

MODULAR SMALL SCALE WOOD GAS CHP

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Exus Energy Ltd (Previously B9 Energy Biomass Ltd) is focussed on developing small scale wood fuelled CHP technology and projects. The company is based in Northern Ireland and following successful demonstration of its technology in the UK it is now commercialising its products and entering new markets.

Although the company has looked at various sources of biomass as a renewable energy source, the focus of its work is on wood fuel. There are essentially three methods of converting wood into energy – pyrolysis, combustion and gasification. When the company set out to select conversion technology for its projects pyrolysis was at the research and development stage and not commercially available, combustion although proven technically was expensive at the small scale (<5 MWe) for generating heat and power. Consequently the company concluded gasification offered the most potential for cost effective and efficient heat and power generation at the small scale.

Following a review of commercially available downdraft gasification equipment it was not possible to find equipment which met the companies expectations as such it was necessary to go back a stage and review technology in the R&D phase. The basis of the Exus Energy technology lies in gasification technology developed in Sweden for automotive power. This core downdraft gasification technology was then further developed and expanded by Exus Energy into a commercial unit for heat and power production.

Keywords: gasification, combined heat and power, liquid waste, tar waste, automation, modularisation, wood fuel.

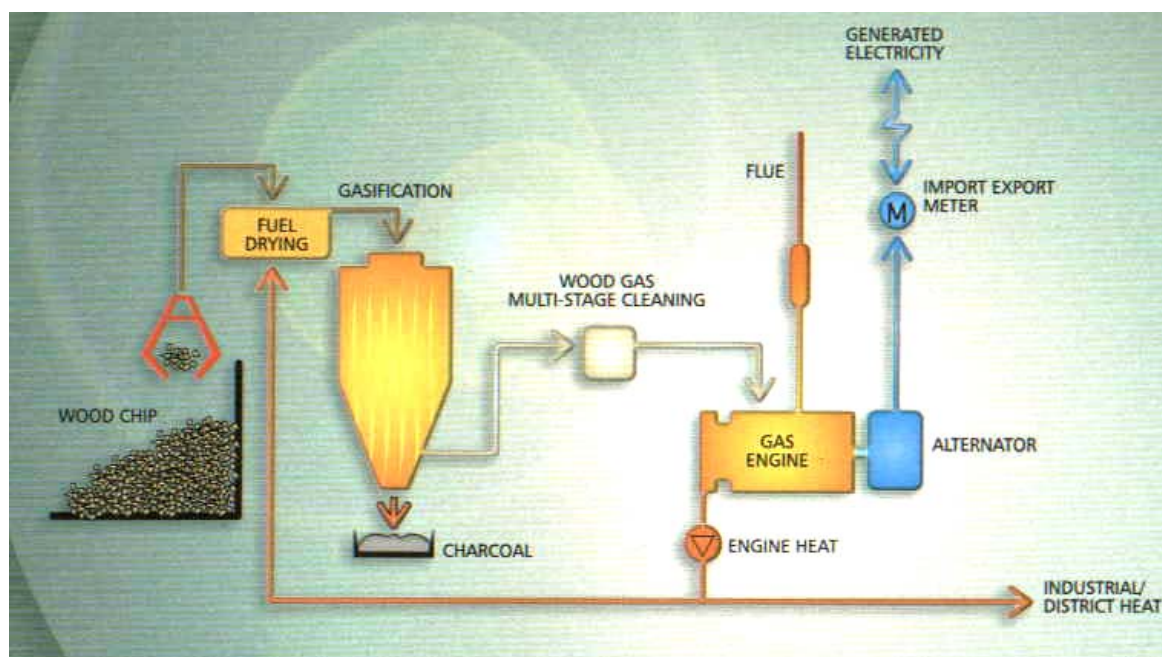


Figure 1. Generation of heat and power from wood fuel.

The Exus Energy technology involves drying the wood chips, gasification in a downdraft gasifier, cooling, cleaning the gas and feeding to an internal combustion engine. The engine coupled to a generator produces electricity at 415V which is subsequently transformed up to 11 kV. Heat is recovered from the process, part of which is used to dry the wood chip initially and the rest is available for heating purposes.

Following a period of design and after winning a contract to supply electricity to the UK national grid the company built and commissioned a demonstration project at the Blackwater Valley Museum. The electricity was sold to the grid and the heat was used in the nearby Museum for space heating. Fuel was sourced locally from sawmill wood chips. The project has successfully demonstrated the following world firsts:

- Zero liquid and tar waste.
- Fully automatic unmanned operation.

The Exus Energy technology can use wood chip (untreated) from various sources including forestry, sawmills and short rotation coppice willow. The conversion efficiency is 24% for electricity, 51% for heat producing an overall efficiency of 75% (depending on moisture content of wood fuel). Ash in the form of char is produced at a rate of 1 kg/hr per 100 kW of electricity.

The capacity of this plant has been increased from 100 kW_e to 200 kW_e and commissioning is now almost complete.

The company recently commissioned its first UK commercial unit 130kW_e at Beddington Zed, London, one of the UK's foremost examples of sustainable housing. This unit provides the heat and power for 82 homes and work spaces. Exus Energy is now also carrying out the operation and maintenance at the site (www.bedzed.org.uk)

A 300kW_e unit is now being manufactured this unit will be installed at an industrial site in Northern Ireland, to provide the heat and power for processing lime. Modularisation of this unit is underway which is seen as key to the success of the companies products, both within the UK and overseas. Further projects are in the planning stage in the UK and Germany at the moment.



Fig. 2. Beddington Zero Energy Development, London

Typical applications for this technology are:

1. Building sector – new housing, public/private sector buildings.
2. Industrial sector eg; sawmills, industrial processing.
3. Energy production eg; renewable electricity markets.

Significant increase in the use of Biomass as a renewable energy source is expected over coming years. Investment within this sector in Europe alone is valued at US\$ 1.2 billion per year. Exus Energy is forecasting significant growth in small scale wood fuelled CHP systems for renewable energy production.