Biomass Boiler Information Request Form

In common with other types of combustion appliances, biomass boilers are potentially a source of air pollution. Pollutants associated with biomass combustion include particulate matter (PM_{10}/$PM_{2.5}$) and nitrogen oxides (NO_x) emissions. These pollution emissions can have an impact on local air quality and affect human health. It is essential that any new biomass boilers installed in New Forest District Council meet certain emission control requirements in order to protect local air quality.

In order to approve a planning application associated with a biomass boiler, the following information below must be supplied to the local authority.

You may find the Carbon Trust publication 'Biomass heating: a practical guide for potential users' a useful companion when completing this form. The publication can be downloaded from http://www.carbontrust.co.uk/publications/publicationdetail?productid=CTG012 (free registration required)

1. Development Details

a) Planning Application Reference	
b) Name of Site	Double H Nurseries Ltd
c) Address where boiler(s) will be located	Double H Nursery Sales, Gore Road, New Milton, Hants, BH25 5NG
d) Person completing form	Mr R Elliott (R Elliott Associates Ltd)
e) Contact telephone number	01590 683176

2. Particulars of the Boiler

This information on the basic design of the system will help us assess the emissions performance. Biomass boilers often produce relatively high emissions when lightly loaded, hence the question regarding an accumulation tank (heat store). The boiler manufacturer and/ or installer should be able to help you provide this information.

f) Describe the proposed biomass boiler including make, model, manufacturer, thermal capacity (kw/MW), efficiency, maximum rate of fuel consumption (kg/hr or m^3/hr).

We are currently in the process of selecting the technology supplier and have conducted a first stage tendering process which has short-listed several possible providers. In this regard, it is not possible to give specifics for the finalised scheme. However, the key principles for the arrangement are consistent across the proposals being considered These can be summarised as follows:

- Fuel Reception unit – providing nominal 3 days fuel capacity on site
- Refractory lined/cooled, moving grate combustion chamber
- WID compliant retention provision - >850 deg C for 2 seconds
- Steam or Thermal Oil /Steam Boiler / Economiser
- Steam or ORC Turbine – output 1.5 MWe + 7 MWth (hot water)
- Emissions abatement – multi-cyclone and bag filter, plus sorbent injection
- Flue

Fuel feed - typically 2600kg/hr (variable with energy and moisture content).

Thermal efficiency of combustion – typically quoted c.87%

Combustion – hot gases output – 8.5 MW

Thermal output from thermal oil boiler – 8.5 MW

g) Describe the boiler combustion system and how combustion will be optimised and controlled.

In order to meet WID compliance, there is a requirement to get the combustion system up to the necessary temperature before flue gases from the combusting waste wood pass through the system (i.e. meeting the 850 deg.C for 2 second retention time criteria). This will be achieved through a gas/gas oil supplementary burner. Once at this temperature, this supplementary supply will be switched off. Combustion optimisation will initially be achieved through consistency of fuel (to an agreed specification) and then, within the system, by monitoring through a control system which will be able to adjust grate speed, and temperature and air flow through the use of primary and secondary air intakes – under and above the grate respectively; and the introduction of recovered heat from the economiser and flue gas system. A continuous emissions monitoring system will be incorporated and information from this system will also help determine whether the combustion system is working efficiently, as well as monitoring emissions. In addition to monitoring system efficiency through the plant's on-site plc monitoring system, it is likely that a modem link will be established with the supplier's remote offices so that they can monitor performance on an on-going basis.

h) Describe the fuel feed system.

Fuel will be processed offsite at the fuel suppliers' premises, i.e. sorted, screened and chipped/shredded prior to delivery to site. Deliveries will be by either walking floor and/or tipper trucks (walking floor being the preferred option). These trucks will discharge the wood fuel into a fuel reception bunker within the annexe building and then be taken by crane grab into a storage bunker. The reception bunker will be located inside the building so as to prevent contamination of the fuel and also to avoid the risk of material (small particles) being blown around the site. The main fuel bunker will have a nominal 3 day fuel storage capacity. The overhead grab will continuously feed the wood fuel into a hopper that in turn discharges onto a transfer conveyor which feeds the fuel to a metering bin prior to being fed into the furnace through a screw conveyor or proprietary stoking system, ensuring that the material is presented to the furnace grate system in a manner which will result in optimum combustion characteristics. There are fire detection and extinguishing systems prior to the furnace which prevent the remote possibility of fire spreading back into the fuel feed system from the furnace.

i) Provide details of the abatement equipment in place for controlling particulate matter (fly ash) emissions.

