



Centre for
Alternative
Technology

HOME HEATING WITH RENEWABLE ENERGY

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Why renewable energy?

Renewable energy sources, such as solar and wind power, can be used without depleting the world's natural resources and without causing significant pollution. Using renewable energy can reduce the amount of fossil fuels we use, and so reduce emissions of the greenhouse gases that are causing climate change, and many other pollutants. Generating your own electricity is usually expensive, but using renewable energy to heat your home is much more cost-effective.

Remember that the first step is always to reduce the amount of energy that you use. Energy-saving measures can save you money quickly as well as lowering your environmental impact. It's also best to minimise your energy consumption before buying a system to meet your heating demand. CAT's book *The Energy Saving House* gives lots of advice on minimising energy use, while our *Insulation* tipsheet runs through all the essential considerations when insulating your home.

What renewable energy sources can I use?

SOLAR ENERGY - There are two main ways to heat your home using energy from the sun. The easiest for most householders is a **solar water heating** (or Active Solar Heating) system, which will provide about half of your domestic hot water needs across the year. It should meet all of your demand through the summer and make a small contribution over winter, so a back-up system will be needed - usually from your existing central heating boiler. In the British climate, such a system cannot really make any useful contribution to your space heating needs. For advice on choosing the right solar water heating system for you, refer to our book *Tapping the Sun*.

A system requires very little maintenance and should last for decades. Some commercially installed systems can be quite expensive, so it's worth getting several quotes. A professionally installed solar water heating system for a typical house will cost between £2,500 and £5,000, and should cut your water heating bill by half.

If you're a keen DIYer, you may want to make some solar water heating panels yourself. Our publication, *Solar Water Heating: A DIY guide* explains how to make your own solar collectors.

Every home gets some of its heating requirements from the sunlight that falls on the outside of the building. If designing a new house, you could use principles of **passive solar design** to make the most of this effect, and so reduce your heating demand by 50 to 80%. Many of the following passive solar principles cost little or nothing if implemented at the design stage, and like most energy efficiency measures, they will recover their costs in a very short time:

- siting the house to maximise solar gain
- putting large windows on the southern aspect of the building, and small ones to the north
- including heavy materials (e.g. masonry) to absorb solar heat and then release it slowly
- arranging the house ventilation system to make best use of the solar heating elements

Clearly, many of these can only be implemented when designing a new building, or undertaking a major renovation. However it is possible to make use of some of the aspects in an existing building:

- shading (e.g. blinds or shutters) to prevent excessive heat gain in the summer
- using thermally efficient glazing (double glazed, argon filled, low-e glass)
- a solar heating space (e.g. a conservatory)

Information on passive solar design and all other house design possibilities can be found in our publication *The Whole House Book*.

WOOD FUEL is the most widespread renewable energy source for heating in the UK. When wood is burned it produces the same amount of carbon dioxide that it absorbed whilst growing - which would have been released anyway if the tree died and rotted. Nearly all wood fuel comes either from commercially managed forestry (where each tree used is replaced) or as a by-product from another activity. Wood fuel from these sustainable sources (where replanting matches harvesting) will not cause a net increase of carbon dioxide in the atmosphere, so won't contribute to climate change.

Wood produces smaller quantities of acid rain chemicals than any fossil fuel and, as long as it is burned efficiently, will produce negligible quantities of soot, hydrocarbons or other forms of pollutant.

Domestic wood-fired systems come in many forms and can use various types of fuel. You will need an undercover space (e.g. an outhouse) to store and perhaps dry the wood.

A **wood stove** will usually heat one room, but may also have a back boiler to heat water and perhaps supply radiators - ideal for a small house. To burn logs cleanly and efficiently, follow three rules:

1. Make sure the logs are well seasoned (usually split the logs and dry for 2 years or more)
2. Burn efficiently - start hot and fast, and only damp down when left with charcoal and ash
3. Don't fill up a non-automatic log burner to try and keep it going overnight without attention

There are also modern, efficient central heating **log boilers** available. Automatically fed boilers require less looking after, but are more expensive. **wood pellet stoves and boilers** are becoming available. Pellets, made from wood industry waste, are drier than logs, so contain more energy, but they are more expensive. The burners are automated and burn cleanly and efficiently.

