



ADAPTING TO A CHANGING CLIMATE: FACT SHEET 4

BIOENERGY

The alternative to fossil fuels

WOOD CHIPS:

- are made from timber waste.
- are easy to handle.
- are used in fully automated burner systems that can reach 93 percent efficiency.
- are well-suited to heat large quantities of water.



WOOD PELLETS:

- burn cleanly and efficiently.
- are very convenient and easy to handle and store.
- are cost-effective.
- have the lowest ash and emissions output of any solid fuel – no sulphur emissions, 60 percent less particulates and 100 percent reduction of CO₂ than fossil fuels.



Fossil fuels, such as oil and gas, have been widely used for heating and in industrial processes. Carbon emissions are harmful to the atmosphere and need to be reduced, which means that energy sources need to change. A clean, renewable alternative is the use of wood chips and wood pellets.

WOODY BIOMASS FUELS ARE CLEAN AND EFFICIENT

Fossil fuels, such as oil, coal and gas, produce harmful emissions as they burn, including carbon dioxide (CO₂), carbon monoxide (CO), nitrogen oxide (NO_x) sulphur oxide (SO_x) and particulates (PM10). Fossil fuels are non-renewable energy sources which mean that oil and gas reserves will someday run out.

In contrast, woody biomass is a clean and renewable way to generate heat. Fuels based on woody biomass are “carbon neutral” because the carbon released during the burning process is the same amount the tree would have absorbed when it was growing.

Optimised combustion systems that use woody biomass for heat are as effective and efficient as fossil fuels, and are better for human health.

Wood pellets and wood chips are two woody biomass fuels increasingly used instead of fossil fuels. Wood chips or pellets are considered most suitable for commercial heating applications, while wood pellet boilers are recommended for larger buildings and industrial applications.

WOOD PELLETS

Although relatively new to New Zealand, the wood pellet industry is well established in Europe and North America and wood pellet stoves are widely used.

Wood pellets are a clean-burning, convenient, and cost-effective fuel that can be used for many applications such as home heating and industrial process heat. The uniform size, weight and low moisture content of wood pellets make them a very effective and compact fuel and allows for low cost handling, transportation and storage.

Wood pellets should be burned in specially designed stoves and boilers that come in different sizes and styles to suit homes and commercial applications. Although wood pellets will burn in traditional wood burners, it is inefficient and costly. Some coal boilers can be converted to run on wood pellets.

Wood pellet stoves are designed to ensure complete combustion, producing a clean burn and the least ash of any solid fuel. They produce no sulphur emissions and 60 percent less particulates than coal. Such low emissions have a very low impact on air quality.

Wood pellet boilers have fully automated ignition and burning systems and are very efficient at converting energy to heat – 93 percent compared to 90 percent for stoves

and fireplaces, and 65-75 percent for log burner fireplaces. They are a good choice for schools and places where space is limited. Wood pellet boilers are recommended to heat large buildings and in industrial applications.

WOOD CHIPS

Wood chips are made from waste products from sawmilling, arboriculture and forestry. Just like regular firewood, wood chips vary in size, weight and moisture content, which means their energy and flammability can vary.

However, wood chips are a carbon friendly source of fuel, well-suited to heat large quantities of hot water, such as in hotels, hospitals or prisons.

Wood chip boilers can often be used either with wood chips or pellets, and many have fully automated start up, tube cleaning and ash clearance systems. Their high efficiency, performance and convenience enables them to compare well with oil or diesel systems.

DOMESTIC HEATING OPTIONS

WOOD BURNERS

Almost half of New Zealand homes use wood for heating, an option that also heats water through a boiler or wood burner and wetback cheaper than an electric water heater.

Wood burners do not burn wood completely, due to a high moisture content and low heat level in the burner. Wood then smoulders and creates smog. Smog contains very fine particles called PM10, which can cause respiratory problems.

To burn as cleanly as possible, a fire needs to be as hot as possible and have the correct amount of air. Modern wood burners have fireboxes lined with firebrick material and maintain an optimal air supply, which allows them to reach 60 to 70 percent efficiency, which relates to the conversion of fuel into heat. A typical open fire has just 15 to 20 percent efficiency.

Wood burners also produce less ash than fossil fuels. Wood produces 0.5 percent ash, which can be used as garden fertiliser, while coal produces 3 to 5 percent ash, which cannot be used as fertiliser.

WOOD PELLET STOVES

Wood pellets and pellet stoves are a recent home heating development for New Zealand. They are designed as either free-standing or fireplace insert models. To operate the fireplace, wood pellets are poured into a hopper and then automatically fed into the firebox. An electric element lights the wood pellets. Heat output is controlled by a thermostat, which regulates how many pellets are fed into the firebox

CENTRAL HEATING

Central heating uses natural gas, diesel, coal, wood chips or wood pellets to produce heat from a central boiler. Often found in schools and businesses, boilers use heat exchange surfaces to heat water or to make steam for industrial processes.

Hot water is especially effective for heating a space through underfloor, radiant and forced air central heating.

Pellet fired boilers are becoming an environmentally acceptable choice, particularly in areas of strict air emission control, such as Canterbury and Nelson.

COMMERCIAL AND SCHOOL HEATING

Most New Zealand schools heat rooms by burning coal, gas or oil. Smaller and more modern schools might use electricity, often to run heat pumps.

Many schools are adopting a carbon-neutral heating alternative by converting coal boilers to wood pellet boilers. This demonstrates to students that environmentally-friendly choices can be simple and very effective.

Schools with a boiler and hot water heating network that runs on coal, gas or oil are very suitable to be fuel swapped to wood pellets.

HEAT FOR INDUSTRIAL PROCESSES

Process heat can be produced through fossil fuels or bioenergy. Wood waste fuel is a common way to save money and the relative cost is expected to improve as the price of fossil fuels increases.

Almost half the wood going into a sawmilling process ends up as some form of wood waste or is used for some other process, such as paper production. In many New Zealand mills, wood waste is burned to produce heat for drying kilns and timber treatment plants.

Wood pellet boilers are recommended for industrial applications.

**THIS IS ONE IN A SERIES OF FACT SHEETS CALLED
ADAPTING TO A CHANGING CLIMATE THAT CAN BE FOUND AT
WWW.MAF.GOV.TZ/CLIMATE CHANGE**

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FOR MORE INFORMATION

- The Bioenergy Knowledge Centre provides tools and information to use wood waste as a renewable energy source: www.bkc.co.nz
- The Energy Efficiency and Conservation Authority works with individuals, businesses, communities, government and local government to use renewable energy: www.eeca.gov.tz