

Fuel store design – It is essential that the fuel store keeps the fuel in good condition and, most importantly, dry. If fuel becomes wet the thermal efficiency of the boiler can be lower and the emissions of air pollutants far higher, especially during start-up

Staff training – Fuel delivery arrangements, operational practices and maintenance of biomass boilers are all significantly different to 'conventional' gas, oil and electric heating. It is therefore essential for staff managing the building to receive training in the operation of the biomass boiler.

Noise – The operation of biomass boilers and associated activities such as fuel deliveries may cause noise, which in some cases can cause annoyance to occupants of neighbouring buildings. Careful design of the site and consideration of delivery schedules can help to minimise any potential noise issues.

Nuisance – Aside from noise, potential nuisance from biomass boilers include odour (e.g. directly from the fuel, or chimney emissions) and dust. Again, potential nuisance can be minimised through careful site design and consideration of maintenance and delivery schedules.

links to further information

- The Carbon Trust walkthrough guide for developers considering using biomass - Biomass heating: a practical guide for potential users' (<http://www.carbontrust.co.uk>)
- The Biomass Energy Centre is a useful source of biomass information (<http://www.biomassenergycentre.org.uk>)
- Further information on air quality on Environmental Protection UK's website (<http://www.environmental-protection.org.uk>)
- A full list of Air Quality Management Areas (<https://uk-air.defra.gov.uk/aqma/list>)
- A list of Smoke Control Areas (<https://www.gov.uk/smoke-control-area-rules>)

This leaflet has been produced as part of the 'Biomass and Air Quality Guidance for Local Authorities' project. Further guidance and tools are available at www.environmental-protection.org.uk/biomass

Environmental Protection UK publishes a range of information leaflets on issues such as air pollution, land contamination and noise. These are available at www.environmental-protection.org.uk



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Biomass and Air Quality Information



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This leaflet explains how biomass burning boilers can affect air quality, and what this means for the planning process for developers containing a biomass boiler or combined heat and power (CHP) unit.

Use of renewable fuels such as biomass can cut emissions of the greenhouse gas carbon dioxide, and therefore helps us to avoid the consequences of dangerous climate change. Biomass can be an efficient, environmentally friendly fuel if attention is paid to the relevant issues and best practice is adopted. In all cases it is recommended that appropriate professional advice is sought to optimise financial and environmental operation.

A definition, which is given on <http://www.biomassenergycentre.org.uk> describes biomass as: "material that is derived from living, or recently living biological organisms. In the energy context it is often used to refer to plant material, however by-products and waste from livestock farming, food processing and preparation and domestic organic waste, can all form sources of biomass".

Why worry about air quality?

The quality of the air we breathe has a direct effect on our health. Air quality in the UK has improved since the 'Great Smogs' of the 1950s. However polluted air is still a major threat to health in many towns, cities and even rural areas. Average life expectancy across Europe is cut by an average of eight months due to polluted air.

Health based standards for many air pollutants have been set in the UK Air Quality Strategy. The three main pollutants of concern are nitrogen dioxide (NO₂), ozone (O₃) and particles (PM). Breaches of standards for all three pollutants are currently experienced in many parts of the UK.

Why are local authorities involved in air quality?

Local authorities are required by law to review and assess air quality in their area. If levels of air pollutants are above the legal standards, or the standards are unlikely to be met by a required date, that area should be designated an Air Quality Management Area (AQMA). The local authority must then draw up and implement an action plan aimed at reducing levels of the pollutant.

What air pollutants do biomass boilers produce?

In common with conventional combustion systems, biomass-burning boilers can emit a number of pollutants including nitrogen dioxide (NO₂), particles (PM) and sulphur dioxide (SO₂). The mix and amounts of pollution produced will depend on the size and design of the boiler, the quality of the fuel used and the presence of any emissions abatement (cleaning) equipment. Generally a well-maintained biomass boiler will produce more pollution than a similar gas system, but less than an equivalent coal or oil fired boiler. The maintenance of the boiler and its associated equipment will also affect pollutant emissions, i.e. poor maintenance will lead to higher emissions.

How are biomass boilers regulated?