Wood chip boilers are available for large heating requirements, such as a farmhouse with some outbuildings or a small 'district heating' scheme (We have one at CAT). They are highly automated and burn efficiently, keeping pollutant levels low even in built up areas. Installation costs are higher than other systems, but the fuel is very cheap as it often comes from sources such as forestry waste.

A log stove is likely to cost between £500 and £1000, with installation costs probably the same again. Pellet Stoves cost £1500 to £2500 plus installation - but are eligible for a £600 grant. A log boiler will be roughly £4000 with a water storage tank £1000, and together with flue and installation the total will be about £7000. Pellet Boilers are more advanced, and so is the price tag - £6,000 to £8,000 for the boiler; total costs perhaps £11,000 to £12,000. Wood-fired central heating boilers should be eligible for a £1500 grant, while wood fuel itself is usually cheaper than most fossil fuels.

See our book **Home Heating with Wood** for more detailed advice on the options.

WIND and **HYDROELECTRIC TURBINES** or **PHOTOVOLTAIC SOLAR PANELS** are the other main ways to harness renewable energy. They generate electricity, usually to sell directly to the grid. You wouldn't normally try to meet your heating need with renewably generated electricity, as it is usually an expensive option. However, a few houses are very well suited to generating their own electricity from wind or hydro, and may be able to use surplus electricity to provide some or all of their heating requirement. These options are covered in **Choosing Windpower** (wind) and **Going with the Flow** (hydro), and our **Micro-Hydro** and **Photovoltaic Power** factsheets. It is also possible to buy renewable electricity through the national grid - see our 'Electricity from Renewable Sources' sheet for more details.

One way to improve the efficiency of electric heating is with a **HEAT PUMP**. These draw a low temperature from an ambient heat source (e.g. under the ground), and boost it with electricity to the temperature required. If properly installed, a heat pump can produce three kilowatts of heat for each kilowatt of electricity used. However, you must have a very well insulated building (ideally with underfloor heating), you need a good site (for laying lots of pipe) and installation costs are fairly high - so they're only suitable for certain homes. See our *Heat Pumps* tipsheet or contact us on 01654 705989 or info@cat.org.uk to find out more.

Further Information and Contacts

CAT publishes many **Resource Guides**, which list hundreds of suppliers, installers, organisations, and publications. These can be downloaded from: www.cat.org.uk/catpubs/ppv.tmpl

We run many residential **courses**, including solar design, solar water heating and heating with wood. See our courses leaflet or www.cat.org.uk/courses

CAT's **free information service** can help with specific queries by phone, email or in person, and give further details of suppliers and publications. *Tel: 01654 705989 email: info@cat.org.uk*

If you want in-depth advice on a particular project, then you may find a paid consultancy with one of our experts useful. Contact **CAT Consultancy** on 01654 705991 or consultancy@cat.org.uk

Low Carbon Buildings *Tel: 0800 915 0990; Web: www.lowcarbonbuildings.org.uk*

Grants for householders, small businesses, community schemes, and larger projects.

If you live in Scotland, contact the **Scottish Community Renewables Initiative** *Tel: 0800 138 8858 Web: www.est.org.uk/schri*

The Energy Saving Trust can give details of local grants to help with energy conservation measures *Tel: 0800 512 012; web: www.est.org.uk/myhome*

Solar Trade Association *Tel: 01908 442290 Web: www.solartradeassociation.org.uk*
Aim to maintain high standards in the solar water heating industry. Can provide lists of installers.

Institute of Domestic Heating and Environmental Engineers *Tel: 02380 66 89 00; Website: www.idhee.org.uk*
Independent non-profit making professional body, promoting the installation and maintenance of safe and efficient domestic central heating systems.

Log Pile (UK wide) and Wood Fuel Wales www.logpile.co.uk or www.woodfuelwales.org.uk
Details of suppliers, contacts and sources of information on all aspects of wood fuel heating.