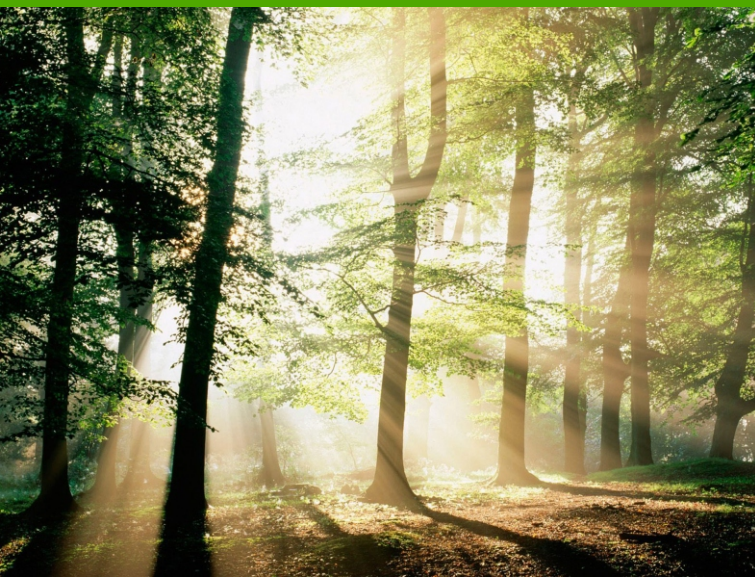


Factsheet

Biomass



Biomass is the term used to describe any material derived from organic processes. Examples of such materials include forestry residue, recycled wood, short rotation coppice, energy crops and agricultural waste. Energy from biomass is released through its combustion and can be harnessed to generate heat and/or electricity and can also be used as a transport fuel.

Although carbon dioxide is inevitably released when the fuel is burned, biomass is considered carbon neutral due to the carbon absorption that takes place during its formation. Unlike fossil fuels biomass is also considered a renewable fuel provided replacement material is grown.

Biomass for energy usage can be sourced from many different sectors. Scotland is fortunate to have an abundant resource thanks to the

considerable amount of forestry that is found here. Biomass can also be contributed from other industries in the form of co-products. Co-products from both agriculture and the food & drinks industry have the potential to be converted into a useful fuel.

For domestic usage biomass is generally used to provide heat, with fuel usually taking the form of wood pellets. Pellets consist of dried sawdust which has been compressed under a high pressure. EU guidelines state that pellets must have a maximum water content of 8%. This low moisture content combined with their high density means that they can be burned with a very high combustion efficiency. As a rule of thumb 2kg of pellets will provide around 10kWh of heat (equivalent to 1 litre of oil). Their uniformity and small size also allows for easy delivery and storage.

On a larger scale biomass can be used to provide both combined heat and power (CHP) and district heating. In these scenarios fuel more commonly takes the form of woodchips or logs.

Many schools and businesses across Scotland are taking the decision to replace their existing fossil fuelled boilers with more efficient, environmentally friendly biomass fuelled equivalents.

The prospects of installing a biomass boiler would be especially attractive if:

- You are needing to replace your existing boiler;
- You already have a wet heating system in place;
- Your existing boiler could still be used as a backup.

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Domestic Use

A household looking to take advantage of biomass heating can do so in two main ways, via a stand alone stove used to provide space heating or through the installation of a biomass boiler connected to a building's central heating and/or hot water system. It is important that the chosen system is accurately sized to meet the property's heating demand. Consideration should also go into the type of fuel used to run the system. This will be dictated by factors such as cost, local fuel suppliers and availability of storage space.

A Delizia Pellet Stove
(output range 3-11kW)
Image Courtesy of 3G Energi



Pellet Stoves

Stand-alone biomass stoves have many of the benefits of fossil fueled heating equivalents but without the associated environmental damage. They provide space heating whilst also adding aesthetic value to a room. Modern stoves generally have temperature and timer controls incorporated as well as fans that distribute warm air around the room. They tend to be much easier to regulate than log burning stoves, and can be left to burn all day with minimal attendance.

In addition, pellet stoves also feature a 'hopper' and an ash pan. The hopper allows for enough fuel to be stored internally for several days of operation while the ash pan facilitates easy cleaning.

Pellet Boilers

Biomass boilers can be fully automatic just like their oil and gas equivalents. Pellet boilers use advanced microprocessors to control the fuel and air mix being fed into the combustion chamber. Above the combustion chamber, heat exchangers are used to heat water, which is then piped throughout the building.

Modern boilers operate at extremely high efficiencies (often in excess of 90%) ensuring ultra-low emissions.

