

Community Woodlands

Information Leaflet

Fuelwood for Homes

This information leaflet provides an introduction to equipment and techniques used to provide heat from wood in domestic situations. Its purpose is to help users choose between the heating options currently available. The resource section provides a list of contacts for more detailed technical information and suppliers of stoves and equipment.

Why heat with wood?

Wood, if sustainably produced, can provide heat for homes which is carbon neutral, modern wood heating systems are cost-effective and environmentally sound, and the use of locally produced fuel can benefit the Scottish rural economy.

This leaflet is aimed, primarily, at rural dwellers in Scotland and those in the rural/urban fringes, as it is these people who are likely to benefit most from heating with wood, to have access to woodfuel supplies and have the space necessary to store and handle logs or chips.

Why use wood as fuel?

Space heating with wood can be as cheap as 30-50% of the cost of other fuels

The waste gasses from an efficient system are virtually smoke-free and the ash can be used as a fertilizer.

Wood is a renewable resource

Wood is carbon neutral because the amount of carbon released during burning is no greater than that removed from the atmosphere by the growing tree.

Greater use of woodfuel will help the government meet its commitments on renewable energy and greenhouse gas emissions, and so there is increasing funding for wood fuel heating schemes.

Scotland has a large low-grade timber resource, much of which is very difficult to market, but is suitable for fuel wood. Sales of wood fuel benefit the rural economy at a time when timber prices are low.

Stove and boiler systems

There are three options currently available for heating houses from wood: using logs, woodchips or wood pellets. Wood pellets are a recent arrival in the UK, although they have

been well used in Scandinavian countries for a number of years. The choice between these options will depend on a number of factors.

Stoves and ranges fuelled manually.

Wood burning stoves.

If the aim is to provide backup heat in a house that already has central heating, then the simplest and cheapest option is to install a wood burning stove fuelled by logs. A woodstove can provide extra heat and a focal point in a room, backup heat in the event of a power cut or central heating breakdown and also provide domestic hot water if the necessary plumbing arrangements can be made. Wood burning stoves are available with outputs from 5 to 20kW and are easy to fit into older houses which already have chimneys, but complete flue systems are also available so that stoves can be installed in newer properties or those without chimneys. Most stove suppliers offer advice and information about installing stoves and flues. Many stoves are available as multi-fuel stoves which can burn both logs and solid fuel, though it is not advisable to burn wood and coal at the same time. The multi-fuel option is useful if there is any possibility that you may run out of wood.

How much heat do I need?

It is hard to be precise and it will depend upon the individual circumstances, such as levels of insulation, number of windows and doors and numbers and sizes of rooms. Stove suppliers and heating engineers will be able to provide tailored advice, but the table gives a rough guide.

<i>Heating requirement</i>	<i>Required peak heat output/kW</i>
<i>Living room</i>	<i>4-10kW</i>
<i>3-4 bedroom house</i>	<i>10-20kW</i>
<i>Larger house</i>	<i>15-30kW</i>

As a guide 1kW is the heat output from a 1 bar electric heater.

The larger wood burning stoves can provide the heat necessary to run up to a dozen radiators, but such stoves will require constant manual re-fuelling with logs. These stoves are plumbed into a pumped central heating circuit which can be controlled by thermostats.

Ranges

It is still possible to buy range cookers that can be fuelled by wood. Both Rayburn and Stanley sell models that can be used for cooking only, cooking and domestic hot water and cooking, hot water and central heating. More information and technical details can be found by contacting the sources listed in the resource section. It should be realised that these ranges were primarily designed to burn coal and solid fuel, and therefore burn wood less efficiently; nevertheless they still work well with dry logs.

Many people in rural Scotland need a source of heat that will operate during a power cut. Wood burning stoves and ranges can provide this, and it is possible to have domestic hot water as well, as long as the system is fed by gravity. A pumped central heating system will, of course, not work in a power cut. Furthermore a fully pumped system should not be fired during a power cut as there would be a risk of boiling the water which cannot circulate.

Wood pellet stoves

Wood pellet stoves are a recent introduction to the UK. They are available as small stoves, of around 9kW output, suitable for heating single rooms, or as full central heating systems. They burn wood very efficiently and the pellets require less manual handling than logs. The hopper of the stove can hold sufficient pellets for several days burning. The stoves require an electricity supply as they are controlled by microprocessors and the heat is distributed by electric fans: they would, therefore, not operate in a power cut. At present wood pellets are not widely available in Scotland.

