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**Installing Biomass Heating Systems
Advice Note for Developers**



Introduction

This advice note concerns the installation of biomass space heating into new build, and retrofitting into existing buildings. It is not intended to cover biomass for industrial process heat, Combined Heat and Power (CHP) systems, or heating for smaller single domestic dwellings¹. It outlines the key practical considerations as well as the legislative framework. Hopefully it will answer the key questions to ensure successful project implementation.

Why biomass?

Perhaps you are at the stage of considering a biomass heating system or you may even be somewhat down the road and have engaged some provisional specialist advice.

You may be considering biomass for a number of reasons:

- It can lessen long term fuel costs in an increasingly volatile energy market.
- You may have a planning commitment to install a percentage of renewable energy in the development.
- You may have a commitment under a Climate Change Agreement or the EU Emission Trading Scheme.

For whatever reason, biomass will often be the cheapest option in terms of pounds per installed kW renewable energy capacity. However there are several key considerations you need to take on at an early stage.

Key considerations

- 1** Biomass is a solid fuel. Issues of delivery, reception and storage need to be considered at a very early stage.
- 2** Modern biomass heating systems are efficient and reliable. However there are some key differences which mean a biomass system cannot be simply substituted for a gas boiler. Your mechanical or heating engineer needs to understand and plan for these.
- 3** Your usual energy contractor or maintenance staff may not have experience of biomass systems. You will need to make sure they are properly trained by the installer or talk to the installer about an energy supply or long term fuel and maintenance contract.

Management options

If this is your first foray into biomass heating you could consider running it through a heat supply contract or a back-to-back contract where the contractor undertakes a greater amount of responsibility for the plant. While this will take some of the day-to-day control from you, it will allow you to become used to the differences. Once you and your maintenance staff become confident you can then always take greater control. If you go down this route this advice note will still be useful for contract negotiations or you may already feel confident to take on the whole project yourself.

¹ See Advice note on domestic biomass heating.



Planning and legislation

Smoke control area

The location of the proposed installation is the first important consideration. You need to establish whether the development falls into a Smoke Control Area² (SCA). A list and Local Authority contact details can be found in Appendix 1. If it is in an SCA then you will be limited to an appliance from the Exempt List³.

In some circumstances it may be possible to persuade the planning authorities to use a non exempt unit if you can provide detailed emissions data.

Boiler size

The size of the boiler is another important consideration. Boilers under 400kW require little further attention from the regulatory authorities as they fall below the threshold of Pollution Prevention and Control Regulations 2000⁴. For boilers over that size fuelled with recycled wood you must supply further information on technical details and environmental impacts to the local authority.

They may also stipulate continuous monitoring of flue gases. This may merely mean handing over data to them at regular intervals. If the proposed boiler is over 3MW in size the Environment Agency will need to become involved.

Building regulations

Building regulations also apply. For installations under 50kW, Part J, Combustion Appliances and Fuel Storage Systems⁵ must be adhered to. It will also provide useful pointers for larger installations. Just as approved gas installers are accredited by CORGI, the solid fuel registration body is HETAS⁶.

Other considerations

The planning authorities may also be concerned about the height and visual impact from the flue. This is unlikely to cause a problem with modern biomass systems unless it concerns a listed building or the development is in a conservation area or landscape designation area. They may also ask about vehicle movements associated with fuel delivery. Again, problems are not likely to occur unless the boiler is very large and the fuel storage is small.

² www.airquality.co.uk/archive/smoke_control/locations.php

³ www.uksmokecontrolareas.co.uk/appliances.php?country=e

⁴ www.opsi.gov.uk/si/si2000/20001973.htm#sch1

⁵ www.planningportal.gov.uk/england/professionals/en/400000000503.html

⁶ www.hetas.co.uk/



Delivery, storage and reception of fuel

This is a major consideration and constraint. It needs to be considered before development plans are committed to paper. If the development envelope is too small it could restrict the fuel storage area or delivery vehicles may not be able to access the storage areas.

