

## **Expanding the supply of high quality wood-fuel boilers throughout the UK**

### **Summary**

Generation of renewable electricity has received more publicity than generation of renewable heat, yet space and water heating represent the largest use of energy in most buildings. Wood-fuel now costs less than the fossil fuel alternatives for generating heat, and government grants to help with the costs of wood-fuelled boilers are making entry to the market easier for new customers. As a result, the demand for wood-fuelled heating is rising fast, and is also being driven by legislation to reduce the carbon footprint of new and refurbished buildings.

Wood Energy is one of the leading wood-fuelled heating businesses in the UK, and is growing quickly to meet the rising demand for their services. Their approach focuses on designing and installing high quality wood-fuelled heating systems, which are reliable and can operate with a minimum of user intervention. The boilers they install are of the best quality and include many advanced features to ensure efficient and reliable operation; the latest models include remote monitoring, allowing Wood Energy to fine-tune and watch over customers' heating systems from their own premises. Wood Energy are also starting to act as an Energy Service Company (ESCo) for some customers, supplying heat to them under a contract while retaining ownership of the boiler and responsibility for fuel supply and maintenance.

In addition to their work installing wood-fuelled heating, Wood Energy has also been instrumental in the development of three local wood-fuel supply businesses in the South West and Wales. They also helped develop the IGNITE wood-fuel training course, which is the only accredited course of its kind in the UK.

Wood-fuel is one of the most important sources of sustainable energy in the UK, and Wood Energy is making a significant contribution to the wood-fuel market's development and growth. Their current installed capacity is 28 MW, yielding CO<sub>2</sub> savings of approximately 11,600 tonnes a year, but their efforts are also helping other wood-fuel companies, as they raise the profile of the technology and help build the supply chains.

Wood Energy has worked hard to build capacity in the wood-fuel market, by developing training courses, helping start fuel supply chains and installing high quality boilers. By doing this it has removed some of the barriers to the adoption of wood-fuel in the UK, and is seeing rapid growth in its business as a result.

### **The organisation**

Wood Energy was founded in 2002 by Dr Robin Cotton, who had been working in a renewable energy consultancy for six years, but wanted to move into the practical delivery of renewable schemes. The rapidly growing business now has a turnover of £2 million/year (2005-06) and employs 28 people, mostly based at the headquarters in Devon, with regional staff operating in other parts of the country.

**Address:** Wood Energy Ltd  
Pinkworthy Barn,  
Oakford,  
Tiverton

Devon  
EX16 9EU

**Telephone:** +44 (0) 845 070 7338  
**Email:** sales@woodenergyltd.co.uk  
**Website:** www.woodenergyltd.co.uk

## Context

Although the potential for using renewable energy to generate electricity and produce transport fuel receives significant public attention in the UK, the importance of heat is often neglected. However, the use of low temperature heat to heat space and hot water in buildings is a major part of UK energy demand, and is responsible for almost a third of UK emissions of greenhouse gases. Despite its high population density, the UK has a significant resource of wood which could be used in a sustainable way as fuel, including 'waste' from tree surgery and from manufacturing, much of which currently goes to landfill. There are also existing woodlands, and new coppice plantations. The rising price of conventional energy over the last few years has made wood-fuel cheaper (per kWh) than fossil fuels and electricity for heating.

A number of policy drivers have encouraged heat users to consider using wood for heating, in order to reduce carbon dioxide emissions. These include the national Climate Change Levy, the European emissions trading scheme, and local legislation – in particular the 'Merton Rule' under which a number of local authorities now require 10% or more of renewable energy supply in all large new building developments.

There is therefore a growing demand for reliable companies to install wood-fuel boilers and heating systems in the UK. Wood Energy Ltd is one of the leaders in this market.

## Technology and use

Wood-fuelled heating systems burn wood in a boiler to produce hot water for central heating systems or steam for industrial processes and very large buildings. The boilers used by Wood Energy in all large installations are made by the Austrian company Binder, for whom Wood Energy is the sole UK distributor. Italian Extraflame stoves and boilers are used for smaller domestic heat loads.

The emphasis of the Binder boiler design is on high quality and high performance, with low maintenance requirements. Careful control of the fuel and air supply ensures that the wood is burned at an efficiency of over 90% from full rated output down to 20% output. This is important because demand for heat at many sites varies greatly with season and often throughout the day as well. The boilers are able to cope with a wide range of moisture content, allowing flexibility in the source and quality of fuel that is used. The exhaust gases are thoroughly cleaned to remove all ash, while exhaust gas recirculation and a lambda sensor (which measures O<sub>2</sub> content in the exhaust) ensure complete combustion and minimise the production of NO<sub>x</sub>. Wood Energy has recently put several Binder boilers through UK clean air testing, and all models up to 1.2 MW are now approved for use in smoke control areas.

The heat exchanger in the Binder is automatically cleaned at preset intervals without affecting operation, to maintain efficiency, and ash is removed automatically from the boiler and stored, allowing collections to be made every few weeks or even months, depending on the ash content of the fuel and the usage of the boiler. The boilers can be used with an accumulator tank (a very large hot-water store) so that the boiler can be fired at times of the day when heat is not needed, and the stored heat used to meet peak demand.

Small boiler systems can be installed and operating within four months of first enquiry, although larger systems take longer because they often go through extended consultancy and tendering processes. To speed up the installation process, Wood Energy has developed containerised systems, where the entire system arrives ready-to-use in a single standard cargo container.

