

New Zealand Wood Pellets – Making the most of National and International Opportunities

28 July 2010

1. Introduction

This profile of the New Zealand wood pellets sector summarises¹ the economic and energy supply opportunities from expanding the national and international wood pellet markets. It has been written for the industry by the industry to give a context of the New Zealand market for anyone planning participation. It is sponsored by New Zealand Trade and Enterprise (NZTE).

While the New Zealand domestic market is currently small, it is growing and is well served by a number of pellet producers; the retail sector is less well developed; and the demand for pellet fuel is generally under developed. While domestic growth will continue to grow it is likely to be somewhat reserved because of the limited demand for pellets. This is despite excess supply capacity.

International opportunities for selling New Zealand made wood pellets are only just being realized with the construction of a large plant in Taupo to target export opportunities in Europe and Asia. The first shipments were delivered in early 2010. International markets are predicted to grow significantly because of European country commitments to climate change targets and an inability to meet growing wood fuel demands. However, competition from other countries to New Zealand's expanded export supply is very strong in particular from North America and increasingly likely from South America and Australia.

This note presents details on the New Zealand situation both in terms of producing pellet fuel to meet national demand and realizing international opportunities. It notes the drivers for national and international demand, where the demand is expected to be affected by the main markets for use. Finally it notes who the major competitors are for New Zealand in the international markets, and the challenges of selling pellets on an international scale.

1.1. Wood pellets – What are they?

Wood pellets are wood particles (e.g., wood shavings and sawdust) compressed into small cylindrical pellets. They are shredded and compressed under high pressure when extruded through holes in a press. Woods natural lignin is the binding agent which holds the pellets together. The pellets are denser than wood chip and have very good handling characteristics. They can be made from a wide range of sources of biomass with the result that pellets made from different feedstocks will have different energy

¹ The briefing note has been prepared by the Bioenergy Association of New Zealand from internationally sourced information and contributions of its Wood Pellets Interest Group Committee members.

densities and other characteristics. Not all pellets are equal and the specific characteristics of pellets must be specified to users in terms of the standards classification to which they have been produced.

Wood pellet fuel - with its minimal carbon footprint and very low ash and sulphur content - is in increasing demand worldwide as a home-heating fuel, for fuelling heat plant e.g. boilers, and from electricity generators where it is used as a fuel to help reduce emissions from their thermal plants. Wood pellets are a cleantech fuel and easy to handle, store and use. They are delivered to a stove/burner/boiler by an auger from a storage hopper and even the small domestic systems most often feature auto ignition for convenience.

They are suitable for both residential and commercial users offering an ideal heating solution. In residential applications pellet fuelled boilers produce hot water for central heating systems and for domestic hot water. For commercial and institutional applications, existing coal fuelled boilers can be converted to run on pellets, although higher performance is usually achieved from installation of new purpose built and fuel specific equipment

Pellets can be co-fired with coal in large heat plant, say for electricity generation, but will require specific fuel storage and handling facilities. Generally however pellet fuel can be incorporated into the existing coal-based power generation infrastructure. Pellets may be mixed with coal and burned with relatively minor modifications or capital outlay, or it may need to be further pulverized according to the nature of the heat plant fueling equipment design.

1.2. Wood pellets and other forms of wood fuel

Wood fuel comes in a range of forms including firewood blocks, firelogs, energy chip, billets and wood pellets. The wood pellets and firelogs are processed forms of wood fuel to provide fuel with specific handling and use characteristics that differ from the less processed forms of wood fuel. In the commercial scale market wood chip and wood pellets can often be used in similar applications. The choice of chip or pellets as fuel is often dictated by price, chip quality, availability and transport costs.

A new form of wood pellets that is still in the developmental phase but is expected to progress to commercial production within the next few years is torrefied wood pellets. The torrefaction process results in pellets of a higher density and better grindability compared to conventional wood pellets.

The table below presents the relative benefits of wood chips, ordinary wood pellets and torrefied (TOP) pellets. Torrefaction has the potential, at least in theory, to further expand international market opportunities.

	Wood Chips	Wood Pellets	TOP Pellets
Moisture Content (%)	35	10	3
Calorific Value (MJ/kg)	10.5	16	21
Bulk Density (kg/m³)	550	600	800
Hygroscopic Nature	Wets	Wets	Hydrophobic

Energy Bulk Density (GJ/m³)	5.8	9	16.7
Behaviour in Storage	Can be stored outside	Requires dry storage	Can be stored in damp conditions

Table 1: Properties of chips, pellets and torrefied pellets²

Key advantages of **wood chip**

- Can be produced from a wide range of feedstocks.
- Requires limited processing.
- Requires relatively low capital cost plant for sourcing and production.
- Can often be sourced locally resulting in limited transport costs.

However

- Difficult to produce to specification.
- Quality can easily vary.
- Difficulties of basing measurement of quantity on quality.
- Transport can often adversely affect the delivered energy price and carbon neutrality.
- Approximately three to four times the volume for storage is required for a unit of energy.
- Has a tendency to bridge, and therefore needs some form of agitation in the bunker for flow.

Key advantages of **wood pellets**

- Uniform characteristics.
- High energy density of pellets.
- Ease of handling.
- Can be produced to specification.
- Can be sold in bags suitable for residential use.

However

- Requires specialized plant for combustion (but no more so than modern wood chip boilers)
- Production plant may be some distance from the use requiring long transport distances but the energy and bulk density of wood pellets allows for this.
- Requires specific storage to keep dry.

Key advantages of **torrefied pellets**

- Lower moisture content than wood pellets.
- Higher calorific value than wood pellets.
- High bulk density giving transport advantages in ocean freight but as standard pellets already max out land transport vehicles on axle weight, no advantage is gained in this area.
- Energy bulk density is higher cf to that of wood pellets.
- Torrefied pellets are hydrophobic and more stable in storage.