Initial Capital Costs

Capital costs depend on the type and size of system you choose. Installation and commissioning costs will vary but could be upwards of £1000. Stand-alone pellet stoves will cost between £1500 and £3000. The cost for pellet boilers also varies depending on size; a typical 20kW (average size required for a detached house) pellet boiler would cost between £11000 to £13000 installed, including the cost of the flue and commissioning.

A Kunzel Pellet Boiler
(output range 15-25kW)
Image Courtesy of 3G Energi



Chimneys and Flues

Pellet stoves and boilers require the installation of a flue to allow exhaust gases to be carried away. If you have an existing masonry chimney, it is recommended that it is lined to prevent a build up of tar deposits or of loose stones and mortar which can lead to smoke problems or risk of fire.

The easiest way to do this is to insert a stainless steel, insulated, flexible liner down the chimney which is connected to the outlet pipe. Stove and boiler suppliers will be able to provide more information on installation.



Biomass

Larger Scale Applications

While much of Scotland's future biomass activity may take place on a domestic level (through the use of pellet stoves and boilers), there is also significant potential for small, medium and large scale biomass heating plants for businesses, public buildings and community/housing schemes.

A wide range of boiler systems are commercially available but all share the same basic features of a boiler, a storage facility and a feed mechanism. The diagram below illustrates the components of a typical system.

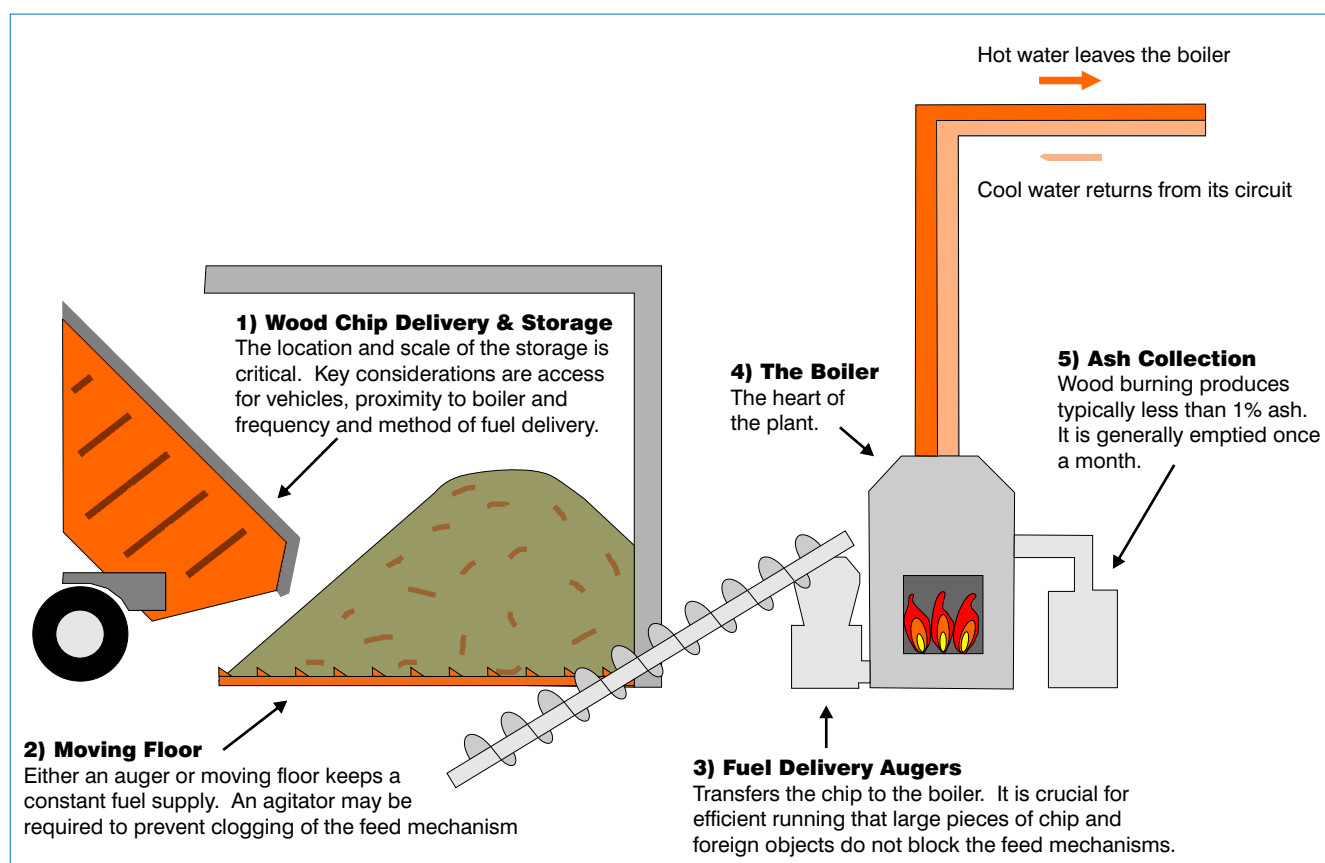
Modern wood fuel-fired boilers and heating systems are robust, highly-engineered and sophisticated items of equipment with a longer life than typical mass-produced gas or oil fired boilers. Installations can also be fully automated and require minimal attention.