This has proved particularly problematic on some PFI contracts where a series of similar buildings at several different locations have been constructed. However, access and space within the development envelope has been different at each site so a single solution for access and storage is not possible.

Fuel stores

Fuel store size is dependent on how often you want refuelling to be carried out. Generally as large a storage area as possible is advised to ensure sufficient reserves. This is obviously linked to the size of boiler but also the size of the delivery vehicle. If you receive fuel in 10m³ loads then you will need at least 12.5 m³ of storage if you reorder when the store is one quarter full.

A ready reckoner for storage size and a worked example is provided in Appendix 2. Be aware however that woodchip above 30% moisture content can degrade if left for more than six months.

A variety of options exist for receiving and storing fuels. Some suppliers of pellets and reprocessed fuels are able to blow fuels down pipes some distance into elevated silos. This is similar to the established practice of delivering animal feeds to intensive rearing units.

The best option particularly where space is constrained is below ground storage although this is the most costly. It allows for the easy tipping of fuels from a variety of vehicle types. A slight variation of this is partially underground / partially above ground storage. The amount above ground is determined by the delivery vehicles' tipping height. A ramp may gain you some extra height. A degree of attention needs to be given to drainage issues with any underground structure.

Where space is not constrained and large quantities of fuel are used, a simple warehouse type store with a walking floor is effective. A similar store without a walking floor and loading with a front loading bucket into a hopper is another simple solution if you have staff and machinery on site. In a few situations, particularly in rural locations a manually loaded single fire log boiler would merely need a simple covered log store and someone to load the boiler once a day. With small pellet boilers, manually emptying 15kg bags into a hopper is by far the simplest option.

Many novel solutions exist to get round most constraints but it highlights the need to establish contacts with fuel suppliers at an early stage.

Further information on delivery storage and reception can be found at the Biomass Energy Centre⁷.

⁷ www.biomassenergycentre.org.uk/portal/page?_pageid=75,17728&_dad=portal&_schema=PORTAL



Fuel supply and quality

Questions about fuel supply are the most common query from developers. Fortunately the North West is blessed with arguably the best fuel supply chain in England. The only area where you may find suppliers limited is if you require loads of chips under 3 tonnes sourced from forestry materials. Details of fuel suppliers can be found in the North West Biomass Fuel Supply Directory⁸.

Pellets

Pellets are readily available in the region. They are dense (requiring less storage space), consistent and can be blown down a pipe to above ground storage easily. They are however the most expensive fuel at between 4-6p / kWh, above that of mains gas at present. If you are considering an automated boiler under 25kW then pellets should be the first choice. Between 25kW - 40kW still strongly consider pellets. Above that chips come into their own.

Wood chips

Chips are considerably less expensive at between 0.5 – 3p / kWh; cheaper than mains gas. They are bulkier and less consistent than pellets. Chip consistency in terms of size and moisture content is vital. Low quality chip has been the largest reason for boiler breakdown to date. You need to get written specifications from the boiler manufacturer or installer of the chip specification the unit will run on. This is likely to be the new European CEN/TC 335⁹ specification or the Austrian ÖNORM M7133¹⁰ grades. You then need to get your fuel supplier to deliver to this standard.

Woodchip is likely to come from two sources, forestry / tree surgery material or recycled waste wood. The forestry materials tend to be wetter and denser. Recycled wood is generally dryer and therefore lighter by volume.

Using waste wood

Using waste wood as a fuel is exempt under the Waste Incineration Directive (WID) as long as it contains no plastic or heavy metal contamination. Therefore chips from clean pallets are acceptable but something derived from treated roofing battens with plastic wrapping contamination is not. If your fuel derives from waste wood make sure the supplier can guarantee it is “exempt” as defined by WID. Pallet derived material could also contain some nails so make sure the supplier passes a magnet over it before it is delivered. Another common fuelling mistake is to use tree surgery waste without any screening, drying and grading. Tree surgery waste which hasn't been expertly reprocessed should never be used.