The regulation requirements of a biomass combustion plant depend on whether or not the fuel is classified as a waste. For combustion plant burning clean, non-waste biomass the appropriate regulatory authority is determined solely by the capacity of the appliance.

The regulatory system that applies to a biomass boiler depends upon its size (rated by its maximum heat input), its location and the type of fuel it burns. Table A summarises regulatory requirements for each size of plant.

Boilers burning contaminated waste wood (and other waste) can emit other pollutants, including highly toxic heavy metal compounds. For this reason boilers burning waste may be subject to more stringent regulations than those burning clean, new wood.

The European Union's (EU) Medium Combustion Plant Directive (DIRECTIVE 2015/2193) of 25 November 2015 is scheduled to enter UK law on the 19th of December 2017. This will limit the emissions from combustion plants of medium size (ie between 1 and 50 MW), including those that use biomass as fuel. Existing plants firing biomass as their

main fuel may have until 2030 (depending on the size of the plant) to comply with the Directive's emissions limits.

Table A: Size, legislation and regulators for the operation of biomass boilers

Plant Size	Pollution Control Regime	Regulator
Type of fuel: Biomass fuel arising from natural sources		
< 20 MWth	Clean Air Act	Local Authority
>50 MWth	IPCC	Environment Agency, Scottish Environment Protection Agency (SEPA) or Northern Ireland Environment Agency
20-50 MWth	LA-PPC	Local Authority or Scottish Environment Protection Agency (SEPA) for Scotland
Type of fuel: Waste or waste derived biomass, exempt from IED*		
<0.4-3 MWth and <50 kg/hr	Clean Air Act	Local Authority
0.4-3 MWth and 50-1000 kg/hr	LA-PPC	Local Authority
> 3 MWth and >1000 kg/hr	IPPC	Environment Agency
> 50 MWth	IPPC	Environment Agency
Type of fuel: Waste or waste derived biomass to which IED applies		
< 3 MWth	IED, LA-IPPC	Local Authority
> 3 MWth	IED, IPPC	Environment Agency

* IED - Industrial Emissions Directive

Boilers with heat input less than 20 MW are currently controlled by the Clean Air Act 1993 which regulates issues such as:

- smoke emissions
- the height of chimneys
- the content and composition of motor fuels and vehicle emissions
- bonfires (such as persistent dark smoke)

The Clean Air Act 1993 allows Councils to establish Smoke Control Areas to improve air quality by controlling domestic and industrial smoke. If you live in a Smoke Control Area the burning of cleaner fuels is necessary - you are restricted in the fuels you can burn, for example you cannot legally burn high sulphur coals or any form of wood in open fireplace. In a Smoke Control Area you must use an "exempt appliances" if you wish to burn wood and coal. There are lists of manufacturers' appliances which are specifically exempted for use in Smoke Control Areas.

The height of chimneys of biomass boilers is regulated by the Clean Air Act and must be agreed in advance with the Local Authority regulator if the boiler will:

- burn pulverised fuel
- burn at a rate of 45.4kg or more an hour any other solid matter; or
- burn at a rate equivalent to 366.4kW or more any liquid or gaseous matter

Then an application must be made to the local authority regulator to agree chimney height, grit and dust arrestment plant before the boiler is used.

How does air quality affect my planning application?

In the planning system air quality is a 'material consideration'. This means that a developer submitting a planning application that may adversely affect air quality can be required to include suitable measures to mitigate (reduce) the impacts on air quality, or, in the worst case, have planning permission refused. The weight given to air quality in deciding the application will depend on such factors as:

- The severity of the impacts on air quality;
- The air quality in the area surrounding the proposed development;
- The likely use of the development, i.e. the length of time people are likely to be residing or working at the location; and
- The positive benefits provided through other material considerations.

You may wish to check to see if your proposed development is in, or close to, any Air Quality Management Areas. A list of these is available via the link at the end of this leaflet.

What information might a local authority require when I make my planning application?

If a local authority is concerned that a biomass boiler may adversely affect air quality it may require some detailed information on the type of system you are proposing to install. Most of these questions relate to the type of boiler proposed, so it is essential that you know the make, model and size of boiler you are proposing to use before you submit your planning application. If your development is in a Smoke Control Area, and the size of your proposed boiler means that the Clean Air Act covers it, it is also essential that you check that your proposed boiler has been approved as an Exempt Appliance.