However

- There are no torrefied pellets produced in NZ.
- Much higher degree of processing compared to chip and standard pellets.
- There are no independently reported TOP plants running economically on a commercial scale.

² <http://www.all-energy.co.uk/UserFiles/File/2007PaulMitchell.pdf>

1.3. *Wood pellets and other forms of fuel*

As well as being a renewable energy source wood pellets have a number of benefits compared to other non wood fuels. Some key advantages of pellets compared to other fuels are:

1. Low emissions – As pellet stove emissions are so low they can be burned in most areas even those with burning restrictions.
2. Easy installation - Only minimal clearance is needed to install the burner/stove.
3. High Combustion – As pellets have a near total combustion (around 98.5%) pellet stoves produce virtually no creosote.
4. Easy to store - One ton of wood pellets has the heat value of about 5 m³ of firewood and stacks easily in one third of the space. This makes it possible to easily store fuel for the entire season.
5. Low waste ash production - A 20kg bag of Wood Pellets produces around 100gms of ash.
6. Environmental advantages – Sustainable source of fuel. Pellets are an environmentally friendly source of heat; they are CO₂ neutral both in combustion and storage. Wood pellets are a clean, environmentally friendly, natural, renewable fuel resource. Can reduce waste destined for landfills and the cost of disposing waste is greatly reduced.
7. High efficiency - The efficiency rating can be as high as 94%, depending on the model and heat output required.
8. Easy to use – The Pellets are clean and easy to use; they flow like a liquid and can work as part of an automated feeding system. They are easy to ignite and to handle generally. They can be used in stoves/burners and boilers.
9. Continuous operation – Typically the burner has a large hopper and the stove can burn continuously for several days, depending on the heat output required.
10. Easy to transport – the compact pellet proves easy to transport long distances.
11. Volume Comparison (Same energy content) - Light oil 1; Coal 1.5; Pellets 3; Wood chips (wet) 13; Dry shavings 22.

2. New Zealand Domestic Wood Pellets Market

2.1. *Wood pellet market*

In New Zealand, the popularity of wood pellets continues to grow albeit slowly and in niche applications.

Residential Use - It's estimated that there are around 10,000 pellet fires installed in residential applications in New Zealand. It's further estimated that 8,000 of these are in the Canterbury Region. As the market is clearly more established in the Canterbury region, and sales are higher, typically the availability of pellets for residential customers is not an issue as retailers have a large enough market for them to put in place an appropriate pellet distribution infrastructure. The pellet distribution networks are not as well developed in other regions.

Pellets are now becoming readily available from a range of sources including: being sold direct from the producer to customer; from local hardware DIY stores and service stations in 15kg bags, and from heating specialists. As the product becomes a more mainstream commodity the tendency is towards more retailer based sales, with about 80% of product to domestic customers now sold through retail stores.

The residential wood pellet market is driven by homeowners wanting to replace existing open fire heating with more efficient heating, installation of modern efficient heating systems in new homes, and the requirement in some regions for the replacement of open fires by cleantech low emission heating.

However the choice of wood pellet heating compared to other heating forms such as from electricity is constrained because of a lack of familiarity with wood pellet heaters, some poor performance by some previously installed equipment, and the previous difficulty in sourcing wood pellet fuel. These matters are now being overcome and so growth in demand is expected to rise. However a remaining constraint is that heater retailers prefer to promote efficient wood burners in preference to wood pellet burners. Generic marketing of wood pellets as a modern efficient form of home heating is required to stimulate and maintain uptake.

New Zealand has a limited market for residential central heating because of previous house design however as heating design becomes more common a consideration for new homes there can be an increase in demand for wood pellets for use in central heating systems.

Commercial scale use - More than 40 schools have converted to using wood pellet fuel in existing or replacement for coal boilers sized up to about 1MW. Some other Government facilities have also provided good leadership in converting existing coal, diesel or gas plant to use wood pellets for heating. There are several examples of innovation in pellets use, not least Radford Yarn Technologies, an innovative Christchurch manufacturer of high-quality carpet yarns who converted from electricity to wood pellets for its primary energy.

The supply of wood pellets to commercial scale applications requires bulk delivery capability and proximity from pellet production plant is still significant as with respect to availability and price. Nature's Flame, New Zealand's leading pellet producer, has invested heavily in a new vehicle that can deliver in conventional ways but can also use pneumatics for delivery into pellet specific storage areas.



In the commercial scale market the use of wood pellets as a fuel for boilers competes with wood chip and other conventional fuels. The ease of obtaining, storing and handling wood pellet fuel with its low

ash characteristics makes it an ideal fuel for limited operator applications such as school or institutional heating.

Torrefied wood pellets are not commercially available in New Zealand.

2.2. *Equipment suppliers*

Residential use - specialist home heating retailers and building supply chains now stock a variety of wood pellet fires and central-heating boilers. There are a number of imported brands of residential heater on the market to suit a range of needs, e.g.

- HDG Compact -Fuel: Wood Pellets Output: 25, 35, 50, 65, 80 kW
- Fu-wi wood pellet boilers: 15kW, 22kW and 30kW
- Woodpecker Wood Pellet Boilers 15-50kW
- ETA
- Hargassner
- Eco Flame Ltd (Sirocco and Oriel)

There are currently three New Zealand based manufactures of residential wood pellet stoves/burners and boilers:

- McKenzie Heating Design (Dunedin)
- Parkwood Pellet Fires
- Pioneer Manufacturing Ltd. (Taranaki)

While there are a number of suppliers of wood pellet heaters the residential market is largely under developed because of the lack of experience by the community of wood pellet heaters and the availability of trained installers and maintenance people.

