A professional's guide to wood fuel heating

For people involved in building planning, development, design and construction

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500kW Biomass boiler image provided courtesy of Companies House

Welcome from Nic Snell

"Woodfuel Wales is the organisation that promotes the efficient supply and use of wood fuel as a clean, low carbon, economic and sustainable energy source in Wales and the Marches.

"Our mission is to help all those in the sector capitalise on the potential of the wood fuel market by delivering a quality, sustainable, good value product in the form of logs, chips, briquettes and pellets.

"Wales risks failing to meet its 2020 carbon reduction targets, and off-setting fossil fuels with wood fuel has an important role to play in meeting those obligations. Reliable quality is a critical factor and we are working with all our members to improve the quality of the products and services throughout the supply chain."

Nic Snell, *Chair of Woodfuel Wales*

This guide will help professionals involved in building design, planning, retro-fitting and construction to consider wood fuel as an option to heat buildings, both domestic and commercial. It is also designed to serve as a useful starting point for public sector managers and business owners when considering the many benefits and opportunities wood fuel heating offers.

Our partnership

Woodfuel Wales has a wide membership across Wales and the Marches. From growers, processors and suppliers to independent stove retailers and larger installers of commercial boilers.

Our members provide a quality service and can help you reduce your carbon footprint. For further information, visit our website **www.woodfuelwales.org.uk** or call **0845 456 0342**.

Why consider wood fuel heating?

- Wood fuel can save on the cost of heating. Financial incentives for boiler equipment and installation are available through the Government's Renewable Heat Incentive (RHI), making wood fuel an attractive long term option.
- Modern wood burning technology is very efficient and can be applied to single room heating all the way up to large scale community projects.
- Wood is a low carbon fuel.
- Wood fuel can help if you or your client has a planning commitment to install a percentage of renewable energy into a development, or if you have a commitment under a Climate Change Agreement, EU Emission Trading Scheme or the Carbon Reduction Commitment Energy Efficiency Scheme.
- Both private and public sector organisations have a key role in driving the uptake of renewable energy and reaching carbon reduction targets.
- Wales needs to reach the national targets set out by the Welsh Government to reduce carbon emissions across the board: using wood for heating can help Wales achieve this goal.

- The Welsh Government is fully committed to sustainable development and is leading the way in developing strategies and incentives to encourage use of biomass through its 'Bioenergy Action Plan for Wales', schemes for woodland planting and management, and for helping to develop the biomass supply chain.
- 14% of Wales is covered in woodland. This resource has the potential to make a significant contribution to the sustainability of our future heating needs.

Image provided courtesy of Companies House

Wood fuel heating - getting started...

There are four main forms of wood fuel used for heating: pellets, chips, logs and briquettes. They vary in price, availability and convenience. Selection of the right fuel type is probably the most important issue when designing a wood heating system. Contact wood fuel suppliers to ask about quality, price and delivery and ask potential equipment suppliers about the specification of fuel they recommend for their boilers and stoves.

Most importantly, high quality wood fuel is dry. Pellets and briquettes are guaranteed with a moisture content less than 10%. However, wood chips (typically 30% or higher) and logs (ideally below 25%) are much more variable. It is therefore important to ensure that fuels conform to a recognised standard, such as the HETAS Quality Assured Fuel (QAF) standard and ENplus for pellets.

Self supply of wood fuel from woodland or waste sources can provide significant long term cost savings. Glastir is a Welsh Government scheme that provides incentives for landowners to improve the management of their existing woodlands, making them more productive, and for planting new areas of woodland. See our booklet: A landowner's guide to managing woodland for wood fuel by visiting **www.woodfuelwales.org.uk**

System supply & storage

Wood fuel heating systems have advanced enormously in recent years, providing high efficiency and versatility.

Step 1 - Consider the system options

Wood fuel heating technology can work at all scales. Be it for a single room, a whole building or multiple buildings, there is a wood fuel solution available.

'Primary Heating Systems' heat multiple spaces and, in housing, tend to be pellet or log boilers which are situated away from the main living areas, close to the fuel store. For large buildings, community and district heating, automated chip or pellet boilers fulfil the same role. Primary systems can run at very high efficiencies (typically 85%).

