CLASP. Climate Change Local Area Support Programme

Planners' reference guide no. 12: Biomass

Introduction

Biomass can be burnt as a fuel to release heat and is derived from natural plant matter. Biomass as a heating fuel is low carbon because of the carbon absorbed during its lifetime as a plant. The carbon emitted during combustion is approximately equivalent to the carbon absorbed during the plant's lifetime however there is a small amount of carbon associated with handling, processing and delivery of the biomass fuel. Consequently, biomass as a fuel has a low carbon burden (typically 0.025kgCO_2/kWh under many guidance documents).

Biomass and biofuels come in a range of forms, from solid wood chip or wood pellets to liquid biodiesels and seed oils. The most common type of biomass fuel is wood chip and wood pellet, with wood pellet having a higher calorific content than chip but also generally costing more due to the increased amount of processing required to produce the fuel.

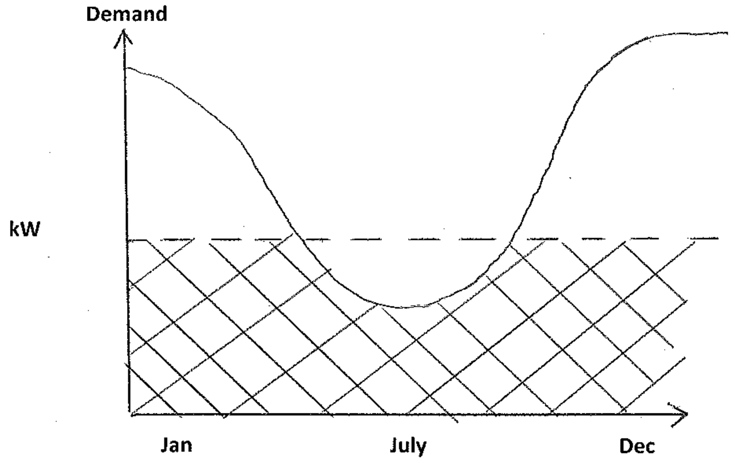
Biomass systems can be used to generate heat only or can be used as a combined heat and power system to generate both heat and electricity, although biomass CHP systems are typically only feasible at a large scale (greater than 5MW).

Rating & output

Biomass boilers come in a variety of sizes and can be as small as a wood burning stove serving a single room, or can be as large as a 1MW plus district energy boiler. In general, complete biomass boiler systems are greater than 8kW in size, with the majority of system in the 50-500kW range. Each boiler is designed for a specific fuel tolerance; some boilers can only burn clean refined wood pellet, whereas others can combust wood chip at a moisture content of up to 50% or more. Overall efficiencies are typically in the range of 80-90%, i.e. 10 units of biomass energy input equates to 8 or 9 units of useful heat energy output.

Biomass boilers are generally more expensive than gas-fired alternatives so they are generally sized to meet the baseload heat demand, with excess heat demands topped up using cheaper gas-fired boilers. This approach maximises the output from the biomass boiler and therefore increases the financial viability of the system while ensuring significant carbon savings.

An example of this base load approach is shown below:



Dimensions

The physical dimensions of the boiler are similar to an equivalent-sized gas-fired boiler, however a considerable amount of space must be allowed for fuel storage, transport access, and to transfer the fuel from the store area into the boiler combustion chamber. This transfer process is usually done through an automated screw or conveyor belt system. The fuel store itself needs to be large enough to accommodate sufficient fuel between deliveries in the winter time.

Wood chip has a typical energy density of 870 kWh/m^3 and wood pellet has a typical energy density of 3,100kWh/m^3.

Fuel supply chain

For a biomass scheme to be successful in delivering real carbon savings and be financially viable, a secure local fuel supply must be sourced. The fuel supply should be sourced from nearby to prevent large increases in associated carbon emissions through transportation and handling and the supply would ideally be agreed on a long term contract to ensure fuel security and stability of pricing.

Further information on local biomass suppliers in the North West can be found at:

http://www.woodfueldirectory.org/

Rules of thumb and costs

Price ranges for different size systems are given below (as at June 2011).

- Typical capital costs: £300-£1,000 per installed kW
- Typical system efficiencies: up to 90%
- Typical system size: >8kW
- Key financial sensitivities:
    - Renewable heat incentive (see table below)
    - Base load size and profile
    - Alternative fuel options (e.g. off gas grid)
    - Security of fuel supply

RHI summary table (correct at June 2011):

Tariff name	Eligible technology	Eligible sizes	Tariff rate (pence/ kWh)	Tariff duration (Years)	Support calculation
Small biomass	Solid biomass; Municipal Solid Waste (incl. CHP)	Less than 200 kWth	Tier 1: **7.6**	20	Metering Tier 1 applies annually up to the Tier Break, Tier 2 above the Tier Break. The Tier Break is: installed capacity x 1,314 peak load hours, i.e.: **kWth x 1,314**
			Tier 2: **1.9**		
Medium biomass		200 kWth and above; less than 1,000 kWth	Tier 1: **4.7**		
			Tier 2: **1.9**		
Large biomass		1,000 kWth and above	**2.6**		Metering

Planning considerations

The main considerations in planning terms is the requirement for fuel storage and access for fuel deliveries, as well as flue emissions in relation to any local air quality standards. Larger systems tend to burn more cleanly than a larger number of smaller systems due to the ability to justify emission cleaning technology for a small number of large plants. However consideration must still be given to the location of a biomass boiler and the height of its flue in terms of both emissions dispersal and impact on the surrounding landscape.

Further information

Planning for Renewable Energy: A Companion Guide to PPS22 - http://www.communities.gov.uk/publications/planningandbuilding/planningrenewable

Renewable Heat Incentive – http://www.decc.gov.uk/en/content/cms/meeting_energy/Renewable_ener/incentive/incentive.aspx

North West biomass fuel supply chain directory – http://www.climatechangenorthwest.co.uk/resources/biomass-fuel-supply-chain-directory

Envirolink Biomass Strategy for England's North West - http://www.merseyforest.org.uk/library/timber-and-bioenergy/?pg=2

The Mersey Forrest renewable heat and biomass summary http://media.claspinfo.org.ccc.cdn.faelix.net/sites/default/files/x.%20The%20Mersey%20Forrest%20renewable%20heat%20and%20biomass%20summary.pdf

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