Commercial scale use – commercial scale applications are either achieved by the conversion of existing coal fuelled boilers to be fuelled on wood pellets, or by the installation of new equipment. Conversion of an existing boiler may be cost effective but will depend on the design and state of repair of the boiler. A small pool of competent engineers with the necessary skill to design and make a conversion is available. As wood pellet fuel burns quite differently from coal it is important that competent and experienced engineers³ undertake the work.

New purpose designed equipment will provide better energy conversion efficiency than can be achieved from conversion of an existing boiler. European brands of biomass boilers available in New Zealand include:

- Large HDG Boilers -100/150/200 kW
- Köb

³ A directory of listed consultants is on the website www.bioenergy.org.nz

- Binder

In addition there are a number of New Zealand based manufacturers, including;

- Taymac (Taylor Manufacturing Ltd) (Christchurch)
- Fogarty Industries (Invercargill)
- RCR Energy
- Rayner Engineering
- Scotts Engineering.

2.3. *Wood pellet production*

The New Zealand wood pellet market is growing with the number of producers and retailers increasing year on year. New Zealand is well placed, given its experience in processing wood resources to meet growing demand nationally and internationally.

Use within New Zealand is predominantly in the residential heating sector and in the small commercial sector. Relatively the market is on the small side with modest growth year on year predicted. Table 2 presents details on the current wood pellet producers. The table gives an approximate indicator of production scale and market focus.

Pellet Producer	Base	Production Scale	Market Focus	Contact details
"HotShottzz" (from Golden Strand Wood Fibre Products)	<i>Auckland</i>	Medium	National Residential / Small commercial use	http://www.pineshavings.co.nz/
Pine Tree Pellets (from Wood Pellet Fuels)	<i>Huntly</i>	<i>Medium</i>	National Residential / Small commercial use	http://www.woodpelletfuel.co.nz/pelletfuels/
Inset Firelogs (NZ)	<i>Hastings</i>	<i>Small</i>	National Residential / Small commercial use	
Nature's Flame	<i>Christchurch, Rotorua and Taupo</i>	<i>Large</i>	National Residential /commercial and industrial use International domestic markets and, electricity generation.	http://www.naturesflame.co.nz/
Firetime Pellets (from Azwood)	<i>Nelson</i>	<i>Small</i>	National Residential / Small commercial use	http://www.woodpellets.org.nz/docs/Suppliers/Firetime_leaflet.pdf
Andrew McAlister	<i>Christchurch</i>	<i>Small</i>	National Residential / Small commercial use	
Starwood Ltd	<i>Timaru</i>	<i>Small</i>	National Residential / Small commercial use	

tba	Dunedin	Small	National Residential / Small commercial use	
Pomahaka Wood Pellets Ltd	Tapanui in West Otago	Small/Medium	National Residential / Small commercial use	
Southern Wood Pellets	Invercargill	Small	National Residential / Small commercial use	

Table 2: Pellet Manufacturers in New Zealand (May 2010)

Table 2 shows the current producers in New Zealand serving predominantly a growing national market. The production facilities are generally medium to small in size but are capable of servicing buyer’s needs in most areas of the country, albeit with most of the demand located in the South Island and the Centre of the North Island. New Zealand's largest wood pellet fuel plant is owned by Natures Flame. It is based in Taupo and was opened in late 2009. The Nature's Flame plant will initially produce up to 40,000 tonnes a year of the clean-burning, low-carbon fuel with a substantial proportion of its output exported. Depending on demand growth and export opportunities, Nature's Flame has plans for expansion in stages up to 300,000 tonnes over the next three to four years. The plant processes large volumes of pine wood residues from central North Island sawmillers and wood-product manufacturers.

Chart 2 below illustrates the magnitude of this increase in production capacity in New Zealand taking New Zealand into the production realms of the smaller players in Europe. This chart has been produced using some production estimates.

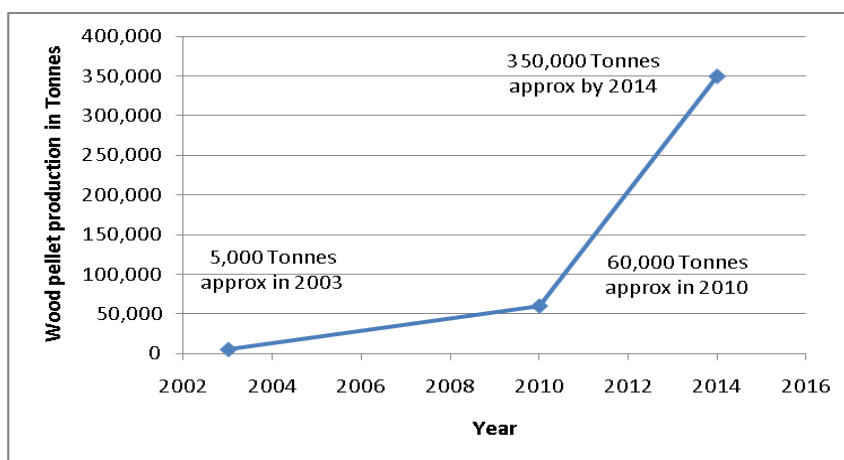


Chart 2: Illustrative estimate of NZ Pellet production past, current and potential

With the current number of wood pellet producers New Zealand is entering a phase where there is adequate number of producers who can potentially supply the current demand for wood pellets at competitive prices for pellets. There is however significant production over capacity and the low prices for pellets make it difficult for producers to be financially sustainable. This would be accentuated if another large pellet producer were to enter the market. The focus for the industry in the next few years must be on assisting the current sector participants to become more financially viable by growing the demand in the residential and commercial sector.

Currently there is only one large pellet producer who has the capability to supply pellets nationwide or for export. Other producers are developing regional markets based on local feedstock supply and the efficiencies of regional distribution networks.