'Secondary Heating Systems' such as stoves are generally designed for single room heating. They are far more efficient (75%) than a traditional open fire (32% efficient) or a gas effect fire (typically 55%). Wood fuel stoves generally use logs, briquettes or pellets and can produce hot water as well as heat space when linked to a central heating system, although in most cases a boiler is more effective in this role

Step 2 - Consider individual client needs

If your client does not have the time, staff or resources to have a significant involvement with fuelling and running a heating system, a fully automated feed system will be most appropriate. Pellet systems exist for all scales of use, but chip systems tend to be most appropriate for medium to large scale applications - as long as the site lends itself to the storage and delivery necessities of wood chip. Log stoves require manual lighting, periodic loading, ash removal and regular monitoring. Log boilers will need less attention but still require input for refuelling and ash removal.

Step 3 - Consider system size

Sizing the system you are designing is crucial to efficiency. Over-sizing a boiler to peak load is a common mistake so get advice early on from a specialist in wood heating, such as suppliers or consultants with proven experience in the industry.

Incorporating a large thermal store (accumulator or buffer tank) within the system is essential for log boilers and highly advisable for other boilers, optimising boiler operation and providing extra heat for short peak loads.

Step 4 - Consider availability, cost, delivery, storage and space

Consider how wood fuel will be delivered to site, stored and conveyed to the boiler or stove. This is a critical decision for the success and cost-effectiveness of the system and will be different for each fuel type.

All wood fuels are bulky and will deteriorate under certain conditions. Your planned system must have suitable dry storage, and good access for delivery. Storage conditions must allow wood fuel to remain within the recommended moisture content for appliances, otherwise it becomes inefficient to burn and can cause problems for equipment.

Wood heating boilers can have a larger footprint than their fossil fuelled equivalents, and extra equipment is required for the system such as fuel storage and handling, and accumulator tanks with large expansion vessels. Flues are another consideration as low level outlets are not suitable for wood burning equipment.

Available systems

Pellet boilers can automatically ignite, feed fuel, self-clean and switch off when not required. They range from around 15kW to 1MW. Pellets for larger installations are delivered by tanker and blown into the storage room or silo. It is important that storage facilities stay dry and remain sealed to prevent dust from entering the boiler room.

Pellet stoves (2–15kW) are easily installed, ideal as one room heaters, and come in many designs. They ignite automatically and operate with a high level of control, often remotely. Pellets are easily loaded into integrated hoppers, have long periods between re-fuelling and flow automatically into the burner. Stoves will need an electrical supply but require little cleaning out. Models are also available that combine room heating with hot water and central heating capabilities.

Wood chip boilers are designed to operate with a particular specification of fuel. Consistent chip size and moisture content is important for boiler feed mechanisms. Specialised chippers designed to produce chip of a consistent enough specification for boiler use are available through professional contract mobile chipper services.

Pellet silo image provided courtesy of Companies House

Tipping from a lorry into an underground bunker is the most efficient way for your client to have wood chip delivered. Above ground storage structures need to fit well with the capability of the delivery vehicle to tip wood chip over the storage retaining wall.

Where wood is being chipped on site, chip can be blown easily into above ground bunkers, thus saving on construction costs. Other practical delivery mechanisms include fast fill auger systems, replaceable hook lift fuel containers and drive in walking floors.

It is common practice for large boiler installations to also incorporate an auxiliary fossil fuel boiler so that during prolonged poor weather conditions, when delivery may be difficult, buildings can still be heated.

Log boilers, suitable for large domestic and small commercial settings, are available from 15-80kW, from basic boilers, to sophisticated, fully controllable domestic heating and hot water boilers that can work at efficiencies above 90%. These boilers are easy to load and ignite, and are often housed in adjoining outbuildings. They are batch-fed (usually once a day), storing the heat in an accumulator tank for use on demand.

