

# Wood Energy

Using wood as a renewable energy source



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Wood fuel is one of the oldest sources of energy known to man – and has been used to provide heat and light for thousands of years.

In the 21st century, energy from wood has become a compelling answer to the global search for environmentally-sustainable sources of energy. New choices of renewable energy are becoming increasingly attractive to both private businesses and public organisations. Many are seeking alternative sources in response to the rising cost of fossil fuels and the need to address climate change issues.



Due to advances in modern technology, wood fuel is a clean, efficient and renewable energy source. It is available for a variety of uses – ranging from home heating, through to large-scale industrial heat and electricity generation. The development of gasification and bio-oil plants will result in even more uses for wood energy in the near future.



This guide tells you more about the potential of wood energy within the New Zealand business environment. It outlines the strong environmental and economic benefits, as well as the emerging opportunities.



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## Wood energy: the big picture

On a global scale, wood fuel (or ‘woody biomass’) is already a well-established source of renewable energy and bioenergy is already making a substantial contribution to supplying global energy demand. Estimates indicate that bioenergy could sustainably contribute between 25% and 33% to the future global primary energy supply in 2050.<sup>1</sup>

Despite being commercially-utilised, wood fuel is still an emerging resource in New Zealand and our abundance of forestry resources means we are well-placed to capitalise on its potential.

As a country with the highest percentage of forestry cover in the Southern Hemisphere, our plantation forest estate spans approximately 1.8 million hectares, or 7%<sup>2</sup> of the total land area. This means that using wood for energy is both environmentally sustainable and supportive of a strong forestry industry.

As a readily-available source of renewable energy, wood fuel is a robust solution for organisations seeking a reliable, continuous and price-stable energy supply.

On a national level, there is solid support for the development of a wood fuel industry in New Zealand. The Government has confirmed its ongoing commitment to encouraging the use of this renewable energy.

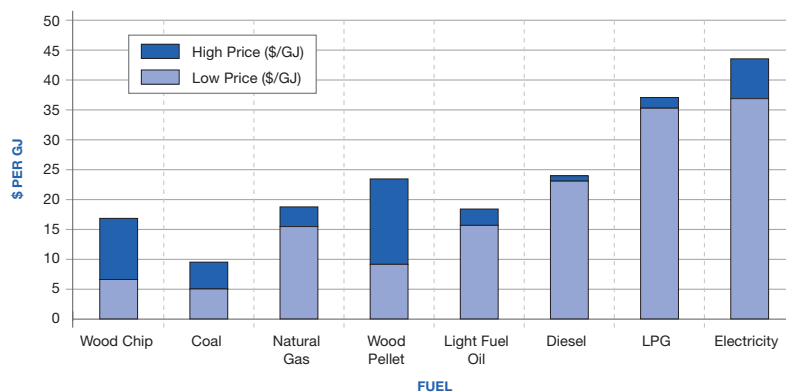
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### The business case

The ability to control energy costs is a key consideration for any organisation. History has shown that the prices of non-renewable fossil fuels are particularly volatile. In New Zealand, for instance, the price of natural gas almost doubled between 2002 and 2008.<sup>3</sup>

Wood fuel, on the other hand, is based on a sustainable and stable future supply. When sourced locally, it is competitive with other fuels such as oil, coal and natural gas – and when used for heating, can often be the lowest cost of all forms of renewable energy.

Wood chip and wood pellets are typically priced per tonne, and can be compared with other energy sources on a cost-per-GJ basis, as shown below.



This pricing information is based on EECA monitoring and the Ministry of Economic Development's New Zealand Energy Data File 2009 Commercial Prices.

Source: Figures calculated from Wood Energy Programme, EECA, April 2008.

This graph depicts the energy costs for different fuels. There is a range in the cost as prices for energy vary significantly due to geographic factors, usage and alternatives available. For example, natural gas costs vary considerably between a large industrial user such as a dairy processor and a household. Another example is wood pellets, which are more expensive in the south than the north due to the absence of reticulated natural gas in the South Island (natural gas can be a substitute for wood pellets).