1.7 New Zealand's Forestry Resources

New Zealand has large quantities of wood fibre that can be utilised for the production of wood pellets. Currently feedstock for pellet production comes from wood processing residues (sawdust, shavings, chip).

The current strong growth of the wood energy sector is already producing a strong demand for wood fuel in a market that has a strong demand for fibre for paper pulp, MDF, cattle standing pads etc. While there is adequate fibre potentially available for all of these uses from forestry operations the forestry sector is not tuned to maximizing the use of trees beyond the production of logs and lumber. The supply of wood fibre is constrained by the low prices being offered by the potential fibre buyers as a consequence of the cost competitive market wood processors are in, and the low cost of conventional energy compared to that of wood energy.

As the opportunity for extracting greater value from trees is recognized and pursued by forest and other land owners it is expected that some tree species will be grown specifically for wood fuel. This will put greater strain on the availability of wood fibre at a price that will make wood pellet production economic.

Over the next decade it would appear likely that short rotation energy crops such as miscanthus will be planted specifically as a source of wood fuel. Some of this production is likely to be a source of feedstock for the production of wood pellets. It should be noted that this material can only be used in Industrial grade pellets such as described in "Category C" in the BANZ Wood Fuel Classification Guidelines. The HDG boilers recommend a maximum of 20% moisture, "Category C" pellets have a maximum moisture of 15%.

With the current state of the fledgling New Zealand wood pellets sector with its current over capacity emphasis should be on assisting existing wood pellet producers to succeed rather than encouraging yet more sector participants. The competition for wood fibre will be a critical element in keeping wood pellet production costs low.

One issue to watch will be fibre supply. This is at risk since an increasing percentage of whole log export continues in New Zealand. New Zealand has not had any large scale timber processing investment for some years. The availability of processing residue isn't currently increasing with New Zealand's increasing harvest, a situation that needs to be watched.

2.5 Standards

New Zealand pellets are produced in line with European and International standards. While the industry in New Zealand works to voluntary standards, the affiliation to European/International standards is necessary given the dominance of European manufactured appliances in the New Zealand market.

Further, compatibility with European/International Standards makes sense on a number of levels not least efficiency, reliability, quality and reputation on a national and international scale.

However there is a proliferation of international standards so to assist New Zealand based producers the Bioenergy Association of New Zealand (BANZ) has prepared and published for use in the domestic market a set of pellet classification guidelines (The Wood Fuel Classification Guidelines⁴) that link to the most common international standards. These are published as voluntary standards which cover all wood fuel resources. The guidelines are an Industry lead initiative. They aim to give the seller and the purchaser of wood fuel confidence in the description and quality of the wood fuel sought or supplied. They provide a common methodology for classifying, specifying and declaring the quality and properties of traded wood fuel in New Zealand.

In June 2010, fuel from leading pellet manufacturer Nature's Flame was endorsed by DIN CERTO, Europe's leading product quality standards body for residential wood pellet fuel. DIN CERTO is an arm of Germany's Institute for Standardisation and its wood pellet certification criteria is being used as the basis of a proposed European Standard. Achieving certification required Nature's Flame to demonstrate quality assurance through its entire production chain⁵. Further details on DIN CERTO are to be found [here](#) and [here](#).

Those exporting wood pellets will of course have to meet the standards required by the purchaser.

2.6 Sector co-operation

The wood pellet sector participants (pellet producers, equipment suppliers, consultants and retailers) work together to collectively develop the wood pellet market through the Wood Pellets Interest Group of the Bioenergy Association of New Zealand. The website www.woodpellets.org.nz is a portal to a full range of information on the wood pellets sector in New Zealand.

2.7 Expansion of the domestic market

The New Zealand Bioenergy Strategy⁶ produced by the Bioenergy and Forest Owners Associations sets out a vision to achieve: *"A nationally significant bioenergy business sector, built on New Zealand's capability and expertise in growing and processing wood-crops and converting organic by-products to energy, which by 2040 supplies more than 25% of the country's energy needs, including 30% of the country's transport fuels."*

The Strategy aims to provide pull to the growing bio-economy and realise greater value from New Zealand's underutilized forestry resource and lift growth in bioenergy use by 2040 substantially above its current 8.5% of consumer energy, with attendant economic, social and environmental benefits. In

⁴ The Wood fuel classification Guidelines are available from the website http://www.woodpellets.org.nz/docs/Articles/Wood-Fuel-Classification-Guidelines_V5-June-2010.pdf

⁵ <http://www.naturesflame.co.nz/top-european-standards-approval-for-natures-flame-wood-pellet-fuel.html>

⁶ The NZ Bioenergy Strategy is available on the website www.bioenergy.org.nz

comparison a “business as usual” approach would achieve only around 9.5% of New Zealand’s total energy needs by 2040, including very little transport fuel.

The growth is driven by the demand for heat from proven wood fuel and biogas technologies, and demand for transport fuels which may be in the form of biogas, biodiesel or bioethanol.

The use of wood pellets as a heating fuel is expected to increase gradually over the next decade building on the now well established number of producers of wood pellets. The growth however will require a number of changes to the perception of wood pellets as a heating fuel and to the performance of residential wood pellet heaters.

3. International Markets and Opportunities

Internationally the wood pellet market is fast developing but the reliability of data on trade, prices, production capacity and actual production varies considerably between countries. *Wood pellets have been identified as one of the fastest growing bioenergy feedstock markets, and also one where it is challenging to obtain reliable information.*

Sweden, together with the USA and Canada, are the world’s largest producers of pellets with an annual production capacity exceeding 3,500,000 tonnes of wood pellets (about 16.5 TWh) in 2006. A second tier of producers from European Union Member States (including Austria, Germany, Italy, Estonia, Latvia, Russia, Poland and Denmark) have production ranging from 200,000 to 600,000 tonnes,. The remaining EU countries produce much lower amounts.