Wood Energy offers the full range of Binder boilers, capable of burning either wood chips or pellets, with outputs ranging from 15 kW to 10 MW. The size of systems installed has increased with time as Wood Energy developed the expertise to handle large projects. At present the most popular size range is around 400 kW, and the largest installed is 3 MW. To date about 100 commercial boilers have been installed or are under contract in the UK and Ireland with a total heat capacity of 28 MW, more than one third of the total wood-heat capacity in the UK. In addition to this, over 100 domestic boilers have been installed.

## **How users pay**

The installation costs of wood heating systems vary from under £200/kW to about £400/kW, depending on the complexity and features of the installation; smaller systems cost more per kW than larger ones. Many users are able to claim a 30% grant under the DTI Low Carbon Building Programme, and businesses can often claim an Enhanced Capital Allowance, offsetting the cost of the boiler and its installation against tax.

Wood Energy has recently taken on its first customer under an energy supply contract, where they act as an Energy Service Company (ESCo). The customer pays Wood Energy for heat, and Wood Energy has the responsibility for managing the system and the wood-fuel supply.

## **Training, support and quality control**

Wood Energy currently offers a two year parts and labour warranty. All users are trained to ensure that they are able to carry out day-to-day operation of the boiler without any assistance from Wood Energy.

A full service is carried out at least once per year, and remote monitoring systems are now being introduced, which will help users monitor their equipment and also allow Wood Energy engineers to diagnose problems and make adjustments without even visiting the customer site in some cases, and be better prepared for the annual service visits.

Where customers require guaranteed heat supply (for instance hospitals and business operations) a backup boiler is always required, irrespective of the fuel used by the main boiler. When the main boiler uses wood-fuel, the backup boiler will usually burn oil or gas. This has been done in about 40% of installations, although in practice the backup boilers have rarely been used.

For the wood-fuel industry, Wood Energy helped develop the IGNITE training course and still helps to run it. IGNITE covers both installation of wood-fuel systems and fuel supply, and is the only accredited wood-fuel training course in the UK. In the past Wood Energy also ran training courses for installers to act as subcontractors for installing domestic wood-pellet boilers. Because of the difficulty found in ensuring quality in this way, Wood Energy is bringing this work back 'in house'.

Although Wood Energy is not commercially involved with wood supply, it has invested significant time and resources in developing the supply chains to ensure reliable wood supply for the heating systems that it installs. This includes three different wood fuel supply businesses, and also three pellet mills, in South Wales, Devon and Somerset.

## **Benefits**

The systems that Wood Energy has installed to date provide heat for a variety of users. The largest system is a 3 MW heating plant for greenhouses at a nursery, which is used for three or four months per year to extend the growing season. In 2006 Wood Energy installed the first system in the UK to generate process steam from wood-fuel, providing 1.65 MW at an animal feed mill. This type of system is used at nearly 100% capacity throughout the year (100% load factor), because of the constant process demand, and thus makes very efficient use of the boiler plant. Several wood-fuelled boilers have been installed in new hospital buildings, where the load factor is still quite high at 35%, because of the heavy demand for hot water even in summer. A high-profile installation is

the boiler system for the National Assembly of Wales, 'the Senedd', in Cardiff. Other users include schools, local authorities, national parks and community developments.

The customers of Wood Energy benefit from the lower cost of wood-fuel compared to fossil fuels, typical costs of wood chip are currently less than 2p/kWh for wood compared with about 3 - 4p/kWh for gas and oil. For many this also leads to exemption from Climate Change Levy payments. The payback period will vary according to the size of the system, the local fuel cost and load factor. However, medium and large scale projects typically achieve payback periods of between 4 and 10 years before any grant support is taken into consideration.

The work of Wood Energy brings significant environmental benefits. From monitoring at some sites, Wood Energy estimates that the current 28 MW installations are generating about 50 GWh/year of heat. Most of this replaces oil and gas, and thus avoids the emission of about 11,600 tonnes/year of CO<sub>2</sub>, along with other pollutants like SO<sub>2</sub>.

About 17,500 tonnes/year of wood are used in the systems installed by Wood Energy. The development of the wood fuel supply chain to provide this fuel is creating jobs in production and supply businesses. It is also benefiting woodland by bringing it under regular management, thereby encouraging biodiversity.

## **Potential for growth and replication**

The demand for wood-fuelled heating in the UK is high and is expected to continue to rise, due to demand for low-carbon technologies in new and refurbished buildings. In the short term the continuing availability of grants is important because of the higher capital costs for wood-fuelled boilers, but wood-fuel will become increasingly attractive without grants as the cost of alternatives increase.

Wood Energy is a leading player in the UK market for wood-fuel heating systems, and wants its rapid growth to continue. Its approach to achieving growth is to ensure effective controls are in place for project management and delivery, and then to work regionally with autonomous branches, comprising technical sales staff, engineers and administrators. Each regional branch will have its own growth targets. Branches are already operating in the South West, South East, North East, Wales and Ireland, with Scotland due to open by summer 2007.

## **Management, finance and partnerships**

Dr Robin Cotton, the founder of Wood Energy, is the Managing director and responsible for the overall management of the company. Staff are highly committed and, despite the pressure of a rapidly growing business, there is very high staff retention. The current emphasis is on making sure that processes are in place to manage future growth, including the establishment of branches with individual responsibilities and targets.

Wood Energy has an important partnership with Renewable Energy Systems (RES), who have recently taken a minority equity share in the business and are actively assisting with all aspects of the business.

Wood Energy has been actively involved in supporting the development of wood supply businesses, and also works closely with several local authorities, and the Renewable Energy Association.

*This report is based on information provided to the Ashden Awards judges by Wood Energy, and findings from a visit by one of the judges to see their work.*

*Dr Anne Wheldon, Technical Director, Ashden Awards*

*Dr Mike Pepler, Technical Manager, Ashden Awards*

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