Information the local authority may request is shown in the box below (Table B).

Table B: Information required by Regulators

Item	Typical information requested	Why is this information needed?	Where can I find this information?
A description of the biomass boiler	May include the make, model, manufacturer, thermal capacity (kW/MW), efficiency, maximum rate of fuel consumption (kg/hr or m ³ /hr), the combustion and fuel feed systems, any emissions abatement equipment fitted and whether the system is fitted with an accumulation tank.	This information on the basic design of the system will help assess the emissions performance. Biomass boilers often produce relatively high emissions when very lightly loaded (i.e. under 30% of full output) or switch on and off frequently.	The boiler manufacturer and/or installer should be able to provide this information.
A description of the boiler stack (flue)	May include the height and internal diameter of the stack, its grid location and exhaust gas efflux velocity (m/s). Some local authorities may require stack height to be calculated using dispersion modelling, a computer modelling technique that looks at how pollutants disperse.	The design of the stack greatly affects how pollutants produced in the boiler disperse over the surrounding area. Where the area is heavily built up, or has existing air quality issues, dispersion becomes more complicated.	Your installer should be able to provide most of the details and make a calculation on stack height and design. When dispersion modelling is required you or your installer may need to engage a specialist consultant.
A description of the intended fuel	May include the type of fuel to be used, its composition, compatibility with the boiler, any standards it meets (e.g. CEN) and arrangements to ensure the quality of the fuel. You may also be asked about arrangements for delivering and storing the fuel.	Emissions from a biomass boiler depend greatly on the type and quality of the fuel used. Reasonable guarantees are therefore needed that the fuel is compatible with the boiler, is of a high quality, and that quality will be assured for a reasonable period of time.	Your fuel supplier and installer should be able to provide this information. Your architect should be able to provide this information.
Building details	May include the height of the building that the stack is attached to and the height and distance away from the stack of neighbouring buildings.	The height and distance of neighbouring buildings will determine their exposure to emissions from the biomass boiler, and therefore the height of the stack needed.	Your architect should be able to provide this information.
Maintenance arrangements for the system	May include details of the schedule for maintaining, cleaning and de-ashing the system, along with procedures for identifying and rectifying faults with the system.	System efficiency and emissions performance very much depend upon regular maintenance. Well-maintained systems also function more efficiently reducing fuel costs.	Your installer should be able to recommend a suitable maintenance schedule.

What types of biomass boiler are there?

Biomass appliances usually fall into two categories – batch fuelled or continuously fired. Batch fuelled appliances are usually small, < 50kW output, units fuelled by logs or lump wood. They can be either stoves, where the main output is by directly heating the room in which they are placed, or hot water boilers. Until the recent introduction of pellet stoves log fuelled batch units were the only type found in the domestic sector where they still make up the majority of sales. In a continuously fired boiler, or stove, fuel is added continuously to the combustion air in the correct proportion to give the desired heat output. Combustion air is regulated to match. Generally continuously fired appliances have lower emissions of pollutants than batch fuelled appliances. In continuously fired appliances two main fuels are used – wood chips and pellets. Pellets are a modern form of manufactured biomass fuel that has many advantages. They are free flowing with a low moisture content and a consistent size and geometry. Designing efficient and effective combustion devices is therefore much simplified when compared with other fuels.

More detailed information on biomass appliances and their operation is available in the Carbon Trust document Biomass heating: a practical guide for potential users.

What other considerations are there with biomass?

System design and maintenance – Biomass boilers operate most efficiently when running under load using fuel of the correct specification, reducing both fuel costs and emissions of pollutants. It is therefore important that the system (including fuel) is well specified, installed and maintained. Professional advice is therefore recommended for system design.

Fuel delivery and storage – The space and infrastructure available for delivery, storage and ash removal is very important. If your fuel store is too small more vehicle movements will be needed, and the consequent environmental nuisance impact may be high. Adequate space will be needed to ensure delivery vehicles can enter, manoeuvre and exit the fuel storage area. Inadequate space will mean smaller vehicles will have to be used, with consequent increased frequencies of deliveries and restrictions in the choice of fuel supplier.