Ceramic stoves

Ceramic stoves are wood burning stoves which are made of fired clay blocks. They are quite large structures and can extend to ceiling height. Their internal flue-ways are very long and this leads to complete combustion of all the gasses from the wood. The ceramic blocks store heat and the stoves require firing only once each day. Because of their size, ceramic stoves are best suited to new-build situations and can prove difficult to retro-fit into existing houses. They burn wood very efficiently, and are probably the most environmentally friendly way of obtaining heat from wood.

Chimneys and flues.

All the above heating appliances require the installation of a flue. Burning wood can produce a build up of tar deposits in a masonry chimney which can result in a chimney fire or cause staining to appear on the outside wall if the stone is at all porous. Stones and mortar can fall out leading to smoke problems in lofts and upstairs rooms and the risk of fire. Masonry chimneys can be lined with ceramic liners which involves opening the chimney up from the outside wall, or can be lined by inserting an inflatable mould in the flue and pumping insulating concrete mix around this mould. Alternatively, the easiest option is to insert a stainless steel, insulated, flexible liner down the flue which is connected to the stove pipe. The void around this liner should be filled with insulating ceramic mica granules.

The insulation provided by these liners means that the flue warms up faster, creating a better draught. Tar deposits are less likely to form in a warm chimney. The settings of the stove controls will also affect the build up of tar deposits. Stove suppliers will be able to provide more information on installing and lining flues.

Programmable and automated heating systems

If the requirement is for a whole house central heating system, then some form of programming and automation are likely to be required.

The following heating systems all require a dedicated boiler room, extension or outbuilding in which to house the boiler, and ancillary equipment such as feed hoppers and storage tanks. In addition consideration must be given to storage of fuel, frequency of fuel delivery and access for delivery vehicles e.g. tractors and trailers or tipping lorries.

Log boilers

Log-fuelled boilers are available which need to be fuelled by hand only once or twice each day. They operate at high levels of efficiency and have large combustion chambers. Some boiler models can take large logs up to a metre long, which will reduce the work of sawing logs. Stoking should take no more than 5 – 10 minutes each day. The heat produced, during the relatively short burn time, is used to heat up water to around 90°C which is stored in a highly insulated heat storage tank. This can be used to deliver heat to the house for the rest of the day, in a programmable way for both central heating and domestic hot water. A further advantage of this type of system is that the heat storage tank can be integrated into a system with different heat sources. For example the water could be pre-warmed by solar panels, or come from other wood burning stoves or a kitchen range, an electric immersion heater or an oil-fired boiler could provide a backup heating system. Log systems, however, become impractical for heating requirements over 50kW.

Wood pellet boilers

If you require an automatic feed system, your choice is limited to either a woodchip system or a pellet system. Wood pellets are now being manufactured in the UK but are not yet widely and easily available, however they are slowly becoming more so. The advantage of wood pellets are that they are made of highly compressed wood waste from sawmills and joinery workshops, they are very energy-dense and provide almost as much heat output per unit of weight as oil or coal. In Scandinavia, wood pellets are delivered to the customer by tanker and pumped into hoppers which feed automatically into central heating boilers. The whole system is as automated as an oil-fired central heating system. The drawbacks of a pellet system are: firstly the current lack of experience and availability in the UK and secondly that pellet manufacture is a large scale industrial process requiring large capital costs in the development of processing plants. Woodwaste will require transportation to the plant and pellets delivered from it with consequential economic and environmental costs. Unless you happen to live near a pellet plant it is not a local source of fuel unlike logs or woodchips. It seems likely that pellet plants will be developed and run by the larger wood-processing companies, with the result that the money spent on buying pellets will be lost to the local economy. However despite these drawbacks, pellet systems work very well and require much less fuel storage space than a log or chip system.

Woodchip boilers

Woodchip heating systems start at outputs of 20-30kW, (suitable for a larger house, e.g a farmhouse) they can be highly automated, but as woodchips are less energy dense than pellets a much larger volume will be required. Roughly one cubic metre of solid wood will produce 2.5m³ of woodchips as blown out of the chipper. 12m³ of chips will produce an equivalent heat output to 1000l of oil.

For a 20 kW boiler up to 0.6m³ could be used each day during the heating season. Roughly 80 to 100 cubic metres of chips would be required per year. This is a major consideration and will need a dedicated storage shed from which the feed hopper of the boiler can be filled once each day. In addition the storage facility will need to be sited so that there is sufficient access for the delivery of woodchips. Apart from this requirement a woodchip system is as automatic and programmable as any oil or gas fired heating system. In contrast to the wood pellet system, a woodchip fired boiler can make use of local fuel sources, from forestry waste for example. The equipment needed is much cheaper and more easily available.