Logs

Logs should be readily available from a variety of sources for single fire or batch log boilers. Size and moisture content are again important but more for overall simplicity of loading and efficiency of combustion. The boiler manufacturer/installer will be able to provide you with details on optimum size and moisture content.

⁸ www.merseyforest.org.uk/files/NW_biomass_fuel_supply.pdf

⁹ www.biomassenergycentre.org.uk/portal/page?_pageid=77,19836&_dad=portal&_schema=PORTAL

¹⁰ www.sewf.co.uk/links/SEWF_Chip_Spec.pdf



Practical differences with biomass boilers

In the vast majority of cases you cannot merely substitute a biomass boiler for a gas boiler. This is most marked where you have a modern Building Management System (BMS). Although most modern biomass boilers allow modulation to around 30% of maximum output, they are not suited to continuous low level output.

They are best run at close to full load. To get the best out of a system it is now accepted that they are run in conjunction with an insulated accumulator tank or thermal store. The BMS can then draw heat from this and the boiler recharges the hot water store by running at high output.

Boiler size

Because of their mode of operation biomass boilers can be undersized as compared to a gas or oil boiler. Do not be tempted to oversize a biomass boiler. Where there are some continuous lower level outputs or rapid peaks and troughs, you can also run the biomass boiler in conjunction with a smaller gas or oil boiler.

Maintenance

Most modern boilers are self cleaning. However, some periodic maintenance may be required. Many have long heat exchanger tubes running horizontally or vertically. Make sure when installing boilers that the tubes are easily accessible. For example installing boilers with vertical tubes into a low roofed boiler room can make removal impossible! Similarly make sure you have sufficient space to remove horizontal tubes.

Modern boilers are also likely to have automatic ash removal. Ash quantities are generally very low (<1% of fuel volume) but you will still need to empty the ash bin. This is likely to be weekly and never more than once a day.

Maintenance requirements are greater than of gas appliances but not onerous. However you will need to build this in to any contracts you have with existing building / heating maintenance providers. While many are becoming increasingly aware of this, it is likely to be a new field for them. They need to have the correct training and allocate sufficient time for this. Some of this work can be undertaken by having a remote diagnostic link back to the installer / supplier.



Practical differences with biomass boilers

Making adjustments

Having a biomass system is often viewed as being innovative and novel. There have been a few instances where building managers keen to demonstrate the new equipment have adjusted boiler settings or attempted to use a different type or grade of fuel. Unless you know the boiler intimately it is best to avoid this temptation. Even if the boiler is technical capable of doing so, switching between pellet and chip for instance may cause problems with not only the feed system but the boiler efficiency.

Sources of advice

There are a number of case studies in Woodfuel Heating in the North of England: A practical Guide¹¹ or the Lancashire Biomass Boiler Study¹². Find a couple that are similar to what you are intending to install and contact the person now in charge of the system. They will give you some extremely useful advice.

Contract options

There are now an increasing number of options available from equipment and fuel suppliers for biomass systems. This ranges from Turnkey Installation to energy management contracts where you buy heat from an Energy Supply Company (ESCo) and everything including fuelling and maintenance are carried out by them. An ESCo contract or something similar like a back-to-back contract where the installer maintains a high level of control, is preferable where you are new to using this technology. Because most biomass systems are relatively bespoke, it is worth taking this approach as any teething problems can be rectified by the specialists that installed the system. You may then wish to negotiate greater control as you become more accustomed to using biomass systems.

Financial assistance

Because this is a technology that government wants to promote, there are a range of financial packages available. Note that you cannot necessarily access more than one for any given scheme.

- Low Carbon Building Programme¹³. Only currently available for public sector building and not-for-profit organisations, it offers up to 50% grant for approved equipment up to 45kW.
- Bioenergy Capital Grant Scheme¹⁴. Up to 40% grant for installations of any size to the private and public sectors. This funding is released in rounds opening in the autumn of each year.
- Rural Development Programme for England¹⁵. Specific funding to rural businesses. Grants may be available for advice and equipment. Local conditions apply.
- Carbon Trust Interest Free Loans¹⁶. Small or medium sized businesses can borrow £5,000 to £100,000 interest free with the repayments based on the savings.
- Enhanced Capital Allowance¹⁷. Enable a business to claim 100% first-year capital allowances on their spending on qualifying biomass equipment.

