



# Woodfuel supply chips and pellets

One of the actions set out in Scotland's Climate Change Delivery Plan is to achieve 11% of heat demand from renewables by 2020.

Increased usage of bioenergy, in particular in the form of woodfuel from sustainably managed forests and woodlands, can contribute to this goal.

## Woodfuel

Woodfuel provides a sustainable alternative to fossil fuel and has seen a remarkable uptake in Scotland over the last 10 years. As a 'carbon lean' fuel, it can deliver a significant reduction in carbon emissions.

The carbon dioxide released through burning wood, is equivalent to that taken up by the tree throughout its life. By replanting trees after harvesting, the ongoing cycle of growth maintains a constant cache of carbon in the forest and secures the future resource.

Sustainably managed forests and woodlands can produce a continual local supply of fuel and reduce 'fuel delivery miles'.

Woodfuel production creates rural employment and provides a new source of income for the rural economy.

Harvesting a wider range of raw materials from a woodland or forest can help to improve its structure, health, biodiversity and value.

Modern woodfuel stoves and boilers, burning woodchips or wood pellets, are convenient to use and, although the installation costs can be higher than fossil fuel systems, lower woodfuel cost and financial incentives can result in relatively short pay back periods.



## Renewable Heat Incentive

In March 2011, the UK government announced details of the £860 million Renewable Heat Incentive (RHI).

This incentive offers financial support for renewable technologies in the industrial, commercial and public sector, including biomass boilers commissioned after July 2009. (Phase 2, the domestic sector scheme, will follow in 2012.)

The scheme is the first of its kind in the world and hopes to rapidly increase the uptake of renewable heat technologies. Financial support will continue for 20 years based on metered heat produced and will give a forecast 12% rate of return on the additional cost of producing renewable (rather than fossil) heat.

Full information on the scheme is available from the Department of Energy and Climate Change (DECC) website: [www.decc.gov.uk](http://www.decc.gov.uk).

The scheme will be administered by Ofgem: [www.ofgem.gov.uk](http://www.ofgem.gov.uk).



## Producing woodfuel

Forests and woodlands are the main source of woodfuel, which can be extracted not just in large scale felling, but also through regular thinning and arboricultural operations. Woodfuel can be produced from forestry materials which otherwise would have no market, such as brash, dead, dying, burnt, blown and bent material that the timber industry cannot use. In 2010, the equivalent of over one million green tonnes of wood was used for energy in Scotland and the Woodfuel Task Force's recent report identified additional material which could make a big contribution to meeting Scotland's heat targets.

RTS Ltd Woodland Managers and Woodfuel Suppliers based in Crieff annually harvest over 200,000 tonnes of timber. A proportion (currently about 20,000 tonnes) is retained for seasoning within the forest prior to processing.

At their purpose-built depot, a 500hp mobile chipper can convert 250 tonnes of seasoned roundwood daily into wood chips, meeting quality standards. Where required, a drying floor can also be used to further reduce the moisture content to as low as 20%.

To ensure supply continuity, at least 300 tonnes of wood chips and a further 3,000 tonnes of roundwood is kept in stock. The mobile chipper also travels to customers across Scotland, chipping locally sourced timber to minimise haulage.



## Woodchips

Woodchips are commonly used in small/medium scale boiler plant. Woodlands owned by farms or estates can become a very local and sustainable source for the supply of woodchips.

Careful consideration of storage and delivery systems is particularly important for plant using woodchip, which is a bulkier fuel than wood pellets, usually around 250 kg/m<sup>3</sup>.

### Chipping

Chipping can take place on site or in dedicated facilities, but felled roundwood first needs to be sufficiently seasoned before processing.

Specialised wood chippers guarantee a uniform chip size. If buying such machinery isn't economic, hiring a chipper and contracting a chipping service are practical and regularly used alternatives.



## Wood pellets

Compressing milled wood shavings and sawdust forms high density cylindrical pellets typically with a diameter of 6 or 8 mm and a length of ±20 mm.

Wood pellets have a bulk density of about 650 kg/m<sup>3</sup> and require less storage space compared to woodchips. They are frequently used in small domestic stoves and boilers, or larger boilers, but are slightly more expensive than woodchips.

### Pelletising

Making pellets requires complex machinery (and large investments). After drying and grinding, the material is fed into a pellet mill. High pressure during extrusion increases the temperature to ±90° C and causes the lignin in the ground wood to melt. This 'binds' the material together without using additives.

Verdo Renewables Ltd is a subsidiary of Verdo Holdings A/S, a Danish utility company, and operates from sites in Andover and Grangemouth (as shown below). The two UK plants each produce 55,000 tonnes of wood pellets (and 15,000 tonnes of briquettes) per year, on a 24/7 basis.

Virgin Scottish timber is debarked, chipped, 'wet' ground, dried, and ground further to a fine, dry powder. This is fed into two pellet mills, with a total capacity of eight tonnes/hr. The pellets are either bagged for domestic use in 10kg bags or stored and delivered to commercial customers in minimum quantities of 10 tonnes.



## Moisture content

Moisture content is the most important factor in achieving efficient woodfuel combustion. At the time of felling, the moisture content of wood can be 50% or more. Seasoning at the felling site or in the supplier's yard lowers the moisture content, which increases the combustion efficiency and ensures effective operation of the woodfuel boiler.