Future trade will include industrial pellet shipments from Australia, New Zealand, South America and South Africa.

Global demand for wood pellets reached nearly 12 million tonnes in 2008 and is worth approximately EUR 2 billion. Europe and North America accounted for 97% of global demand. Europe imported €66.2 million (about \$92.6 million) of pellets and other wood-based fuels in the first three months of 2009, up 62% from the same period a year earlier, according to the EU’s statistical arm. Worldwide, wood pellet use is growing strongly, with about 3million tonnes traded internationally (ocean trade). Key drivers are the rapidly increasing prices for other home-heating energy forms and from industry seeking to reduce emissions from fossil fuelled het plant. The current and future demand for wood pellets is strongly driven by the world’s need to develop renewable forms of energy and reduce greenhouse gas emissions. In some countries, the current slowdown in the economy has actually had a positive effect on the biomass industry because politicians have often favored bio energy and pellet-heating projects in government funded economic stimulus packages.

The global wood pellet market is and will continue to be a growth area. The market has grown rapidly (CAGR⁷ 27% in Europe and 17% in North America from 2005 to 2008). However, these growth rates will slow as markets mature. It is predicted that by 2015, global pellet demand will almost double, reaching approximately 24 million tonnes (CAGR of 10.5%).

⁷ CAGR – Compound Annual Growth Rate

Several country markets are mostly driven by export potential opportunities: the Baltic States (Estonia, Latvia, and Lithuania), Finland, Russia, Poland and Canada. These countries all have relatively low internal sales. Canada produced around 1,200,000 tonnes of pellets in 2006, of which a very high proportion was sent to Europe through Rotterdam in the Netherlands. The Canadian Pellets Association estimated that 700,000 tonnes of Canadian wood pellets would be used in European power stations in 2007. The Canadian production is also a consequence of the large areas of forest that have been killed by the Pine Beetle which provides a significant comparative advantage for sourcing feedstock at low costs.

Russia, with its 880 million hectares of woodland, is already exporting its pellets but with its huge potential, it could become one of the largest markets globally for wood pellet provided economic and political conditions are in place. Some large potential producers like Brazil, Argentina, Chile and New Zealand are in the phase of planning the necessary infrastructure.

3.1 Policy as driver for international pellet demand

In Europe, concerns about climate change and strategies to realize renewable electricity targets are a predominant driver for pellets growth, especially for large-scale co-firing of pellets with coal. For small-scale heating applications, the price advantage/competition with fuel oil plays an important role. This second driver is also the predominant one for North America, combined with a desire to diversify fuel supply. For Asia, the general need for (new) energy carriers and shifting from the heavily polluting fossil fuel technologies towards low carbon ones may be the most important drivers behind increasing demand for wood pellets.

The pellets' clean-burning properties and low ash content are attracting demand from both the higher-value home-heating market in Europe and from industry in Europe and Asia:

- Europe – growth in the home heating and electricity generation sectors for two types of pellets in terms of quality (Category A for residential use and Category C for co-firing in generation plant).
- Asia - In Japan, utility companies are investigating the incorporation of wood pellets in the fuel mix for their thermal electricity generating stations.

4. Pellets in Europe

4.2 Opportunities for Wood Pellets in Europe in 2010

Figures for the first three months of 2009 suggest that Europe's wood pellet imports are now worth about 200 million Euro a year (NZ\$400m). The European need for wood pellets is such that consumption in 2010 is predicted at 12.7 million tonnes. The promise of Carbon Credits – a means to offset carbon emissions - is also a big draw card. Other home-heating energy, electricity and oil, is very expensive and consequently Italy now has more than a million pellet fires in homes. The market is already very well established, with demand for up to 2 million tonnes of top-grade pellet fuel a year.

Sweden is currently the biggest consumer of wood pellets in the world, consuming over 20% of the world's production of wood pellets. There are no signs portending any slowdown in demand for wood

pellets in Sweden, and the annual growth is expected to be between 8% and 10% in the coming years. Other large markets include mainly central European countries, such as Austria, Italy, Germany, the Netherlands, Denmark and Belgium.

The European targets for producing electricity from renewable energy sources has resulted in a number of power stations e.g. Drax in the UK, committing to using biomass for a significant part of their fuel, but they are finding it difficult to source locally produced pellets and are now scouting the world looking to import pellets for fuel.

4.2 Sourcing pellets for Europe

In 2007 more than 285 small to large pellet production plants (with an annual capacity from 2,000 to 150,000 tonnes) were in operation in the EU, up from 230 in 2006. By 2009 this had grown to be over 450 pellet-producing plants with many new projects planned over the next few years. The bulk of these plants can be found in central and northern Europe.

In order to meet the demand for its fast growing market, Sweden produced almost 1.6 million tonnes in 2008 and imported another 300,000 tonnes mainly from other countries in Europe but also from Canada.

The United Kingdom, Denmark, Sweden and Germany are some of the countries that are expected to have the fastest growth in forest biomass consumption (both pellets and wood chips) over the next ten years. These countries will thus both invest in domestic production capacity and increase imports.

New Zealand based Nature's Flame is shipping New Zealand's first pellet exports into Italy for the residential market and the Netherlands for the power generation market.

4.3 Drivers for Wood Pellets in Europe

The decision by the EU to use a minimum of 20% renewable energy by 2020 has driven a rapid increase in wood pellet production in Europe. Sweden, Germany, Denmark and the UK are expected to have the fastest growth in consumption through the coming 10 years.

Added attractions include the many financial incentives in Europe such as:

- Investment Tax Credits
- Capital Grants
- Consumer Rebates
- Excise Tax Exemptions
- Tax Credits
- Targets and Quotas combined with Penalties
- Subsidies
 - Productions of Green Electricity
 - Consumption
 - Research

Furthermore, under the Kyoto Protocol the use of biomass for energy production gives credit to the user, not to the producer of the fuel. As such, Sweden, Italy, Denmark and other industrialized countries have a strong interest in importing pellets.