¹¹ www.creativeconcern.com/iwood/pdf/WoodfuelHeating.pdf

¹² www.lancashire.gov.uk/corporate/web/view.asp?siteid=3681&pageid=17280&e=e

¹³ www.lowcarbonbuildingsphase2.org.uk/

¹⁴ www.defra.gov.uk/farm/crops/industrial/energy/capital-grants.htm

¹⁵ www.nwda.co.uk/rdpe

¹⁶ www.carbontrust.co.uk/energy/takingaction/loans_renewables.htm

¹⁷ www.eca.gov.uk/etf



Appendix 1 - Local authorities with smoke control areas

No Smoke Control Areas within the authority

Wyre Borough Council 01253 891 000
Eden District Council 01768 817 817
South Lakeland District Council 0845 050 4434
Chester City Council 01244 324 324
Congleton Borough Council 01270 529 529

Smoke Control Areas across the whole authority

Bolton MBC 01204 333 333
Liverpool City Council 0151 233 3000
Manchester City Council 0161 234 5000
Salford City Council 0161 794 4711
Tameside MBC 01613 428 355

Smoke Control Areas across some of the authority (usually based on roads)

Allerdale Borough Council 01900 702 702
Bury Metropolitan Borough Council 0161 253 5000
Blackburn with Darwen BC 01254 585 585
Blackpool Borough Council 01253 477 477
Burnley Borough Council 01282 425 011
Barrow in Furness Borough Council 01229 876300
Chorley Borough Council 01257 515 151
Carlisle City Council 01228 817 000
Copeland Borough Council 0845 054 8600
Crewe and Nantwich BC 01270 537 777
Ellesmere Port and Neston BC 0151 356 6789
Fylde Borough Council 01253 658 658
Halton Borough Council 01519 078 300
Hyndburn Borough Council 01254 388 111
Knowsley Metropolitan BC 0151 489 6000
Lancaster City Council 01524 582 000
Macclesfield Borough Council 01625 500 500
Oldham MBC 0161 770 3000
Pendle Borough Council 01282 661 661
Preston City Council 01772 906 000
Ribble Valley Borough Council 01200 425 111
Rochdale MBC 01706 647 474
Rossendale Borough Council 01706 217 777
Sefton Council 0845 140 0845
South Ribble Borough Council 01772 421 491
St Helens MBC 01744 456 789
Stockport MBC 0161 480 4949
Trafford Metropolitan Borough 0161 912 2000
Vale Royal Borough Council 01606 862 862
Warrington Borough Council 01925 443322
West Lancashire District Council 01695 577 177
Wigan MBC 01942 244 991
Wirral MBC 0151 606 2000

Ask for an Environmental Health Officer dealing with Air Quality



Appendix 2 - Calculating fuel usage and storage size

This should be considered as a rough estimate only. It is based on equivalent inputted fuel and does not take into account boiler efficiency. You also need to factor in the type of delivery vehicle that will be fuelling the store and also the intervals between refuelling.

Estimate yearly kWh usage.

Then;

$$1 \quad n \text{ kWh} \times 0.0036 = n \text{ GJ}$$

$$2 \quad n \text{ GJ} \div 19 = \text{Tonnes of oven dried wood (x ODT}^{18}\text{)}$$

$$\text{m}^3 \text{ Pellets}^{19} = n \text{ ODT} \div 0.9 \times 1.5$$

$$\text{m}^3 \text{ Virgin chip}^{20} = n \text{ ODT} \div 0.65 \times 3$$

$$\text{m}^3 \text{ Recycled chip}^{21} = n \text{ ODT} \div 0.8 \times 5$$

■ Example of 100kW boiler using 100,000kWh/year would require annually;

