1 square metre ( $m^2$ ) per person to give enough hot water through the summer. The installer will assess your hot water needs and size the system accordingly. This will also involve sizing the solar cylinder, which will usually be double the size (much taller) of a standard cylinder – this gets the best performance from the solar panels.

#### Which collector type should I chose?

Two types are typically used: 'flat plate' or '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. However, overall they will deliver similar value for money.

#### How much hot water will I get?

In the UK, a solar water heating system should meet 40% to 60% of domestic hot water demand (showers, hot taps, etc). As Fig. 3 shows, most of this is in the summer. Because solar radiation is much weaker in winter, SWH will not produce enough hot water in winter, and it will not help with space heating (such as radiators).

#### What's the likely cost?

A roof-mounted SWH system should cost between £3,000 and £5,000. As a big part of this cost is for plumbing and scaffolding, you may be able to save by installing SWH while carrying out other repair work, or when it's integrated it into a new building.

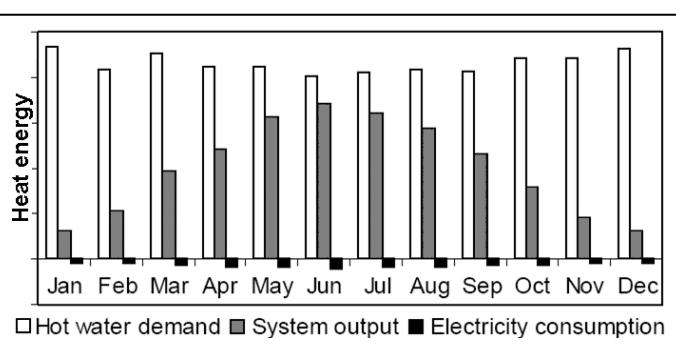


Fig 3: Typical seasonal output profile of a domestic SWH system (a  $3m^2$  collector and a daily hot water demand of 160 litres at  $55^\circ C$ )

## **Does SWH make financial sense?**

A domestic solar water heating system typically reduces gas, oil or electricity bills by between £50 and £100, depending on how much hot water it produces what fuel it replaces. To help make SWH financially attractive and boost development of the industry, the government has put in place the Renewable Heat Incentive (RHI). See the box below for more about this.

### **Further Information:**

See our website for answers to common questions about solar water heating, and for a video case study of a system:  
<http://info.cat.org.uk/solar-water-heating>

### **Energy Saving Trust**

Tel: 0800 512 012; Web: [www.est.org.uk](http://www.est.org.uk)  
Advice on energy efficiency measures and details of grants and support. Also, see the 'Generating Energy' section of their website for a buyers guide to solar water heating, plus the 'Here comes the Sun' report into field trials of SWH systems.

## **How do I find an installer?**

To qualify for RHI payments you need to use installers and equipment accredited through the Microgeneration Certification Scheme (MCS). You could also check if the installer belongs to a professional body that promotes high standards. Do always get a few quotes to compare.

### **Microgeneration Certification Scheme**

Tel: 020 7090 1082  
Web: [www.microgenerationcertification.org](http://www.microgenerationcertification.org)  
Details of all RHI-accredited installers.

### **Solar Trade Association**

01908 442 290; [www.solar-trade.org.uk](http://www.solar-trade.org.uk)

### **The Institute of Domestic Heating & Environmental Engineers (IDHEE)**

Tel: 02380 66 89 00; [www.idhee.org.uk](http://www.idhee.org.uk)

### **Association of Plumbing & Heating Contractors**

Tel: 024 7647 0626; Web: [www.aphc.co.uk](http://www.aphc.co.uk)

### **Chartered Institute of Plumbing & Heating Engineering**

Tel: 01708 472791; [www.ciphe.org.uk](http://www.ciphe.org.uk)

## **Solar Water Heating and the Renewable Heat Incentive (RHI)**

The Government's Renewable Heat Incentive (RHI) provides financial support for solar water heating in both domestic and non-domestic buildings.

### **Support for domestic buildings**

All eligible SWH systems are supported financially through tariff payments of 19.51 pence per kWh. These payments will be based on the expected heat output of the system and paid for a seven year period. You will need to have taken basic energy conservation measures to be eligible (such as loft and wall insulation).

A family-size SWH system may contribute 1500kWh of heat per year. At 19.51p/kWh over seven years the tariff payment would then amount to just over £2000. Fuel savings during the first seven years might be between £400 and £800, but these will continue beyond this and will be worth more to you as fuel prices rise.

Total payments and savings should therefore add up to several thousand pounds over the lifetime of the system. Check our website for further news about the RHI, or contact us if you have any questions.

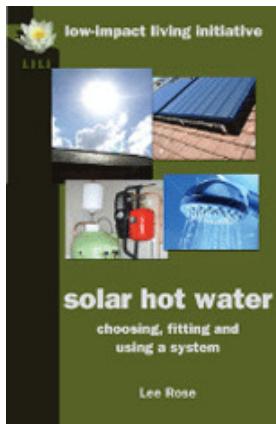
### **Support for non-domestic buildings**

Non-domestic buildings – from a B&B or pub to large public buildings like schools or factories – can receive a tariff payment of 10.16 pence for every kWh of heat produced by the solar panels, measured by a heat meter. So for example, if a hotel's solar water heating system produces 10,000kWh over a year then RHI tariff payments will be about £1000 for that year.

For more information about the RHI, please visit <http://info.cat.org.uk/rhi>



# Centre for Alternative Technology Canolfan y Dechnoleg Amgen



## CAT Mail Order

<http://store.cat.org.uk/> ☎ 01654 705959

### **Solar Hot Water: Choosing, fitting & using a system (Lee Rose)**

Particularly applicable to domestic dwellings in the UK, although the principles described are widely adopted throughout the developed world. Lee has over 10 years of experience in consulting, training and installation work, field trials, technical research and developmental thinking in the solar thermal industry. He combines this with a passionate personal commitment to making the best use of the earth's most abundant energy resource. This book provides a comprehensive introduction to every aspect of solar hot water, including relevant equipment, components, system design and installation and even how to build your own panels.

**270 pages, paperback, £12.95.**

## CAT Short Courses 2015

[www.cat.org.uk/shortcourses/](http://www.cat.org.uk/shortcourses/) ☎ 01654 704952

### **17-19 Aug      *Introduction to Renewable Energy Systems (3 days)***

& This course is a jam-packed introduction to all renewable energy systems.

**6-8 Nov** Wind, hydro, biomass, solar and heat pumps are all covered for this comprehensive introductory course. It is designed to be suitable for a wide range of people from those with a general interest through to architects and specifiers, housing officers, teachers, students, interested individuals, builders merchants and DIY Store employees.

## CAT University Degrees

[www.cat.org.uk/graduateschool/](http://www.cat.org.uk/graduateschool/)

Interested in sustainability? Then why not make it your career! CAT offers fully accredited, hands-on Masters courses in Renewable Energy and Sustainable Architecture & Design.

## CAT Charity

[www.cat.org.uk/membership/](http://www.cat.org.uk/membership/) ☎ 01654 705988  
[www.cat.org.uk/fundraising/](http://www.cat.org.uk/fundraising/) ☎ 01654 704953

We rely on generous donations to continue to provide this information service free at point of use. Please consider making a donation – or join CAT as a member to stay in touch!