Current concerns in Europe also focus on the problem of deforestation of European forests. Many European countries simply cannot hold out to the demand for woody biomass. While there is no doubt the inclusion of woody biomass helps them to meet their carbon reduction targets and targets for increased heat and electricity from 'green' and sustainable sources, such commitments are increasingly going to have to be met with imported wood fuels.

In this respect, New Zealand's advantage is the use of processed wood waste for high quality contamination free wood pellets. In some cases this kind of waste would otherwise be going to landfill. In addition the New Zealand tree harvest is on a 25 year rotation compared to the 80 year cycle in Europe.

5. Wood pellets in Asia

With booming economic development spurring energy consumption in Asian countries, it is estimated that this region will be the biggest global energy consumer by 2030. It is estimated that CO₂ emissions in developing countries will increase to be three times those of developed countries by 2100.

China is currently in a phase of rapid industrialization and integration into the world economy. But this has come at a high price, putting great strain on the environment through extensive use of fossil fuels and other natural resources.

Bioenergy development has become a top government priority, and China's law on renewable energy was implemented in January 2006. The current focus is on electricity generation from surplus agricultural residues, which are estimated at 200 million tonnes yearly. The government has set up a long-term target of 30 gigawatts of electricity generated from biomass by 2020, which will require billions of dollars in investment.

China plans for renewables to meet 10% of total energy consumption by 2020, and has extensive biomass resources with the special focus of the agricultural residues. In general, the potential biomass resources to be used in China include wood waste and straw, and feed grain that is now too old to use.

China plans to produce 50 million tonnes of pellets by 2020. Chinese government has declared that 50 combined heat and power stations are to be built using straw pellets as fuel. China has been steadily introducing wood-pellet production technology, and all the equipments can mostly be manufactured domestically now. The production cost is much lower than that of abroad. The price is comparable with low calorific value electricity coal. However, the wood-pellet industry is still at its preliminary stage, but China plans to produce 50 million tonnes of pellets by 2020.

As part of a growth phase, it's likely that the Chinese will require imported pellets.

The Japanese government considers the use of biomass, particularly as a source of renewable energy, to be a key element in the achievement of its commitments under the Kyoto Protocol. The Japanese

government is supporting an increase in energy production from biomass sources from 218 000 kilowatts (kW) in 2002 to 330 000 kW in 2010. The Japanese too will require imported pellets to help meet demand for cleaner energy.

6. Wood pellets in South America⁸

IEA Research indicates that concrete initiatives have been made almost exclusively by private sector in several South American countries, based on the European domestic and industrial demand and their attractive prices. European policies at the industrial level, and opportunity energy costs at domestic level are the most important drivers for Latin American pellet production at the moment. Some large potential producers like Brazil, Argentina, and Chile are in the phase of planning the necessary infrastructure with all shipping pellets to Europe.

Pellets production is just starting in Latin America and supply of biomass residues for that purpose is not a barrier at the moment. However, the lack of industrial capacity and the logistic barriers are serious constraints. Exports of pellets, at present, have been made for domestic uses. However, pellets costs from given Brazilian sites, according to some analysis, showed competitiveness if compared with market prices also for large scale uses in Europe.

Research shows that Argentina was the first South American country to export pellets. Brazil commenced exports in 2007 and Chile followed suit. Currently, the attractive European market of pellets for domestic use, with prices at 150-185 Euro/t is absorbing the small amount produced in South America, assuring net earnings despite some high logistic costs such as port tariffs, containers freight, domestic and destination handling.

The largest market in Europe is for bulk supply, for heat and power generation, which is paying 100-120 Euro/t in average, without delivery costs (Pigaht et al, 2005). Thus, regarding European market, the trends for South American pellets, mainly from Brazil and Argentina, are towards price reduction, due to the demand for pellets being for different (large scale/nondomestic) purposes. For Chile and other countries located at the Pacific Coast, market for pellets in Asia and Japan remains unknown, different to the existing markets for wood chips and pulp production (Campino, 2007). Pellets from Chile will have to confront the additional freight cost distance plus the Panama Canal toll.

The tables below⁹ set out the production capacity for the three countries noting all three are exporting total current production and significant opportunity for growth in both Chile and Brazil in terms of productions capacity.

Country	Production capacity (1,000 t/yr)	Current production* (1,000 t/yr)	Domestic consumption (1,000 t/yr)	Exports* (1,000 t/yr)
Brazil	60	25	—	25
Argentina	7.2	7.2	—	7.2
Chile	80	20	—	20

⁸ <http://www.bioenergytrade.org/downloads/ieatask40pelletandrawmaterialstudynov2007final.pdf>

⁹ *ibid*

Country	Market	Pellets use	Price (CIF)	Trends
Brazil (a)	Europe / Italy	Domestic (15kg bags)	185 E/t (container)	Price reduction
Argentina (b)	Europe / Italy	Domestic (15kg bags)	150-180 E/t (container)	Price reduction
Chile (c)	Asia / Japan /USA	n/a	n/a	n/a

7. Wood pellets in North America¹⁰

Over 80% of U.S. pellets in 2008 were shipped to in-country destinations. Most of the rest was exported to Europe, a growing trend boosted further by the handful of large plants geared to exports. By contrast, almost 90% of Canadian shipments were exported, mainly to Europe. Reflecting this difference in markets, most U.S. pellets were placed in 18-kilogram- (40-pound-) sacks, whereas over 80% of Canadian volume was shipped in bulk. Bulk shipments usually require volumes of at least 10,000 tonnes, thus favoring larger firms in exporting activity.