■ 30m³ Pellets/yr

■ 83m³ Virgin chip/yr

■ 112m³ Reprocessed chip/yr

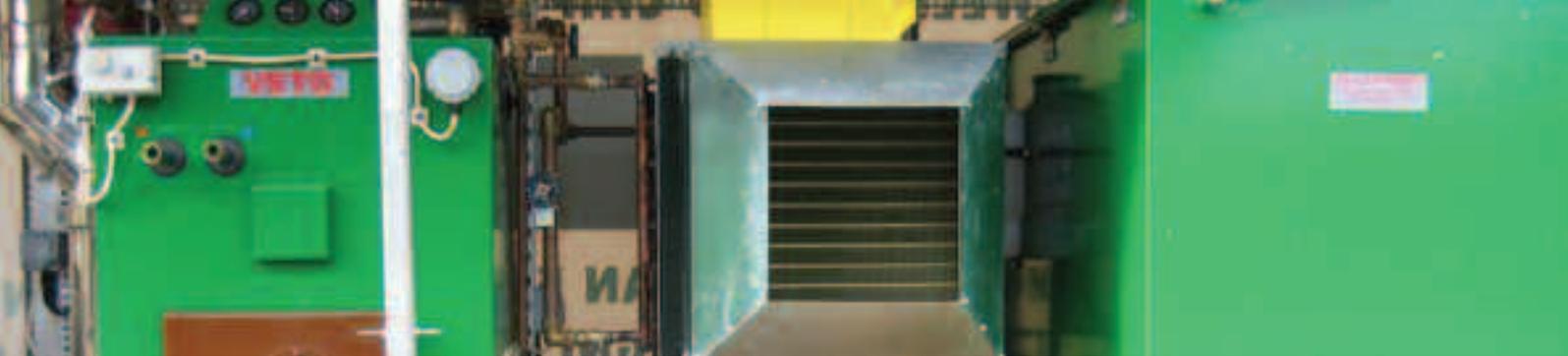
¹⁸ ODT or Oven Dried Tonne is used in energy calculations only.

An ODT fuel doesn't actually exist.

¹⁹ Where pellets have a 10% moisture content and 1.5 m³/tonne

²⁰ Where virgin chips have a 35% moisture content and 3 m³/tonne

²¹ Where recycled chips have a 20% moisture content and 5 m³/tonne



Useful information

Main national suppliers and installers of biomass boilers

3G Energi 01573 229198

www.3genergi.co.uk

Suppliers of Kob, Kunzel, Extraflame and Palazzetti boilers

Econergy 0870 0545 554

www.econergy.ltd.uk

Suppliers of KWB, Froling, Veto and Compte boilers

Energy Innovations 0844 800 6805

www.energyinnovationsuk.com/

Suppliers of Gilles and P&H boilers

Rural Energy 01664 454989

www.ruralenergy.co.uk

Suppliers of Herz, Twin Heat and Polytechnik boilers

Renewable Energy Systems

01923 299 200

www.res-ltd.com

Suppliers of Binder boilers

Talbotts (Industrial) 01785 213366

www.talbotts.co.uk

Suppliers of Talbotts boilers

Selected District Heating and ESCo Specialists

Vital Energi 01254 296010

www.vitalenergi.co.uk

Utilicom 01293 549944

www.utilicom.co.uk

North west based integrated boiler and fuel supply businesses

Bowland Bioenergy 01995 61829

www.bowlandbioenergy.co.uk

Independent boiler advice and fuel supplier from Lancashire

W Bardon Biomass 015395 52506

www.wbardenbiomass.com

Rural Energy agent and fuel supplier from Cumbria

Useful Links

North West Fuel Supply Directory

www.merseyforest.org.uk/files/NW_biomass_fuel_supply.pdf

Biomass Energy Centre

www.biomassenergycentre.org.uk

Woodfuel Heating in the North of England a Practical Guide

www.creativeconcern.com/iwood/pdf/WoodfuelHeating.pdf

Lancashire Biomass Boiler Study

www.lancashire.gov.uk/corporate/web/view.asp?siteid=3681&pageid=17280&e=e

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