When choosing a log boiler the size of the fuel chamber dictates how much energy can be provided from a single charge. The boiler and accumulator will take up a considerable amount of room. Logs are heavy and awkward to transport from storage to boiler, therefore it is important to plan enough storage space close to the boiler and to be sure that the operator/owner understands the potential work load.

Log burning stoves range in size from 4-16kW and suit smaller scale (domestic) applications because they are manually loaded. They are available in many designs and sizes to suit all styles and needs.

The stoves are the cheapest type of wood fuel appliance, making them ideal for lower cost projects. A stove with a water heating back boiler can be used to entirely run central heating and hot water, or supplement the existing heating system when used in combination with a primary boiler system. Room sealed stoves take air from outside rather than from the living area to provide draught, so warm air loss in the living space is hugely reduced.

Financial incentive

The Government's Renewable Heat Incentive tariff based support scheme (RHI) is now open. Phase 1 of the RHI is aimed at non-domestic heat generators. Successful applicants will receive quarterly payments for twenty years linked to the amount of heat generated. The scheme is administered by Ofgem (rhi.enquiry@ofgem.gov.uk). Stoves are currently not eligible. The scheme is intended to give a return of up to 12% to successful applicants over its lifetime and is retrospective for boiler equipment installed from 15th July 2009. To qualify for RHI all equipment must be MCS accredited and systems up to 45kW must be installed by an MCS accredited installer.

Tariff Name	Eligible Technology	Eligible sizes	Tariff rate (p/kWh) (rates are subject to change)
Small Biomass	Solid Biomass:	<200kWh	Tier 1:8.3
			Tier 2:2.1
Medium Biomass		200kWh and above <1000kWh	Tier 1:5.1
			Tier 2:2.1
Large Biomass		1000kWh and above	1.0

Tariffs are linked to the retail price index and are adjusted periodically. In each year the Tier 1 tariff is paid until the system has operated for the equivalent of 1,314 hours at the rated capacity of the installation. For the rest of the output during that year, the Tier 2 tariff will apply.

Support levels for the Domestic RHI (phase 2) will be announced sometime in 2013.

Those in receipt of the Renewable Heat Premium Payment (RHPP, a one off grant of £950 to purchase boiler equipment for biomass systems) administered through the Energy Saving Trust are still eligible for the domestic RHI.

For further information on the RHI scheme visit **www.decc.gov.uk.** For more information on the RHPP grant visit **www.energysavingtrust.org.uk**

Case studies

Ceredigion Council Headquarters

Ceredigion County Council, with the help of a Wood Energy Business Scheme grant from the Forestry Commission, installed a wood chip district heating system at their Penmorfa headquarters in Aberaeron in 2006. The 550kW boiler system heats offices for 150 staff, an adjacent residential home, sheltered flats and a primary school.

Manager, Martin Severs, says, *"Our district heating system is making the most out of the resources we have locally, the system replaced an expensive and inefficient combined oil and electric system.*

"The wood used for the boiler is grown within our region and a local company processes and delivers the fuel. We are really happy with the results, saving over 350 tonnes of CO_2 and a staggering £45,000 a year."

Bleddfa Centre

Shirley Elwell is Administrator of the Bleddfa Centre, an arts exhibition, events and workshop space in Radnorshire. With council grant help, she has recently overseen the conversion of their Hall Barn buildings from electric to wood fuel and is delighted with the results.

"The Hall Barn is a fantastic facility for the local community, but the electric heating system was very inefficient and meant that for large parts of the winter the centre could not open. Now, with the installation of our new 25kW pellet boiler, we have warm and comfortable facilities that can be used year round. We were keen to switch to a carbon neutral source of heating as this fits in well with the ethos of the centre.

"Modern wood fuel heating makes a remarkable difference to the appeal of the centre and we recommend other organisations consider it seriously."