### Woodchips

Seasoning wood for up to a year will reduce moisture content sufficiently before chipping. Once chipped, this won't reduce much further without forced drying. Starting at the right level is therefore important. Typically, small boilers need woodfuel varying between 20 to 30% moisture content to operate properly. Higher values may be used in larger 'wet' wood systems. At 30% moisture content the energy density of woodchips is around 12.5 GJ/ton.

### Wood pellets

The raw material for wood pellets will have a much lower moisture content than woodchips and this is further reduced during manufacture. The end product has a moisture content of 10% or less and an energy density of around 17 GJ/ton.

## Quality control

Woodfuel, in the form of chips or pellets, has to be produced with consistent quality and to the right standards in order to meet the boiler's fuel specification. The boiler manufacturer will specify which standards are required for optimum performance of the system. Origin, particle size, moisture and ash content are all important factors.

The European Committee for Standardization (CEN) has developed standards for woodfuel, which can be downloaded from the Biomass Energy Centre website. The Industry is also developing fuel standards, such as the HETAS Solid Biomass Assurance Scheme ([www.hetas.co.uk](http://www.hetas.co.uk)).

## Sustainability

The Renewable Heat Incentive and the Renewables Obligation (Scotland) outline sustainability criteria for woodfuel, to ensure sustainable land use and a minimum level of carbon emissions reduction.

Wood from forests in Scotland is regulated by the UK Forestry Standard, which sets out the UK's approach to sustainable forest management. Sustainable woodfuel supply is at the core of the long-term viability of the sector.



From its manufacturing site in Banff, bulk deliveries of Puffin Pellets take place throughout Scotland using a dedicated four axle tanker truck which takes a maximum load of 12 tonnes in three separate compartments. This allows scheduling of combined deliveries and, for example, supplying a maximum of eight tonnes to one address and another four to a second (in this case; Meldrum House Hotel). Flexible hoses connect the truck to the store inlet and air pressure forces the wood pellets through. This happens in a controlled manner, limiting dust and preventing damage to the pellets.

## Delivery

Woodchips can be transported in various ways, for example, by tipper truck or trailer. A below ground bunker is the most effective for tipping. Any storage needs to be well ventilated and protected from rain or water ingress, with easy access for deliveries

Wood pellets are the most user friendly form for domestic situations as they can be bought from local distributors in convenient weights of 10-20 kg, from single bags to a pallet load of bags at a time. Bulk loads of four tonnes or more are most cost-effective to deliver pneumatically by special tankers.



## Fuel supply contracts

Contracts can be set up giving the owner of the installation 'full control' to arrange fuel supplies, servicing and monitoring. Local sourcing and detailed understanding of the system's requirements can reduce the costs and long-term woodfuel contracts will stabilise price. 'Full service' options are also available, including operation and maintenance contracts from Energy Service Contracts (ESCOs) which offer metered heat at a fixed prices.

## Costs

In general, woodchips are cheaper than wood pellets by weight but it is important to take the difference in energy content into account (as well as the varying investments in boiler and storage for each type of fuel). The costs of woodchips can also relate to their moisture content and some suppliers will offer to sell by heat output rather than weight. In all cases, haulage cost will depend on distance and therefore 'optimising' the size of woodfuel storage (fewer deliveries) and finding a nearby supply can reduce costs.



As a family concern, Treelogic covers a range of arboriculture and forestry services, including wood fuel production and supply, from Dalfling Farm near Blairdaff. Diversification on the farm has also resulted in a converted steading. Since 2007, this complex and two farm houses are all provided with heating and hot water from a centrally positioned 55 kW boiler unit.

The hopper is loaded with wood chips which are produced on site from locally sourced, seasoned wood, creating a very short supply chain. Treelogic's practical experience as producer and user has inspired new customers throughout Aberdeenshire who are supplied by tipper trailer or truck.

## Using woodfuel

More than 200 commercial and industrial woodfuel systems are already operating in Scotland (plus numerous small scale domestic applications), making significant savings on CO<sub>2</sub> emissions. Medium sized installations provide heating and hot water to factories, offices, hotels, farms, breweries and public buildings, such as schools and leisure centres. District heating systems supply metered heating to housing association complexes or industrial estates and large scale CHP (Combined Heat and Power) plants are servicing manufacturing sites. The Forestry Commission Scotland office in Inverness, opened in 2007 as illustrated below, is an example of how wood can be used as a construction material and for its energy in the form of woodfuel.





Further information, case studies and reports can be obtained from:

**Forestry Commission Scotland**

[www.forestry.gov.uk/scotland](http://www.forestry.gov.uk/scotland)

**Biomass Energy Centre**

[www.biomassenergycentre.org.uk](http://www.biomassenergycentre.org.uk)

**Usewoodfuel Scotland**

[www.usewoodfuel.co.uk](http://www.usewoodfuel.co.uk)

This website provides information on regional support as well as a Suppliers List for woodfuel. The list gives the details of a wide range of woodchip producers listed by region and the four wood pellet manufacturers in Scotland; Arbuthnott Wood Pellets Ltd in Laurencekirk, Balcas Ltd in Invergordon, Puffin Energy Ltd in Inch and Verdo Renewables UK Ltd in Grangemouth.



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