Woodchippers cost around £6,000 and can be run from a tractor, in contrast to a pellet plant

costing millions. Forestry contractors and local tree-surgeons often have such equipment and the production of woodchips could provide them with extra income, helping to boost the local economy. It must be borne in mind, however, that different boilers have different requirements with respect to the dryness and size of the chips that can be burnt; this must be taken into account when considering choice of chipper and boiler.

A drawback of woodchips is the need for a drying facility. Wood is easier to chip whilst still wet after harvesting, but wet chips will quickly begin to degrade and rot and so must be dried. Small piles of chips, sufficient for several weeks use, can be spread on a concrete floor of a covered shed and turned manually to dry, but a forced-draught system will be needed to dry larger quantities of chips. The production, drying and supply of woodchips is an operation more suited to co-operatives or contractors rather than individuals, unless you have your own woodland or energy coppice and equipment. Much more detailed technical information can be found from the contacts and sources listed in the Resources section of this leaflet.

Log supply and drying

An average, reasonably insulated, three bedroom house needs around 50-100 GJ of energy per year for central heating and hot water. You can find your annual energy expenditure by looking at the figures on your gas and electricity bills. Energy consumption is usually expressed in kilowatt hours (kWh), whilst energy output of fuel is usually expressed in joules or gigajoules. One gigajoule (Gj or 1,000,000,000joules) is equivalent to 280kWh. If we assume that we are burning air-dried (25% moisture content) oak or beech logs in a stove which is 70% efficient and that 1 cubic metre of wood will provide 6.3Gj of energy, then between 8 and 16 cubic metres of wood will be needed each year. As logs are round and irregular, one solid cubic metre of wood requires 1.8m³ of storage space when neatly stacked. These figures illustrate the volume of logs that are needed to heat a house solely from wood, and the considerable amount of manual handling needed to fell, cut, transport, split and stack the logs and stoke the stove. One solid cubic metre of logs represents around 12 to 14 wheelbarrow loads.

How many logs do I need?

	<i>Peak heat output of appliance/kW</i>	<i>Annual energy requirement/Gj</i>	<i>Solid volume of logs required/m³</i>	<i>Volume when stacked neatly/m³</i>
<i>Living room stove</i>	<i>4-10kW</i>	<i>20-50</i>	<i>3-8</i>	<i>6-15</i>
<i>3-4 bedroom house</i>	<i>10-20kW</i>	<i>50-100</i>	<i>8-16</i>	<i>15-28</i>
<i>Larger house</i>	<i>15-30kW</i>	<i>70-140</i>	<i>11-22</i>	<i>20-40</i>

These figures are based on burning air-dry beech logs in an appliance which is 70% efficient. For softwoods allow 25-30% more

In terms of the area of woodland required to supply a volume of timber sufficient to heat a 3-bedroomed house, the smallest area required would be around 4ha if managed by coppicing. The coppice system has never been popular in Scotland, with the exception of the production of tanbark and charcoal, which ended 150 years ago, and figures for the productivity of Scottish coppice are hard to come by. Productivity figures for English coppiced woods of oak, ash, sweet chestnut and lime suggest that annual increments of 3-4 m³ per hectare are achievable for a 10 year rotation, which means that 4ha of coppiced woodland could supply enough fuel, with 1/3ha being cut each year, supplying 10-12m³ per cut.

There is considerable interest in the development of short rotation energy coppice at the moment using fast growing varieties of poplar and willow; these can produce up to 6tonnes per hectare per year. This system is better suited to short rotations of 2 – 3 years and hence the production of thin stems for chipping rather than log production.

Drying logs.

Freshly felled timber contains between 40 – 60% moisture, depending upon species. If carefully stacked under cover and with plenty of ventilation it should be possible to dry the logs to around 25% moisture content, suitable for burning. Firewood is best felled during the winter for use in the following winter. It should be cut to manageable lengths and left to partially dry for a couple of months. In spring it should be cut, split and stacked under cover to air dry for the rest of the year in a woodshed with plenty of ventilation. The logs should be cut to a length suitable for your stove and should be split so that they are no thicker than 10cm. Ideally, if you have the space, the air-dry wood should be brought indoors to dry even more for a couple of weeks before burning.