Wood fuel quality and standards

For wood fuels, quality mainly refers to the moisture content, size and shape of the fuel, the sustainability of its source and the service provided. **HETAS** is the official government recognised body to approve solid fuel domestic heating appliances, all wood fuels and services. **HETAS** provides a guide for approved products and services and has developed the Quality Assured Fuel (QAF) scheme that certifies wood fuel producers working to the European standard. **HETAS** is also a certification body for the pellet quality scheme 'ENplus' which has been adopted by the European Pellet Council (EPC). As well as fuel standards, there are also quality specifications for wood fuel burning appliances. The standard BS EN 303-5:1999 specifies emissions, efficiency, heat output, safety and testing. For further information visit **www.hetas.co.uk**.

Look for quality standards; they give you and your clients confidence in the systems and the fuels.

Compliance with Regulation

Since the Clean Air Act of 1993 was introduced, only 'Authorised Smokeless Fuels' can be burned if an appliance is within an area deemed a Smoke Control Area (only 4 small areas in Wales). Wood is not an authorised fuel, however, wood can be used in ***'Exempt appliances'*** in smoke control areas. Local authorities enforce smoke control area legislation and must be informed of small and medium sized installations. For further details visit **www.smokecontrol.defra.gov.uk**

Building Control must also be informed of boiler installations which are 'notifiable appliances'. Guidance on the requirements for installation of solid fuel burning appliances below 50kW is provided in 'Approved Document J' of Building Regulations which regulates design, construction and testing of chimney and linings, ventilation, distance of combustible material from appliance and location and fitting of notice plates. Visit **www.planningportal.gov.uk** for overview and guidelines.

A **HETAS** registered engineer can self-certify to clients and the local authority that the system complies fully with regulations. Alternatively, local authority building control consent must be approved before installation and, once installed, a building control body or approved inspector must declare it is safe to use.

For further information contact The Solid Fuel Association on **08456 014 406** or visit the website **www.solidfuel.co.uk.** Alternatively search for the Domestic Building Compliance Guide (section 5) by visiting **www.planningportal.gov.uk**

Types of industry professionals

Professional services exist that design and commission integrated renewable and fossil fuel technologies at a variety of scales.

Energy Supply Companies (ESCO's) offer contracts to supply heat. They will often design the system, manage installation, own and maintain the equipment and be responsible for fuel supply and maintaining the availability of heat for the client.

Installers certified with the **Micro-generation Certification Scheme (MCS)** have demonstrated that they can install technology used to produce heat from renewable sources to the highest standards for sub 45kW installations. HETAS operates a **'Competent Persons Scheme'** that fulfils the assessment and certification role for installers. Demonstrating and employing MCS competence is also linked to regulatory instruments such as the Code for Sustainable Homes (CSH) and the Standard Assessment Procedure (SAP). Visit **www.decc.co.uk** or **www.planningportal.gov.uk**

To find an installer for sub 45kW installations contact the Energy Saving Trust on 0800 512012 or visit **www.microgenerationcertification.org**

For more information

Since 2000, numerous pellet, wood chip and log fuelled boiler systems have been installed across Wales and the Marches heating private residences, and businesses as well as government buildings.

Many lessons have been learnt from these "early" installations and much of this knowledge has been documented in a series of best practice guidelines available from the Carbon Trust. Visit **www.carbontrust.co.uk/Publications**

Specialist companies who have experience in the design and commissioning of wood fuelled heating systems are listed on the Woodfuel Wales directory available on our website. Some of these companies are approved for consultancy by the Carbon Trust and are able to offer advice independent of the equipment suppliers. Visit **www.woodfuelwales.org.uk**

Woodfuel Wales would like to acknowledge the help of the Stove Industry Alliance (SIA) in the creation of this guide. For more informatoin, visit **www.stoveindustryalliance.com**

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Woodfuel Wales is an initiative of the Welsh Timber Forum that represents and promotes the wood fuel industry in Wales and The Marches.

A Welsh version of this Guide is available to download on the Woodfuel Wales website.

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HETAS
QUALITY ASSURED FUEL
Working with HETAS for quality supply

Cronfa Amaethyddol Ewrop ar gyfer Datblygu Gwledig: Ewrop yn Buddsoddi mewn Ardaloedd Gwledig
The European Agricultural Fund for Rural Development: Europe Investing in Rural Areas

Llywodraeth Cymru
Welsh Government