Biomass can be defined as any material which is, or is derived directly or indirectly from, plant matter, animal matter, fungi or algae. This includes wood, straw, energy crops, sewage sludge, waste organic materials and animal litter.

Wood fuels can take the form of logs, chipped wood, shredded wood or pellets. Logs are commonly used in small scale systems (less than 50 kW thermal output) which are manually loaded on a daily basis. Chipped or shredded wood is generally used for automated systems from 50kW up to 1MW and beyond. Pellets have a much higher energy density than other wood fuels and are commonly used in smaller automated systems or where space is restricted.

Energy crops can be divided into several categories: short rotation energy crops; grass energy crops; and other agricultural energy crops (which may be grown for biogas production or to make transport fuels, and are not discussed further in this Guide). Short rotation energy crops include short rotation coppice and short rotation forestry. Short rotation coppice uses fast growing trees such as poplar and willow. The trees are cut back every 2-4 years to encourage growth, which can be used for energy crops, or to provide organic matter for composting.

Biomass has been successfully used for heating for many decades and is a proven technology. Biomass heating systems can be used for space heating, hot water production, steam production or a combination of these uses. Whilst there are a number of different types of biomass boilers, the key elements of a biomass system are the same. Fuel is fed to the grate mechanically where it undergoes combustion to produce energy. Biomass combustion takes place in the following four stages which can occur simultaneously:

1. **Warming and Drying**
2. **Pyrolysis**
3. **Gasification**
4. **Combustion of gases**

The main components of a biomass boiler are:
- Fuel transfer system – to move fuel from the storage area to the boiler.
- Fuel feed system – to move fuel into the boiler.
- Ignition system – used to start the combustion process.
- Combustion grate – the type of grate will vary according to the fuel type.
- Refractory material – used to reflect heat back to the grate to help dry the fuel and retain heat.
- Air feed/control system – to enable even and thorough combustion.
- Heat exchangers – to transfer the heat generated to water.
- Ash extraction – to clear the combustion chamber and exhaust gas treatment system.
- Control system – overarching system that controls variables such as fuel intake and air feed.
- Exhaust gas treatment system – used to minimise emissions of particulate matter and fly ash.
- Flue gas fan – used in certain circumstances to draw flue gases through the plant.
- Flue – chimney stack to draw gases through the plant and disperse them at a safe distance.
- Expansion tank – allows the expansion of water in sealed systems.
- Fire protection system – most modern plants include water dousing systems and automatic shut off gates to prevent burn back and reduce fire risk.

One of the most important factors to consider when thinking about a biomass heating installation is the type of fuel you will be using. This will be determined by several factors including the availability of the fuel, the fuel storage capacity and the level of automation required. For example, a pellet boiler is generally smaller than a wood chip boiler as the fuel handling equipment. The type of equipment required and any access restrictions for fuel delivery vehicles.

Sewage sludge, waste organic materials and animal litter usually require specific energy conversion and fuel handling equipment. The type of equipment will be determined predominantly by whether the fuel is wet or dry. Wet fuels are usually unsuited to combustion or gasification as it takes energy to dry the fuel before these processes can take place. It must be noted that there are environmental and regulatory constraints associated with the use of waste as a biomass fuel. These constraints may significantly increase the costs associated with the installation and maintenance of a waste fuelled biomass plant.
Combined Heat and Power, also known as CHP, is the simultaneous generation of usable heat and power in a single process. CHP units recover the steam and hot water produced in generating electricity for further use in industrial processes or community and space heating. Large scale (>1MW) biomass CHP units typically use conventional, super-heated steam turbines to generate electricity. Alternatively, a gas turbine can be used with a biomass gasification plant. At a smaller scale, CHP technology based on renewable fuels is still being developed and is not wholly proven in Ireland.

**Installation Considerations**

In addition to the considerations regarding fuel type, availability and site restrictions, a CHP plant must have access to a grid connection and a constant heat demand. The efficiency and economic performance of a CHP plant will be affected by fluctuations in the heat demand, therefore a reliable heat demand is preferable. In addition if the electricity generated by the plant is to be exported, the plant must be located in relatively close proximity to a suitable grid connection. The cost of transporting the heat or electricity off site will have a substantial impact on the financial performance of the installation.

**Financial Incentives**

The production of heat by a biomass installation is expected to supported by the Renewable Heat Incentive Scheme (RHI) in the near future.

The proposed RHI is expected to be a subsidy payment based on the amount of heat produced by the boiler that goes in to the process or building being served. We will update this fact sheet when more details emerge.

The production of electricity from biomass is supported by the Renewable Energy Feed in Tariff (REFIT). For every megawatt hour of renewable electricity generated a fixed Feed in Tariff applies. The tariff is index linked to inflation.

**Emissions Standards and Sustainability**

Ireland has not implemented limits on biomass emissions at the time of publication. The UK’s RHI scheme ensures that emission limits are observed. Flue gas emission standards were introduced for UK’s RHI eligibility from 23rd September 2013 and proof of compliance is now required on application to the RHI. The UK standards are:

- NOx limits of 150g / GJ energy.
- Particulates less than 30g / GJ.

While challenging at first for some biomass systems, especially those operating on straw or miscanthus fuel, it appears that most models of boiler can meet regulatory limits. Check carefully with your supplier that emissions compliance has been met for your intended fuel.

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