The downside to these systems is that wood fuel storage and delivery systems are often large and costly. The size of the combined boiler room and fuel store often necessitates the use of a separate building whereas a natural gas or oil fired boiler would fit in a small room integrated into the

building which is being heated. For these reasons, the capital costs of automated wood fired heating systems can be as much as five times higher than for fossil fuel-fired heating systems (SDC 2005).

Associated Costs

The Sustainable Development Commission's 2005 report *Wood Fuel for Warmth* provides actual capital and running costs for three different scale of biomass project running in Scotland. These costs are presented in Table 1. For comparison the costs of the equivalent fossil fuelled heating system are also shown.



Description of Scheme	Approximate Capital Costs	Approximate Capital Costs of Equivalent Fossil Fuelled Heating System	Approximate Running Costs	Approximate Running Costs of Equivalent Fossil Fuelled Heating System
Wood Chip-fired District Heating 51 homes - 460 kW boiler, fuel store, boiler house and installation	£260,000	£153,000	£27,500 pa	£38,000 pa
150 kW Wood Chip-fired Boiler with Accumulator Tank and Boiler house / Fuel Store	£65,000	£12,000	£3,500 pa	£6,000 pa
32 kW Log-fired Boiler including Boiler house / Fuel Store, fully installed	£10,000	£3,750	£580 pa	£1,000 pa

Table 1 - Comparison of Capital and Running Cost of Wood Fuel and Non-Renewable Heating Systems
- For a more detailed breakdown of costs please see 'Wood Fuel for Warmth' (link provided at end of factsheet)

Biomass

Considerations

Fuel Costs

Unlike most other forms of renewable energy, biomass heating systems require continual payment for the fuel. It is important that research is done prior to any installation into what fuels may be available from local suppliers and their respective costs.

Indicative costs for pellets (most suited to domestic applications) are around £140-£160 per tonne. Prices will vary depending on the size of your order and distance from supplier.

Woodchips come in at around £45 - £60 per tonne, significantly cheaper than pellets, however are generally only used in larger scale (commercial/industrial/community) applications.

Care should be taken when purchasing woodfuel. Fuel of an inferior quality may cause problems with the internal workings of your stove or boiler and leave a residue (referred to as clinker) which could lead to blockage. You will also need a greater amount of inferior quality fuel (ie fuel with a higher moisture content) to provide the same level of heating time as good quality fuel.

More detailed information on biomass fuel specification can be found on the the Biomass Energy Centre website: www.biomassenergycentre.org.uk

Space Constraints

Unlike gas and electricity which enter a property through a pipe or cable biomass fuel must be stored onsite.

An adequate space for storage is needed to avoid frequent transport deliveries which would reduce the carbon savings generated from using biomass and increase transport costs.

There is considerable variation between the storage needs associated with different boiler systems and fuels. Generally speaking biomass must be stored in a secure, dry location with easy access for deliveries.



Planning permission

Most domestic scale biomass schemes will not require planning permission as they are internal

alterations. Larger schemes, intended for communities or businesses may involve the construction of a boiler house or fuel store. Planning permission would be a requirement for such developments.

Exhaust gases require a flue vent that rises above the roofline of the building; planning permission may be required for this depending on the height above the roofline. Planning may also be an issue if your property is located in a designated 'smoke control area'. There are no such designated areas within the Highlands and Islands however if your property is located elsewhere it is advisable to check with your local council. More information on smoke control areas can be found by following the link at the end of this factsheet.

Maintenance

Biomass stoves and boilers will require slightly more frequent cleaning than their fossil fueled equivalents. This will predominantly take the form of removal and disposal of ash. Stoves will require an annual service and flue clean. Boilers also need an annual service and, depending on the scale of the machinery and intensity of use, may need an additional interim service to ensure that moving parts are well lubricated.

For domestic usage of stoves and boilers, house occupants need to be willing and capable of managing fuel supply and cleaning.

Useful Links

A comprehensive list of accredited manufacturers, distributors and installers of biomass equipment can be found at;

www.lowcarbonbuildings.org.uk/info/installers

The Energy Saving Trust - Biomass

www.est.org.uk/myhome/generating/types/biomass

National Energy Foundation's Log Pile project

www.nef.org.uk/logpile

To find out more about UK smoke control areas

www.uksmokecontrolareas.co.uk

Sustainable Development Commission - Wood Fuel for Warmth

www.sd-commission.org.uk/publications/downloads/050626-SDC-Wood-Fuel-for-Warmth.pdf