In 2008, total North American installed capacity was 4.2 million metric tonnes; up from 1.1 million in 2003. Capacity is set to reach 6.2 million tonnes in 2009 if all announced plans to start mills reach fruition. The Appendix contains histories and sizes of existing or prospective pellet plants as of June 2009.

Canadian firms were first to recognize the market potential of selling pellets to European power plants and established a significant industry on the basis of using the plentiful surplus waste fiber streams available from sawmills in British Columbia. These plants accounted for about one-half of the total North American capacity in the early 2000s.

Whether conventional or torrefied, USDA Research indicates that the pellet industry faces a constraint on its growth from the limited availability of waste fiber. The same research also indicates that the prospect of power plants requiring a substantial part of their fuel to come from biomass is a potential market-altering event. The volumes involved are on a different scale of magnitude than current uses and would likely overwhelm existing supply capabilities and prevailing patterns of fiber use, as experienced in Europe. This represents an opportunity for pellet fuel producers but a threat to long-time waste users such as panel plants.

Non-binding, voluntary standards for product grading and classification are a weak link in an industry's marketing. In difficult procurement environments, producers desperate to meet contractual obligations can be tempted to use whatever source of fiber is available, such as waste wood with bark content. This can lead to inconsistency in performance and hamper consumer acceptance. Mature industries producing a minimally undifferentiated commodity typically submit to third party inspection and verification to assure buyers of their product's quality and consistency.

¹⁰ http://www.fpl.fs.fed.us/documnts/fplrp/fpl_rp656.pdf (USDA 2009)

8. Wood Pellets in Australia

Despite the distance, Australia too is making significant inroads into the European pellet markets. This year alone has seen the exportation of 20,000 tonnes of wood pellets to Europe. Around 100,000 tonnes of wood pellets are set to be transported to Europe by the end of 2010.

Leading pellet producer Plantation Energy Australia leads the field with contracts in place to supply a number of European Energy producers.

Australian companies are known to be exporting to Belgium and the Netherlands. Australian exports are largely focused on the Category C pellets (lower quality) for co-firing in European power plants.

9. World Pellet Prices

Pellet prices on the world market have trended upward during the past seven years, as reported in the Wood Resource Quarterly. Prices in Sweden have generally been higher than in Central Europe, but in 2009, prices fell the most in Sweden, resulting in a convergence with prices in Germany and Austria. Wood fiber costs are expected to increase later this year, which would result in higher production costs for many pellet manufacturers. As a consequence, it is probable that wood pellet prices will start moving upward again this coming winter after a few months in retreat.

Relative to other heating fuels, biomass pellets have in many countries been consistently the cheapest energy source over the past two years. Heating oil, natural gas, and electricity are all considerably more expensive, with in some cases a price difference reaching as high as 200 percent (natural gas versus pellets in Sweden; in Germany in mid-2007 natural gas prices were almost twice those of bulk biomass pellets; likewise, in Austria, pellets have been consistently less costly than heating oil since mid-2003, with peaks in the difference between 2005 and 2006 when the fossil fuel was often twice as expensive).

While pellet use in New Zealand is growing, relatively, sales are small and suppliers can more than meet local demand. Prices are therefore unlikely to be affected by world markets. Typically, 20 kg bags sell for upwards of \$10, on average around \$15. Prices vary depending on quantities purchased.

10. New Export Markets for New Zealand

9.1 Export production capacity

New Zealand's first major export shipment of pellets was 6,500 tonnes destined for European power plants. The shipment left New Zealand in March 2010 from the Port of Napier. This first shipment is part of a three-year, \$15 million contract with the European utility sector. Nature's Flame wood pellets produced at the Taupo plant are also being exported to Italy for the home-heating market and to Japan, for use by electricity generators and the horticulture sector to heat glasshouses.

A key aspect for ensuring access to international export markets will be accessing firm flows of adequate quantities of pellet feedstock at lowest cost. This will require a balance of adequate revenue to forest owners to encourage them to make quality pellet feedstock available, yet minimize the cost of feedstock so that pellets can be sold into the international export market at competitive prices.

9.2 Competition in the international markets

In terms of the countries that New Zealand is competing against for international sales, clearly the North American capacity with its established routes for freighting bulk supplies of pellets to markets in Europe are the biggest – ie, Canada. Future competitors also selling from a distance into the European market include Australia and South America. Globalization is taking place and trade is becoming a key feature of wood pellets markets. A rising number of pellet producers from around the world, especially Canada and Russia, are already selling in Europe and are looking for new business contacts.

A projection for China indicates that they might be producing around 50 million tonnes of biomass pellet fuels by 2020 from a variety of sources such as switchgrass, agricultural residues (rice, sunflower, corn, soybean, cotton, etc...) and woody energy crops. While in Latin America, pellet production is so far marginal, the European demand for pellets may trigger further investments in the near future.

New Zealand will need to be clear on its point of difference which is expected to be based on the utilisation of forest and wood processing residues and pellet quality.

9.3 NZ Capability to meet the international market

Export of wood pellets will need to be integrated into the wider national forestry and wood processing strategies where the wood pellets are a byproduct from these industries.

New Zealand's substantial plantation forestry resource and potential for increased wood processing being done locally (rather than just exporting logs) means New Zealand has the potential to be a leading supplier of high quality wood pellet fuel.

Current concerns in Europe also focus on the problem of deforestation of European forests. Many European countries simply cannot hold out to the demand for woody biomass. While there is no doubt the inclusion of woody biomass helps them to meet their carbon reduction targets and targets for increased heat and electricity from 'green' and sustainable sources, such commitments are increasingly going to have to be met with imported wood fuels. In this respect, New Zealand's advantage is the use of processed wood residues for production of pellets that would otherwise be wasted. In addition the New Zealand tree harvest is on a 25 year rotation compared to the 80 year cycle in Europe.