The flue gases will pass through a multi-cyclone system to remove larger particles and then through some form of ceramic filter to reduce smaller particles. The fly ash will be collected in a separate skip or big bag system for disposal in accordance with the appropriate regulations. The flue gasses will also be subject to urea, sodium bicarbonate and activated carbon treatment in compliance with the Waste Incineration Directive requirements.

j) How does the biomass boiler deal with variable heat loads – is the boiler linked to an accumulation tank?	
	The site has a fairly steady heat demand, albeit that this has some seasonality. It is possible to adjust the heat delivered from the system by adjusting the amount of fuel fed into the biomass boiler, dealing with longer term requirements for reducing heat supply. The primary method of dealing with short term, minor fluctuations will be via the installation of a hot water accumulator, which will provide a steady state heat supply to the glasshouse heat distribution system. Additionally, it is likely that some form of cooling/radiator system will be installed to deal with the requirement for more rapid heat dissipation. The design of the system is aimed at satisfying the core base load heat demand. Peak heat demand will be met by supplementing the biomass output with output from the existing gas fired boilers on site – which will also be retained for back-up supply during biomass shutdown periods. The boiler will be connected to the 560m³ heat accumulation tanks already installed on site and this will be supplemented by up to 1,000m³ additional capacity, subject to detailed design.
k) Is the biomass boiler an exempt appliance in accordance with the Clean Air Act 1993? If yes provide evidence to demonstrate the biomass boiler has been tested and certified as an exempt appliance (for example a link to the appliance on the UK Smoke Control Areas website http://www.uksmokecontrolareas.co.uk/appliances.php)	
	The operation of the biomass plant will be subject to the Environmental Permitting (England and Wales) Regulations 2010 as well as the Waste Incineration Directive (WID) Regulations, and will require a Part A Environment Permit to be issued by the Environment Agency.

3. Boiler Operation and Maintenance

System efficiency and emissions performance very much depend upon regular maintenance. Your installer should be able to recommend a suitable maintenance schedule.

l) Describe arrangements for cleaning and de-ashing the boiler.
Bottom and fly ash will be automatically collected and conveyed to separate collection systems. Bottom ash is likely to be a wet system and fly ash a dry system. Some additional, intermittent manual ash removal from the plant may be necessary but this will take place during the pre-determined routine maintenance periods.
m) Provide details of the maintenance schedule associated with boiler, abatement equipment and stack. This should include frequency of boiler inspection and servicing by a trained boiler engineer.
These details are not available at this time. However, suffice to say that the recommended maintenance regime will be complied with in order not to invalidate the plant warranties, as well as optimising plant performance. Where recommended, regular servicing will be undertaken by specialist contractors. The Environment Agency will set standards in relation to abatement and flue stack maintenance provision, which will be complied with in order to maintain the plant's operating licence.
n) Describe how incidences of boiler or abatement system failure are identified & mitigated.
A continuous emissions monitoring system will be incorporated providing continuous, real time monitoring against the parameters agreed with the Environment Agency. Deviations from these parameters will be flagged up on the monitoring system, identified and then investigated to establish the cause and also the necessary remedial action required to correct the problem, e.g. adjustment of sorbent additives.

4. Boiler Stack Details

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 and a computer modeling technique known as dispersion modeling may be required. Your installer should be able to provide most of the details and make a calculation on stack height and design. When dispersion modeling is required you or your installer may need to engage a specialist consultant.

o) Identify the height of the boiler exhaust stack above ground. *The height should be calculated using dispersion modelling software such as ADMS 4 or Aermod [delete if dispersion modelling is not required]* Evidence shall be presented to demonstrate that predicted emission concentrations associated with the calculated stack height do not have a significant impact on the air quality objectives for NO_2 and PM_{10}.
The height of the chimney is 18 metres, and was confirmed by both D1 calculation and iterative modelling using the ADMS 4.2 atmospheric dispersion model. See Atmospheric Dispersion Modelling report appended to planning application.
p) Identify stack internal diameter (m).
The internal diameter of the chimney is 0.63 metres.
q) Provide maximum particulate matter and nitrogen oxides emission rates (mg/m^3 or g/hr) to standard reference conditions (6% oxygen, 273K, 101.3kPa).
Particulate emission rate = 0.052 g/s NO_X emission rate = 1.03 g/s Calculated by multiplying the normalised fluegas volumetric flowrate of 5.2 $Nm^3\ s^{-1}$, by the respective WID Emission Limit Value. Reference conditions of 11% O_2, dry and STP.
r) Identify the exhaust gas efflux velocity (m/s).
The exhaust fluegas volumetric flowrate = 7.25 $Am^3\ s^{-1}$ at a temperature of 190 ºC, which for a 0.63 metre diameter chimney gives an efflux velocity of 23.3 m/s.
s) Provide the grid reference of boiler exhaust stack.
The grid reference of the biomass CHP plant chimney is 422953,94622

