



Centre for
Alternative
Technology

THE WOOD-FUELLED HOME

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Moving to renewable energy sources to heat and power our homes will reduce emissions from the fossil fuels (oil, coal and gas) that are causing climate change. Wood fuel is already a cost-effective way – this sheet gives advice on using it in a sustainable way.

Why Burn Wood?

Biomass fuels include wood, energy crops such as oilseed rape or miscanthus ('elephant grass'), animal wastes and other agricultural by-products such as straw and grain husks. When burned, these fuels release only the amount of carbon dioxide (CO₂) that they absorbed whilst growing - unlike the carbon in coal, oil and gas, which was absorbed over millions of years but is being released in the space of a few decades. The energy used to harvest, process and transport the fuel does need to be factored in as well. Very little energy is needed to harvest wood, so when used locally it is a very low-carbon option.

Planting trees to absorb carbon dioxide may provide temporary mitigation from climate change, but doesn't address the fundamental problem. To meet our energy needs in a zero-carbon future we must make sustainable use of trees as fuel, and replant them as we harvest them – creating a continuous carbon cycle. Growing our own fuel also creates jobs and is ideal for strong, local economies.

No fire without smoke?

Emissions from wood fuel contain virtually no sulphur dioxide and very low levels of nitrous oxides, so won't cause acid rain. Burning wood cleanly gives off very low amounts of smoke particulates, and many wood-fired appliances are certified for smokeless zones (see www.uksmokecontrolareas.co.uk).

It's important to burn efficiently: use properly seasoned wood (with low moisture content) and make sure that equipment is used properly. Manually fed stoves can produce lots of pollutants if operated badly.

Logs should be burned fiercely with lots of air input until they are almost charcoal, after which the stove can be 'damped down'. Reducing the air supply too early creates lots of smoke & tar. The key is good 'secondary combustion' of the high-energy volatile gases given off by burning wood. Some stoves are fitted with a 'Lambda' sensor, to regulate the amount of oxygen added and so optimise efficiency. Avoid burning treated, painted or glued wood, or non-wood waste, as these will give off toxic and polluting gases.

Building regulations require all fuel burners to have a dedicated vent to avoid production of carbon monoxide. The chimney needs an insulated flue to prevent fumes condensing as tar. With complete combustion, wood burns to a small amount of ash, which (unlike coal ash) is an excellent fertiliser.

Choosing wood-fired appliances

Before switching to any new heating system it is vital to maximise energy efficiency. Measures such as increasing insulation, lagging pipes and draught-proofing will save money on fuel, and also on equipment - as they'll allow you to specify a smaller boiler. A combination of wood fuel and solar water heating (for hot water in summer), can give renewably-generated heat all year round.

Open fires are a poor choice, financially and environmentally. Most of the heat goes up the chimney and the rate at which the fire draws in oxygen creates draughts across the room that reduce the benefit from the fire. A simple wood stove is a great improvement; it should need only one-third as much fuel, as the efficiency can reach 70%. Automated pellet stoves are more convenient, and can even have an automatic de-ashing function.

Advanced wood heating systems for larger houses have been common for many years in mainland Europe and the USA, and are as efficient as modern gas boilers - converting well over 80% of the fuel into useful heat.

A 'batch' log boiler can be fired up once a day (or less often) and the heat stored in a large water cylinder. Automated pellet boilers make wood fuel almost as convenient as gas. They are more costly, but ease of use is a big plus.

For those keen on range cooking there are specially designed wood-fired ranges, with a bigger firebox to accommodate logs. Doing everything from one appliance is not ideal, so the efficiency of these is less than dedicated boilers or stoves, but they would give the satisfaction of a wood-fired Sunday roast!

Storage

Delivered wood should be stored for at least one year, preferably two, to air-dry the wood to a moisture content below 25%. Bringing logs inside for the last week or so improves them to room dryness. Stoves might be specified to cope with 50% moisture content, but efficiency will suffer. Compressed wood pellet fuel has only about 8% moisture. Manufacturers specify pellets of a certain size, shape and moisture content to ensure reliable operation. Some pellets are produced for power station co-firing, and are not good enough quality for domestic appliances.

The required storage space depends on how big and how well-insulated your home is. A small cottage is likely to need 8 cubic metres (m³) of logs each year, a 3-bedroom house 12m³, and a large detached house 16m³. Pellets have a higher energy content and so take up less than half as much space. Stoves use 0.5 to 1.5kg of pellets per hour, so a 15kg bag should last a few days.

Larger systems can use chipped wood - this allows more automation than logs and is cheaper than pellets. A wood chip boiler heats several buildings at CAT; seasoned wood is delivered, chipped, and stored until it reaches 15% moisture content. For larger schemes, it's a good idea to have a supply contract to ensure a reliable supply of wood.

What's the cost?

A log stove is likely to cost between £500 and £1000, with installation costs probably the same again. Pellet Stoves cost £1,500 to £2,500 plus installation. A log boiler will be roughly £4,000. Together with a water storage tank, flue and installation the total will be about £10,000. Automated Pellet Boilers are more advanced, and so is the

price tag: £6,000 to £8,000 for the boiler; the total perhaps £10,000 to £15,000.

Remember to factor in the ongoing purchase of fuel. Bought in bulk, log fuel should be cheaper than gas, oil or coal. A 15kg bag of pellets will cost £3 to £4, but bulk delivery should be similar to or less than fossil fuel. The Log Pile service (below) lists suppliers around the UK. Also, find out about the support structure in place for the equipment you choose, before going for the cheapest. Will it be easy to get the appliance serviced annually? Are there enough plumbers or engineers with the relevant knowledge?

What financial support is available?

From Spring 2011, log and pellet boilers will be covered by the Renewable Heat Incentive (RHI) scheme. Under the RHI, households can receive annual payments for operating a biomass heating system. For example, a family with a pellet boiler central heating system could receive £1,000 each year over 15 years. See our information sheet on the *Renewable Heat Incentive* for further details.

Finding installers

To be eligible for financial support under the Renewable Heat Incentive, both installer and system must be Microgeneration Certification Scheme (MCS) accredited. It's always a good idea to get quotes from more than one installer. Accredited installers are listed at: www.microgenerationcertification.org

Further Information

Home Heating with Wood is a book giving detailed advice on planning a wood-fired heating system. Sold by CAT Mail Order: 01654 705959; <http://store.cat.org.uk>

Residential Course: Wood Fuel Heating In-depth advice on choosing and installing wood-fired heating. Includes site visits. 01654 704952; www.cat.org.uk/shortcourses

Log Pile: Information, suppliers, examples. Tel: 01908 665555; Web: www.logpile.co.uk

Energy Saving Trust: energy efficiency advice and details of any local grants. Tel: 0800 512 012; www.est.org.uk/myhome

Carbon Trust: advice for businesses. 0800 085 2005; www.thecarbontrust.co.uk