9.4 Selling fuels on the International Market – The Challenges

Compared to other forms of biomass, such as wood chips, the main advantage that wood pellets offer is the significantly higher energy content per unit of volume. This allows for greater transport efficiency over longer shipping distances, an advantage which could increase in importance as the sustainability or "carbon footprint" of such long distance trade routes' comes under the spotlight. This will also lead to possible export of torrefied wood pellets with their higher energy density and good storage characteristics.

Increasing demand for pellets in Europe and past decreases in ocean freight costs have created new opportunities for producers to export pellets from the US South East, from South America and recently from Australia and New Zealand. However, prices for industrial pellets (which are considerably lower than residential pellets) have not risen greatly, and margins for many producers are under pressure

because their raw material costs (sawdust, woodchips or in some cases logs) have risen. Logistical costs remain an issue and pellets exports will need to be a mix of high and lower quality in order to overcome this. More recently, freight cost increases make the long distance export of pellets only just viable.

The 2007 IEA Pellets Report indicates that for the European market, the trends for Latin American pellets, mainly from Brazil and Argentina, are towards price reduction, due to the demand for pellets being for different (large scale/nondomestic) purposes. For Chile and other countries located at the Pacific Coast, the market for pellets in Asia and Japan remains unknown, different to the existing markets for wood chips and pulp production (Campino, 2007).

The United States may become an option depending on the future policies for renewables. However, Canada is one of the largest pellet exporters, and it may supply the US market at competitive prices. Looking at the European market, pellets from Chile will have to confront the additional freight cost distance plus the Panama Canal toll.

Issues in terms of long distance freight to be aware of are as follows:

- Market pricing habits – this is a relatively immature industry
- Ocean shipping rates – volatile, demurrage (charges associated with loading/unloading delays), deadfreight
- Land storage and logistics – large volumes, truck-rail-barge demurrages
- Customer relationship management – time, language and cultural differences

On a barrel of oil equivalent (bbbleq) basis, pellets beat crude oil and even natural gas easily. However, the high bulk density and low volumetric energy density of pellets being lower, long distance trade may push up the price given high transport costs. Still, the fuel remains very competitive when scale advantages and smooth logistical chains are in place (large production centers, low-cost logistical chains from inland sources to ports, bulk transport in oceangoing ships). These chains are still under development and are expected to improve in the future as the global pellet market matures.

Access to markets will be very important and assistance from New Zealand trade representatives in each of the most likely markets with their ‘feet on the ground’ will be important in identifying and selling the New Zealand capability to supply wood pellets on a continuous basis.

11. Opportunities for New Zealand Pellets – Summary

- New Zealand already has adequate wood pellet production capacity to comfortably service a growing national market in pellets for residential and small commercial use.
- New Zealand Pellets are predominantly produced from wood processing residues – heat used for pellet drying is often wood-waste fuelled and soon (in the case of Nature’s Flame, sourced from geothermal heat) - sustainable production.
- New Zealand wood pellet production costs are likely to be lower on the world scale and so pellets are competitively priced.
- Significant growth in value to New Zealand landowners with energy crops a co-product with other land uses.
- New Zealand has a significant existing forestry resource and capacity for extensive expansion.

- New Zealand wood processing plants are state of the art in terms of processing efficiency and extraction of quality process residues.
- New Zealand forestry sector is using 25 year rotation trees cf 80 year rotation trees in Europe - key point of differentiation of New Zealand from overseas in terms of availability of harvest and process residue.
- Demand in Europe and Asia outstrips the ability of these countries to meet their own demands and imports will be a fact of life in the future.
- It is increasingly accepted that fuel, even green fuel, has to travel from its point of origin to its point of use. Imports to Europe are coming from Australia and South America – distance is clearly acceptable. Relative to coal, oil and gas, pellets are more acceptable ‘green fuel’ commodity.
- New Zealand has long established timber routes into Asia.
- The opportunities for increased export of wood pellets will depend on a balance of increasing revenue for forest and other landowners so that they are encouraged to make feedstock available, and least cost of feedstock to pellet producers so that export can be at competitive prices.
- The export wood pellets will depend on future forestry and wood processing added value strategies as the production of wood pellets is as a byproduct of these industries.
- Future markets of interest to New Zealand are likely to be the growing national market, albeit small by international standards and the international markets of Europe (dependent on freight costs) and Asia (including Japan). New Zealand is supplying high quality pellets (typically referred to as “Category A”) to the European residential markets and while resources are plentiful in Asia, “know how” and expertise is less so. For the short to medium term therefore Asia also presents opportunities for sales.

Where to go for more information

Bioenergy Association of New Zealand (BANZ) www.bioenergy.org.nz and www.woodpellets.org.nz

Individual Producer web-sites (See Table 1)

IEA Report [“Global Wood Pellets Markets and Industry: Policy Drivers, Market Status and Raw Material”](#) (until July 2007) - The study provides an overview of the most important aspects of this booming market: the development of wood pellet technologies; the key drivers and policy contexts in the main markets; a sketch of different regional markets (Europe, North America and the emerging wood pellet industry in Latin America and Asia) with their respective pellet production, consumption and trade patterns as well as a comparison of pellet prices and other heating/power sources; and insight into solid forest industry by-products. The report concludes with an evaluation of the global raw-material potential for wood pellets from sawdust.

Wood Pellets - The Bioenergy Feedstock Solution? Global market, players and trade to 2015, http://www.poyry.com/Sectors_and_Services/Management_Consulting/Forest_and_Related_Industries/Multiclient_study_Wood_Pellets_The_Bioenergy_Feedstock_Solution_Global_market_players_and_trade_to_2015.html

<http://www.poyry.com/linked/services/pdf/58.pdf>