

Renewable energy

Factsheet

Biomass - small scale

Introduction

Energy from biomass is produced from organic matter of recent origin. It does not include fossil fuels, which have taken millions of years to evolve. The CO₂ released during the generation of energy from biomass is balanced by the CO₂ absorbed during the fuel's production. We call this a carbon neutral process.

People have been producing energy from biomass for centuries, and in many parts of the world it is still the principle source of heat. However, modern technologies are far more efficient than open fires and an increasing range of fuels are now being utilised.

Bioenergy is produced from organic materials, either directly from plants or indirectly from industrial, commercial, domestic or agricultural products. Bioenergy falls into two main categories:

- Biomass includes forest products, untreated wood products, energy crops, short rotation coppice (SRC) e.g. willow, miscanthus (elephant grass). These are generally used for stationary heat or electricity generation.
- Biofuels are made from animal wastes, industrial and biodegradable municipal products from food processing and high energy crops e.g. rape, sugar cane, maize. Biofuels are normally used as transport fuels.

Using biomass as a fuel source

For small scale domestic applications of biomass, the fuel usually takes the form of wood pellets, wood chips and wood logs. We are generally familiar with wood chips and logs. Wood pellets are a compact form of wood, which have a low moisture content and a high energy density. Although they are currently more expensive than logs and wood chip, they are easier to handle and ideal for automated systems.

The energy content of the fuel is related to its moisture content. High moisture content will slow the combustion process, as the moisture must first boil off before the fuel can burn. Full combustion is also the cleanest process, leaving no partial combustion products like carbon monoxide, particulates or unburnt volatile hydrocarbons. The type of heating system you choose has a direct effect on the fuel used and the storage space required.



Applications - individual dwellings

There are two main methods of using biomass to heat a domestic property:

- Stand-alone stoves providing space heating for a room.
 - Can be fueled by logs or pellets but only pellets are suitable for automatic feed
 - Generally 6-12 kW in output
 - Some models can be fitted with a back boiler to provide water heating.
- Boilers connected to central heating and hot water systems.
 - Suitable for pellets, logs or chips
 - Generally larger than 15 kW.

Stoves can achieve efficiencies of more than 80 per cent. They are normally used to provide background heating whilst adding aesthetic value, as they are designed to be located in the living area of the house itself (see fig 1). Although many wood-burning stoves act as space heaters only, the higher output versions may be fitted with an integral back boiler to provide domestic hot water and, if required, central heating via radiators.

There are many domestic scale log, wood-chip and wood pellet burning central heating boilers available. Log boilers require manual loading and may be unsuitable for some situations, whilst automatic pellet and wood-chip systems can be more expensive. Many boilers will dual-fire both wood chips and pellets, although the wood chip boilers will require larger hoppers to provide the same time interval between refuelling.

Boilers can be designed with an integral hot water energy storage tank or accumulator tank that stores water up to 90C, enabling the supply of heat to be further decoupled from the combustion of the fuel. This is particularly helpful with log boilers where systems operate at full load and the matching of demand with load is performed by the accumulator.

Is my house suitable

You should consider the following issues if you are considering a biomass boiler or stove. An accredited installer will be able to provide more detailed advice regarding suitability.

- **Fuel:** It is important that you have storage space for the fuel, appropriate access to the boiler for loading and a local fuel supplier.
- **Flue:** The vent material must be specifically designed for wood fuel appliances and there must be sufficient air movement for proper operation of the stove. Chimneys can be fitted with a lined flue.
- **Regulations:** The installation must comply with all safety and building regulations (see the current Building Regulations available at www.odpm.gov.uk).
- **Smokeless zone:** Wood can only be burnt on exempted appliances, under the Clean Air Act. This mainly applies to domestic appliances.
- **Planning:** If the building is listed, or in an area of outstanding natural beauty (AONB), then you will need to check with your local authority planning department before a flue is fitted.

Costs

- **Capital costs:** This generally depends on the type and size of system you choose but installation and commissioning costs tend to be fairly fixed. Stand alone room heaters generally cost £1,500 - £3,000 installed. The cost for boilers varies depending on the fuel choice; a typical 15kW (average size required for a three bed semi detached house) pellet boiler would cost from £4,000-£12,000 installed depending on the type of system chosen, including the cost of the flue and commissioning. A manual log feed system of the same size would be slightly cheaper.
- **Running costs:** Unlike other forms of renewable energy biomass systems require you to pay for the fuel. Fuel costs are generally dependant on the distance from your fuel supplier; if you have a supplier nearby this will reduce the costs of the fuel considerably. As a general rule the running costs will be more favourable if you live in an off gas area.
- **Payback:** This will depend on the fuel being replaced and the type of wood fuel being used but will be more favourable in off gas grid areas.

Local benefits

Producing energy from biomass has both environmental and economic advantages. It is most cost-effective when a local fuel source is used, which results in local investment and employment. Furthermore, biomass can contribute to waste management by harnessing energy from products that are often disposed of at landfill sites.

Where can I get more information?

Your nearest Energy Saving Trust Advice Centre can provide free, impartial, expert advice on renewable energy measures. Based in your region, we can help you choose the most suitable renewable energy technology for your home, as well as put you in contact with local suppliers and installers in your area. To find out more, call 0800 512 012 or visit www.est.org.uk/myhome.

Useful links

- For advice and information about renewable energy technologies and other energy saving measures for your home: www.est.org.uk/myhome
- British Biogen, UK Trade Association for bioenergy: www.britishbiogen.co.uk
- British Association of Biofuels and Oils: www.biodiesel.co.uk
- Information on wood fuel, system suppliers and local fuel suppliers: www.nef.org.uk/logpile



Fig 1: 8.8kW automated pellet stove.