5. Fuel Details

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.

t) Describe the fuel specification including origin, type of wood (chips, pellet, briquettes), nitrogen, moisture, ash content (%).
The fuel specification will be waste wood – agreed to a CEN/TS 335 or Onorm/DIN standard. See further description in u) below.
u) Does the fuel comply with European or equivalent fuel quality standards such as CEN/TS 335 or ONORM?
Yes, the agreed fuel specification will comply with CEN/TS or Onorm standards. In terms of particle size, this is likely to conform to Onorm /DIN particle size G100 and moisture content w<20 or w20-30. The potential fuel source is currently being analysed to establish what further processing may be required to optimise its specification from a combustion and emissions viewpoint and to understand its chemical make-up. The finalised fuel specification will include targets for ash, sulphur, chlorine, heavy metals etc.
v) Describe what fuel quality control procedures will be adopted to guarantee constant fuel quality from your supplier.
A regular sampling regime will be established to ensure that the delivered fuel does not deviate from the agreed specification. Samples will be analysed in accordance with a recognised methodology and procedure, e.g. CEN. Should non-compliances be identified, then an action plan will be established to address the issue.
w) Provide evidence to demonstrate that the biomass boiler combustion system is applicable to the fuel specification.
We have appointed AIM Energy Limited as consultants to assist in the biomass technology selection and supplier tendering process. Appropriate due diligence is being carried out to ensure that the technology is selected to match the fuel specification, amongst other criteria. Several reference visits have taken place to view comparable plants and a preliminary tender process completed which has short-listed a number of suppliers who are capable of meeting the requirements. Further investigation and analysis is taking place before the final selection is made.

x) Identify where and how fuel will be stored on site (e.g. bunker or silo).
The fuel store on site will be a bunker arrangement within the Enclosure Building with a hydraulic walking floor system for discharge to a transfer conveyor.
y) Describe how fuel will be unloaded from the delivery vehicle into the storage facility and what control measures will be in place to reduce particulate matter emissions to atmosphere.
The processed fuel will be discharged from the delivery vehicles onto the floor of the annexe located in the south east corner of the Enclosure Building. The walking floor system will transfer the fuel onto a conveyor storage bunker and then into a delivery screening filter before being conveyed up to a gravity feed hopper for the boiler. Procedures will be established to ensure that i) any spillages during unloading will be cleaned up immediately and ii) the lid or roller shutter door is closed on completion of the delivery operation. Good housekeeping in and around the vicinity of the fuel bunker will be maintained. Double H relies on light transmission through their glasshouse roofs for fast plant growth and they spend in excess of £10,000 per annum on glass cleaning. The company will ensure that no dust from the wood fuel reception system is allowed to reduce light transmission in the glasshouses.

6. Building Details

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.

z) Record the distance of adjacent buildings from boiler exhaust stack.
(Boiler Exhaust stack attached to Biomass Plant) To North – 38 metres To East – 16 metres To South – 60 metres To West – 39 metres
aa) Record the height of adjacent buildings from boiler exhaust stack.
Biomass Plant max. 14 metres height, surrounding glasshouses 6 metres height

bb) Record the dimensions of building to which the boiler exhaust stack is attached.
Biomass Plant to be 40 m x 30 m with 15m x 15m fuel reception annexe.
cc) Indicate the distance from the boiler exhaust stack to the nearest fan assisted intakes and openable windows.
Nearest fan assisted is in the existing gas boiler room 50m to the north-west Nearest openable windows are in the glasshouse roof 17m to the east Nearest openable windows in a habitable building are on the north side of Gore Road, 160m to the north

7. Plans

Please attach the following to this form:

- A site plan showing the location of the boiler room, fuel storage area and the access and exit route for fuel delivery vehicles, and
- A site plan showing the position of the boiler exhaust stack, fan assisted intake air vents and nearest openable windows.

Please see attached plan 2931 BIF 01

8. Returning this form

Please return this form to:

Rachel Higgins
Environmental Protection
Appletree Court
New Forest District Council
Lyndhurst
Hampshire
SO43 7PA

Further guidance documents and tools are available to download from www.environmental-protection.org.uk/biomass, or contact Environmental Protection UK, 44 Grand Parade, Brighton BN2 9QA – phone 01273 878770]