The figures for quantities of wood given above are averages. Softwoods produce less heat per log than hardwoods such as oak or beech, on average three hardwood logs will produce the same heat output as four softwood logs. In practice you may find it useful to have supplies of both. Conifer logs, split small, are useful for firelighting as they contain inflammable resin. The owners of wood-fuelled Rayburns and other cooking ranges maintain that softwood logs bring the range to cooking heat faster than hardwood logs.

Buying logs.

Some fuelwood merchants advertise in Yellow Pages and can be easily contacted. However, supplying logs is often a part-time occupation and happens within the 'black' economy, hence suppliers do not advertise. Stove shops can usually suggest a local supplier. Other avenues to explore would include local tree surgeons, local estates and sawmills and asking in the local pub. Keep an eye open for logs being delivered to neighbours or to the pub. Word of mouth is often the best means of finding logs.

When ordering wood, it is essential to be clear about what your supplier calls a load. Some suppliers deliver bagged logs, usually in old fertilizer and feed sacks and the sizes can vary. Logs by the lorry or trailer load can vary with size of vehicle and whether they are piled high or neatly stacked. Bear in mind that a cubic metre of solid wood occupies around 1.8m³ when stacked. You should also ask your supplier how dry the logs are – most are supplied fresh-cut. Since transport is expensive, suppliers are likely to charge more for deliveries beyond about a 10 mile radius of their base.

Resources section.

Central and Southern Scotland stove suppliers. Most will provide information and advice, chimney lining and installation services.

The Burning Question,
19 Howe Street,
Edinburgh. EH3 6TE
0131 557 4262
www.theburningquestion.co.uk
sales@theburningquestion.co.uk

Forest Fire Ltd
50 St. Mary's Street,
Edinburgh. EH1 1SX,
0131 556 9812

The Fire Side.
Main Street,
West Linton,
Peeblesshire.
EH 46 7EA.
01968 660219
www.thefireside.co.uk

Pearsons of Duns Ltd.
The Cheeklaw Centre,
Station Road,
Duns,
Berwickshire. TD11 3EL
01361 882277

Bowlines,
Birkhill,
East Linton.
East Lothian.
01620 860471.

Kindlete Ltd.
Woodmuir Plantation
Forth,
Lanarkshire. ML11 8EP.
01555 812111

Stove Shop.
Forgan Smithy,
Gorgan,
Newport on Tay,
Fife. DD6 8RB

01382 541486

Scottish Stove Centre
Red House,
Croftamie.
G63 0EU.
01360 660111

Fires and Parts
24 Abbotsinch Road,
Grangemouth.
FK 3 9UX
01324 486868

Dowling Stoves.
Bladnoch Bridge Industrial Estate,
Bladnoch Bridge,
Wigtownshire. DG8 9AB.
01988 402666

See Fuelwood for Homes and Communities (RS Information Sheet 13) for more information on suppliers of burning equipment etc.

Log Suppliers.

Acorn Oak Kindling,
81 Burnside,
Auchtermuchty,
Cupar.
Fife. KY14 7AL.
01337 827522

Mackay & Co.
Brunthill Farm,
Kinross,
Perthshire. KY13 0LB
01577 862696.

Fells & Forest
Nether Hazelfield,
Auchencairn,
Castle Douglas,
Kirkcubrightshire. DG7 1RD.
01556 640105.

Reith Partners

Whitebank,
Methven,
Perth.PH1 3QU.
01738 840333.

Firewood Supplies
Riverside Cottage,
Kilmore,
Oban,
Argyll. PA34 4XX
01631 770206.

D.S.Morrison
Homlea Cottage,
Station Road.
Errol.
Perthshire. PH2 7SN
01821 642510

J. Fraser
No. 1. Holding,
Clentry,
Kelty,
Fife. KY4 0JQ
01383 830538.

Taylor's Logs
East Mains of Balgvies,
Guthrie,
Forfar,
Angus. DD8 2TY.
01307 830360

Stewartry Firewood
Ladies Walk
Kirkudbright. DG6 4XX.
01557 330359.

Shiresmill Woodlands
2 Overton Farm Cottages,
Blairhall,
Dunfermline,
Fife. KY12 9HA.
01383 851585.

Greenrig Tree Services
16 Greenrig Road,
Hawksland,
Lanark. ML11 9QA.
01555 892423

Duncan Currie
Ballachlaven Farm,
Isle of Islay
PA45 7QP.
01496 840294.