<sup>1</sup> International Energy Agency, <http://www.ieabioenergy.com/IEABioenergy.aspx>

<sup>2</sup> Ministry of Agriculture and Forestry

<sup>3</sup> Ministry of Economic Development Energy Data

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With the introduction of the Emissions Trading Scheme (ETS) in New Zealand, the economics of using wood fuels improve even further. From 2010, all greenhouse gas emissions are required to be offset through the purchase of carbon credits. For most users, this cost is met by energy suppliers who will incorporate carbon offsets into their product cost.

As wood fuels do not incur any carbon charge, they are not subject to these price rises (more information on the Emissions Trading Scheme can be found on [www.climatechange.govt.nz](http://www.climatechange.govt.nz)).

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### **The environmental case**

The push to address climate change is now firmly on the agenda – globally, nationally and locally. Despite New Zealand’s reputation as a ‘clean green’ nation, the country’s carbon footprint is significant. Per head of population, New Zealanders emit nearly twice as much greenhouse gases as the British and almost five times as much as the Chinese. New Zealand’s greenhouse gas emissions continue to increase – between 1990 and 2008 its carbon dioxide emissions rose by 45%.<sup>4</sup>

Organisations that switch to wood fuel, therefore, will be making a vital contribution to New Zealand’s environmental responsibility. Wood fuel is described as a ‘carbon neutral’ energy source. This is because when wood is burned, it simply recycles back into the atmosphere the CO<sub>2</sub> that it absorbed as a growing tree. Therefore wood fuel does not contribute much to global warming – unlike fossil fuels such as coal, oil and natural gas.

Wood fuels lead to an even more efficient use of our forestry resource, as they are mainly produced from plantation forest wastes and prunings. By-products from the wood processing industry, such as sawdust and shavings from sawmills, are also recycled as wood fuel.

Replacing fossil fuels with wood fuel will benefit the environment in a number of ways. These include:

- reducing CO<sub>2</sub> emissions by up to 100%
- improving air quality through reduced particle emissions (compared with coal or diesel)
- encouraging the planting of sustainable forests producing recycled ground fertiliser in the form of wood fuel ash
- reducing the risk of soil and water contamination associated with other energy forms (e.g. coal)
- reducing the environmental costs associated with transport (due to localised wood supply).

For organisations who are promoting their commitment to corporate social responsibility, using wood fuel also represents a valuable marketing advantage.

## Wood Energy: the technology

Converting to wood fuel technology usually requires an investment in new wood boiler technology (or the adaptation of an existing boiler).

The decision to invest in a wood boiler is a strategic one. The upfront cost to install the technology is higher than installing a standard gas or coal boiler. The long-term financial advantage, however, lies in the many future years of reduced fuel costs. As with all renewable energy technologies, evaluation of life cycle costs is important.



The other business advantages include reduced emissions liability, environmental leadership, and improved corporate social responsibility.

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### Boiler technology

Modern biomass boilers are designed to burn a range of woody biomass fuels highly efficiently. Depending on the type of fuel used, these boilers are able to convert up to 93% of the fuel's energy content into heat.

Features of the modern wood fuel boiler may include:

- **Fully automated fuel loading & operation.** Most wood fuel boilers are fully automated and require minimal supervision.
- **Low maintenance.** With low particle emissions and other features such as separate wood storage, automatic loading and self-cleaning operation, the new technology offers a clean, mess-free environment in the boiler room.
- **Remote monitoring.** If required, your system can be monitored remotely (via a modem connection) to check operation and emission performance.
- **Automated ash removal.** An automated ash removal system can extract the low ash residue into a receptacle next to the boiler. The ash can then be recycled as a ground fertiliser.

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### Types of wood energy

Wood energy is generally supplied in solid form, known generically as 'woody biomass'. However within the next few years, wood will also be used increasingly to produce biogas and bio-oil.

Woody biomass comes in various forms, which are all sourced from forest residues and residues from wood processing sites. At its most simple, it can be collected from the surrounding environs (e.g. tree trimmings) at virtually no cost. However most users will source their wood fuel commercially.



The current options include:

**Wood pellets:** manufactured from materials such as dried and compressed sawdust, wood shavings and chaff. Wood pellets are ideal for organisations that:

- have a smaller energy requirement (as pellets are more expensive than wood chips), e.g. a boiler up to 100 kW
- have an existing coal-fired boiler that could be easily converted
- prefer a fuel that is clean, free-flowing and requires little maintenance
- are located in urban areas where fuel storage space is limited
- require a higher level of automation and are located in a clean air zone.



**Wood chips:** made from wood off-cuts. They can be fairly regular in size when screened. Wood chips are ideal for organisations that:

- have a larger energy requirement (as wood chips are a lower-cost fuel)
- have a fuel-feed and boiler system designed for the use of wood chips
- are located in the region of a wood chip supplier
- have sites with space for larger fuel storage.



**Hogged wood:** wood that has been mechanically broken down. It is a lower-quality (and thus lower cost) option. Hogged wood is only suitable for large industrial applications with appropriate feed mechanism.

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### The supply chain

As a fully sustainable resource, wood fuel in New Zealand has a sound future. In 2004, wood provided 7% of New Zealand's total energy needs – in the form of heat for industry, home heating, and a small amount of electricity generation.

This figure is predicted to increase, as our plantation forests make more wood residue available.

**Wood pellets** can be purchased commercially from various sources. The government-owned energy supplier, Nature's Flame, currently operates three wood pellet manufacturing plants – two in the North Island, and another near Christchurch in the South Island. There are also a number of smaller suppliers operating around the country.

**Wood chips** will be available in ample quantities in regions with forestry resources. Wood chips can be sourced direct from the supplier – e.g. sawmills, wood processing plants, or local farms.

Alternatively, customers may choose to source their fuel via a wood fuel energy service company. This has the added advantage of ensuring quality control and energy content of the wood chip. Some companies also provide a 'heat' contract (whereby the customer pays for the actual energy delivered, rather than the tonnes of fuel consumed).

Suppliers of wood pellets and wood chips are listed on the Bioenergy Association of New Zealand (BANZ) website ([www.bioenergy.org.nz](http://www.bioenergy.org.nz)).

## Wood energy: is it right for your business?

### A checklist

The first step to implementing a wood fuel system in your organisation is to complete a feasibility assessment. This will outline whether the project is economically viable; as well as giving projections on emission reductions, and options in fuel supply. This assessment can be done inhouse, or outsourced to a specialist firm.

Factors to be assessed include:

- **Current heat plant** – What is the age, type and rated output of the existing heat plant?
- **Existing boiler upgrade** – Can your existing boiler be adapted for wood fuels? What are the relative costs for upgrading to pellets or chips?
- **Energy cost** – What is the current energy expenditure and projected energy costs, including wood?
- **Relative economics of installing a wood fuel system** – What is the capital and running cost of a wood-based system relative to other options?
- **Fuel supply** – Is your organisation located in a region where there is a readily-available supply of wood fuel? Can the suppliers provide a fuel suitable for the boiler (refer to the Wood Fuel Classification Guidelines on [www.eecabusiness.govt.nz](http://www.eecabusiness.govt.nz) and [www.bioenergy.org.nz](http://www.bioenergy.org.nz))?
- **CO<sub>2</sub> emissions** – What are current emission levels?
- **Air shed issues** – Does your existing energy system contribute to local air shed pollution?
- **Resource consent obligations** – What are the resource consent considerations for your current and any future systems?
- **Fuel storage** – Is your site adequate for wood fuel storage, or can it be upgraded?

After considering the feasibility of a wood-fuelled system, relevant staff or contractors will need to be employed to design, build and implement the system. Your supply of wood fuel will also need to be secured and contracts negotiated.



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[www.eecabusiness.govt.nz](http://www.eecabusiness.govt.nz)

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